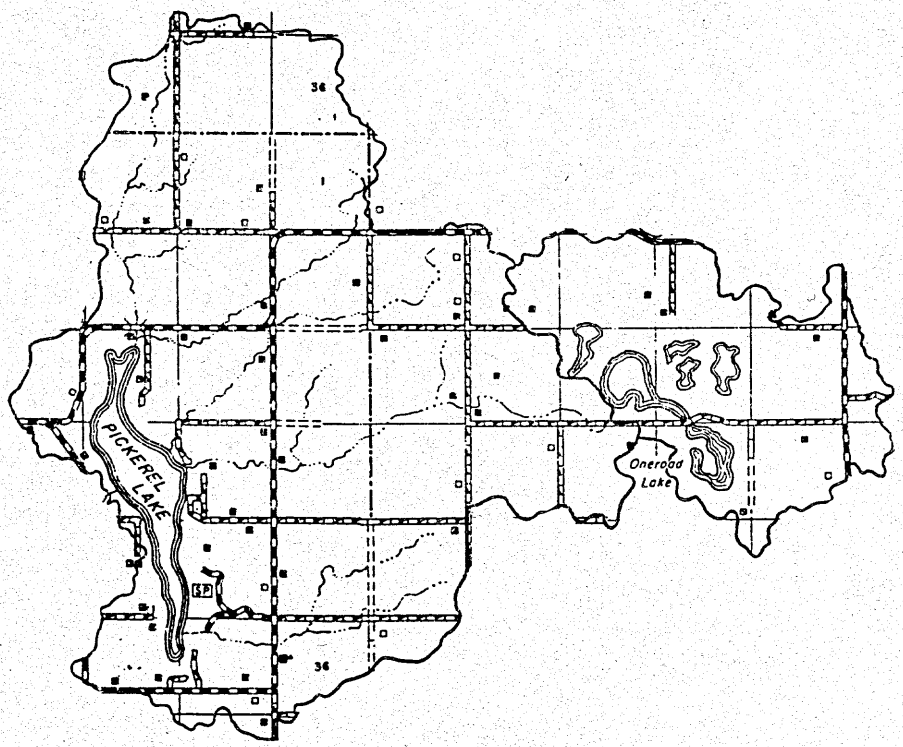
Sponsored By
Day Conservation District

U.S. Environmental Protection Agency
Natural Resources Conservation Service
Farm Services Agency
S.D. Dept. of Environment & Natural Resources
S.D. Dept. of Agriculture
Water Resources Institute

Final Report For The Pickerel Lake Protection Project



June 1996

Day Conservation District
Pickerel Lake Protection Project
Final Report

Compiled by
Dennis Skadsen
Project Coordinator

&

Dave German
Water Resources Institute

June 1996

Table of Contents

Preface 1
Acknowledgments 3

Part 1-The Pickerel Lake Protection Project

Introduction 1-1

Pickerel Lake
Topography 1-1
Shoreline Development 1-2
Inlets & Outlets 1-2
Aquatic Flora & Fauna 1-3
Beneficial Uses 1-3

Pickerel Lake's Watershed
Location 1-5
Climate 1-5
Soils 1-6
Land Use 1-7
Land Ownership 1-7
Status of Farmsteads 1-7
Wetlands 1-16
Wildlife 1-17
Economic Impact 1-17

Water Quality Impairments 1-19
Project Participants 1-20
Project Objectives 1-21
Funding 1-24

Part 2 - Project Activities

Section 1 - Project Coordinator
Introduction 2-1
Responsibilities 2-1
Activities & Accomplishments 2-2
Other Activities & Accomplishments 2-3

Section 2 - Information & Education
Introduction 2-6
319 Project Workplan 2-6
Local Meetings 2-7
Programs 2-8

Northeast SD Water Quality Conference....2-9
News Releases....2-10
Annual Reports & Newsletters....2-11
Photographic Documentation....2-11
Technical Assistance....2-12
Watershed Tours....2-12
Project Signs....2-13
Project Fact Sheets....2-13
Quarterly Reports....2-14
Adopt-A-Stream....2-15
Lake Atlas....2-15
Lake Property Owners Survey....2-15
South Dakota Conservation Digest....2-16
Lake Ecology Curriculum....2-16
Aquatic Exotics....2-17
Conclusions....2-17

Section 3 - Shoreline Stabilization
Introduction....2-18
Shoreline Survey....2-18
Survey Notes....2-18
Survey Comparisons - 1985 & 1993....2-21
Shoreline Stabilization - Private Property....2-24
Shoreline Stabilization - Pickerel Lake State Recreation Area....2-31
Outlet Weir and Spillway Reconstruction....2-32
Shoreline Stabilization Demonstration Site....2-33
Drainage Problems & Lakeshore Developments....2-35
Conclusions....2-35

Section 4 - Mapping
Introduction....2-37
Overlay Maps....2-37
Detailed Watershed Maps....2-37
Conclusions....2-38

Section 5 - Best Management Practices
Introduction....2-41
Selection of Fields to Receive Best Mgt. Practices....2-41
Incentive Payments....2-43
WQIP Incentive Payments....2-43
SD Coordinated Soil & Water Conservation Fund Incentive Payments....2-43
Field Checks....2-44
Cropland Best Management Practices....2-47
Best Mgt. Practice Implementation....2-47
Use of No-Till Planting....2-47
Information & Education....2-49
Other Conservation Programs....2-49
Conservation Reserve Program (CRP)....2-49

Great Plains Conservation Program....2-50
U.S. Fish & Wildlife Service....2-50
Best Management Practices on Lakeshore Property....2-50
Conclusions....2-51

Section 6 - Animal Waste Management
Introduction....2-52
Site Selection....2-52
System Design....2-52
System Construction....2-53
System Inspection, Operation & Maintenance....2-55
Post Construction Problems....2-56
Previous Built AWMS's....2-56
Future AWMS Construction....2-56
Solid Waste Management & Utilization....2-57
Conclusions....2-58

Section 6A - Feedlot Monitoring
Introduction....2-60

Site Description
Gruby Site....2-60
Kulesa Site....2-60

Methods....2-61
Total Phosphorus....2-61
Nitrogen....2-61
Suspended Solids....2-62
Fecal Coliform Bacteria....2-62
Monitoring Results....2-62
Gruby Feedlot....2-62
Kulesa Feedlot....2-66
Conclusions....2-67

Part III - Water Quality Monitoring

Section 1 - Tributary Runoff Monitoring
Introduction....3-1
Sampling Sites....3-1

Section 2 - In-Lake Monitoring
Introduction....3-3
Trophic State....3-3
Dissolved Oxygen....3-3
Water Temperature....3-4
pH....3-4
Transparency....3-10

Nitrogen 3-10
Organic Nitrogen 3-11
Ammonia as Nitrogen 3-11
Nitrate plus Nitrite 3-12
Phosphorus 3-14
Total Phosphorus 3-14
Total Dissolved Phosphorus 3-15
Chlorophyll a 3-16
Suspended Solids 3-17

Part IV - Project Disbursements

Introduction 4-1
Project Budget Review 4-1

Disbursements
Project Coordinator Wages & Benefits 4-1
Information & Education 4-4
Shoreline Stabilization 4-10
Mapping 4-11
Best Management Practices 4-12
Animal Waste Management Systems/Waste Utilization 4-14
Travel 4-16
Technical Assistance 4-17
Office Support Staff 4-17
Planning Committee 4-18

Local Match 4-18

Figures

Figure 1 - Pickerel Lake....1-4
Figure 2 - Pickerel Lake Watershed....1-9
Figure 3 - Soil K Factors....1-10
Figure 4 - Classification of Farms....1-8
Figure 5 - Land Use....1-11
Figure 5A - Land Ownership....1-12
Figure 6 - Wetlands....1-13
Figure 6A - Drained Wetlands....1-14
Figure 7 - Aquifers....1-15
Figure 8 - Coordinator Activities....2-5
Figure 9 - 1993 Shoreline Survey Map....2-22
Figure 10 - 1985 Shoreline Erosion Map....2-23
Figure 11 - Cross Section Drawing of Shoreline Stabilization Design....2-26
Figure 12 - Location of Shoreline Stabilization Activities....2-27
Figure 13 - Location of Shoreline Stabilization Activities....2-28
Figure 14 - Location of Shoreline Stabilization Activities....2-29
Figure 15 - Location of Shoreline Stabilization Activities....2-30
Figure 16 - Shoreline Stabilization Site Design....2-31
Figure 17 - Outlet Weir Reconstruction....2-32
Figure 18 - Critical Area Overlay Map....2-39
Figure 19 - GIS Section Map....2-40
Figure 20 - Contracted Fields in Pickerel Lake's Watershed....2-45
Figure 21 - Location of Animal Waste Mgt. Systems....2-54
Figure 22 - Total Nitrogen Above & Below Gruby Feedlot....2-65
Figure 23 - Suspended Solids Above & Below Gruby Feedlot....2-65
Figure 24 - Total Phosphorus Above & Below Gruby Feedlot....2-66
Figure 25 - 1993 Runoff Monitoring Sites....3-2
Figure 26 - Dissolved Oxygen & Temperature Profile for Site 2 in 1991....3-5
Figure 27 - Dissolved Oxygen & Temperature Profile for Site 2 in 1992....3-6
Figure 28 - Dissolved Oxygen & Temperature Profile for Site 2 in 1993....3-7
Figure 29 - Dissolved Oxygen & Temperature Profile for Site 2 in 1994....3-8
Figure 30 - Dissolved Oxygen & Temperature Profile for Site 2 in 1995....3-9
Figure 31 - Secchi Disk Transparencies, 1991 through 1995....3-10
Figure 32 - Organic Nitrogen Concentrations, 1991 through 1995....3-11
Figure 33 - Ammonia As Nitrogen Concentrations, 1991 through 1995....3-13
Figure 34 - Nitrate & Nitrite As Nitrogen, 1991 through 1995....3-13
Figure 35 - Total Phosphorus Concentrations, 1991 through 1995....3-14
Figure 36 - Total Dissolved Phosphorus Concentrations, 1991 - 1995....3-15
Figure 37 - Chlorophyll a Concentrations, 1991 through 1995....3-16
Figure 38 - Box & Whisker Plot, Chlorophyll Concentrations, 20 Lakes....3-17
Figure 39 - Suspended Solids Concentrations, 1991 through 1995....3-18

Tables

Table 1-1	Precipitation 1992-1995	1-5
Table1-2	Major Wetland Types In Pickerel Lake's Watershed	1-16
Table 1-3	Pickerel Lake Milestone Schedule	1-23
Table 2-1	Criteria Used For Prioritizing WQIP Cropland	2-42
Table 2-2	Project WQIP Acres & Incentive Payments 1994-1996	2-46
Table 2-3	Conservation Cropping Sequences	2-48
Table 2-4	Total Acres Per Crop Type Planted On Contracted Acres	2-48
Table 2-5	CRP Acres & Contract Expiration Dates	2-49
Table 2-6	Animal Waste Management System Cost-Share	2-54
Table 2-7	WQIP Waste Utilization & Mgt. Incentive Payments, 1994-1996	2-58
Table 2-8	Concentrations of Contaminants in mg/l at the Gruby Feedlot	2-63
Table 2-9	Below-Above Contaminant Concentrations at the Gruby Feedlot	2-64
Table 2-10	Concentrations of Contaminants in mg/l at the Kulesa Feedlot	2-67
Table 3-1	Concentrations of Nutrients & Sediment of Grab Samples - 1993	3-2
Table 4-1	Disbursements - Project Coordinator Wages & Benefits	4-2
Table 4-2	Pickerel Lake Protection Project Budget	4-3
Table 4-3	Materials & Equipment Purchased With 319 Grant Funds	4-7
Table 4-4	Disbursements - Information & Education	4-9
Table 4-5	Disbursements - Shoreline Stabilization	4-11
Table 4-6	Disbursements -Best Management Practices	4-13
Table 4-7	Disbursements - Animal Waste Management	4-13
Table 4-8	Disbursements - Travel	4-16
Table 4-9	Local Match & In-Kind Contributions	4-19
Table 4-10	Total Project Costs	4-21

Appendices

Appendix A - References

Appendix B - Lakeshore Development
- Lakeshore Development Map - Page 1
- Description of Lakeshore Developments - Pages 2-4
- Atlas Maps - Pages 5-15

Appendix C - Northeast Hydrological Unit

Appendix D - Wildlife
- Reptiles & Amphibians Occurring in the Waubay Basin Watershed - Page 1
- Birds Occurring in the Waubay Basin Watershed - Pages 2-5
- Mammals Occurring in the Waubay Basin Watershed - Page 6
- Natural Heritage Database - Pages 7-8
- Key to Codes Used In Natural Heritage Database Reports - Page 9

Appendix E - 1991 Fish Kill
- Pollution Is A Factor In Pickerel Fish Kill
- Lake Problems Explained Here
- Making Waves At Pickerel Lake

Appendix F - Pickerel Lake Sanitary Sewer District
- Project News Releases - Pages 1-5
- District Boundary Map - Page 6
- Outline of District Regulations - Page 7
- Capital Cost Estimate - Page 8
- Survey - Page 9
- Letters of Support - Pages 10-15

Appendix G - Information & Education Work Outline

Appendix H - 1992 Informational Meeting Notes

Appendix I - Project Flyers
- Adopt-A-Stream
- Shoreline In Need Of Repair?
- Lake Awareness Seminar
- Lake Awareness Seminar II
- We Need Your Help!
- Pickerel Lake Tour

Appendix J - Project News Releases
- Pickerel Project Is Okayed
- Project Begins At Pickerel
- Lake Project Meeting Set

- Special Funds Are Available
- Help Wanted
- Is Project Coordinator
- Runoff Dirties Lake Pickerel
- Project Aims At Protection To Avoid Restoration
- Busy Buddies Clean Shoreline
- Lake Awareness Seminar
- Residents Unite For Water Quality At Pickerel Lake
- Pickerel, Enemy Swim Lakes Clean
- Project Completed To Protect Pickerel
- Other related news releases

Appendix K - Project Newsletters

Appendix L - Project Fact Sheets

- A Brief Geological History of Pickerel Lake
- Pickerel Lake Water Levels 1928-1993
- Pickerel Lake Fisheries
- A Pictorial Key To Pickerel Lake Fish
- Lake Protection Tips
- Understanding & Maintaining Your On-Site Septic System
- Controlling Shoreline Erosion
- WaterWise Boating
- Wanted-A Clean Lake!
- Water-Get The Facts Vol. 1
- Water-Get The Facts Vol.2
- Managing Lawns To Protect Water Quality

Appendix M - A Self-Guided Tour of Pickerel Lake's Watershed

Appendix N - 1994 Water Quality Report

Appendix O - Lake Property Owners Survey

Preface

Since the early 1900's, lakes have been classified according to their trophic state. The word "trophic" means nutrition or growth. Lakes are placed into one of four trophic states based on the amount of nutrients, algae, and aquatic macrophytes found in their waters. An Oligotrophic lake has low nutrient concentrations and a corresponding low plant growth. Eutrophic lakes have high levels of nutrients and an overabundance of plant growth. In between these two trophic levels of lake enrichment are the Mesotrophic lakes. Unfortunately, most South Dakota lakes are placed in a fourth trophic state called Hypereutrophic. Hypereutrophic lakes exhibit thick smelly algae blooms and dense aquatic weed beds. These lakes also experience occasional winter and summer fish kills. Pickerel Lake currently alternates between a Eutrophic and Mesotrophic state. However, a 1985 study of Pickerel Lake showed dangerous amounts of nutrients from nonpoint source pollution threatening to change this lake's trophic state for the worse.

Pickerel Lake is a relatively deep glacial lake located in northeastern Day County atop the Couteau Des Prairie - a large lateral moraine. The lake was formed 12,000 years ago by a large block of stagnant ice buried in outwash from the retreating Des Moines Lobe of the Late Wisconsin Glaciation. The landscape surrounding Pickerel Lake after the glacier's retreat was barren with little vegetation and Pickerel was probably Oligotrophic. Over time plant communities would become established, and Pickerel Lake shallower and more eutrophic as decaying plant and animal material accumulated on the bottom.

Over the next 10,000 years, the climate and vegetation surrounding Pickerel Lake would undergo drastic changes. 10,000 years ago Pickerel Lake was surrounded by boreal forest, the climate cool and moist. Woolly mammoth, Shasta ground sloth, Giant beaver, and large predators such as the Dire wolf and Sabertooth tigers roamed these forests. As the climate warmed 8,000 years ago, mixed deciduous trees became dominant along the lake's shoreline. On the upland, trees became scarce and open areas of grass and ferns developed. About this time the first humans appeared in this area and a great wave of extinction ended the reign of the large mammals. Continuous summer droughts 8000 to 4000 years ago led to the disappearance of the remaining upland deciduous forests. These forests were replaced by tall grass prairie, the remaining trees surviving along the riparian borders of lakes, streams, and rivers.

Over a thousand years ago, the first permanent human inhabitants known as the Woodland Culture - thrived in villages along northeastern SD glacial lakes leaving burial mounds along their shores. The first Sioux Indians reached northeastern SD over five hundred years ago, migrating west from Minnesota in pursuit of the buffalo, then the largest mammal of the plains. The first white settler in Day County established a trading post on Waubay Lake in 1868. Prior to 1892, all of Pickerel Lake's watershed lay in the Sisseton-Wahpeton Indian Reservation, and was sparsely populated. An 1880 census showed only 86 white settlers living in Day County. This quickly changed after the Sisseton-Wahpeton Reservation was opened to settlement in 1892. Then, almost every quarter section of Pickerel's watershed was claimed for settlement. Many of these sodbusters settled near wetlands, streams, or the lakes's horeline to have a ready supply of water for their animals and themselves. Cultural sources of nutrients from human and animal wastes would be added to the natural nutrients carried into Pickerel Lake. Much of the virgin tallgrass prairie was broken and converted to cropland exposing soil to wind and water erosion. Sheet erosion would carry the exposed soil of croplands into the lake via streams and drainage's. Pickerel Lake's shoreline became the location of several popular summer resorts and vacation cottages. Shoreline development added new sources of nonpoint source pollution to the lake from failing and poorly maintained or designed septic systems, and lawn fertilizers.

The droughts of the 1930's eliminated many of the homesteads settled in the late 1800's, and the trend of farm consolidation and abandonment has continued in this lake's watershed. Today, only thirteen working farms with livestock and residence remain. Year-round lake homes are replacing the summer cottage. By the late 1970's, signs of cultural eutrophication were becoming evident in Pickerel Lake.

Despite the onset of cultural eutrophication, Pickerel Lake remains one of the ten cleanest lakes in South Dakota. In 1991, the SD Nonpoint Source Task Force adopted the "SD Lake Protection Strategy", listing 21 of the states deeper and larger lakes that have not yet been seriously degraded by nonpoint pollution. Pickerel Lake was the highest ranked natural lake on the Lake Protection Priority List. The main objective of the "SD Lake Protection Strategy" is to fund lake protection projects to maintain the current water quality of these 21 lakes, and prevent expensive lake restoration projects in the future. Pickerel Lake is the first lake in South Dakota to receive such a protection project.

The Day Conservation District (DCD) served as grant applicant and project sponsor for this project. In April 1992, the DCD entered into a contract with SD DENR that made EPA 319 Nonpoint Source Pollution Control funds available for implementation of the Pickerel Lake Protection Project. This report will detail project activities and expenditures from April 1992 through June 1996 - the projects end.

Acknowledgments

Several individuals have invested considerable time and effort into the planning and implementation of this project:

Day Conservation District: Noel Anderson - Business Manager; Claire Bierschbach, William Bisgard, Marvin Bury, Robert Duerre, Alden Hanson, Rodney Tobin - District Board of Supervisors

Natural Resources Conservation Service - Webster Field Office: Tom Quinn - District Conservationist, Tim Nordquist - District Conservationist, Dan Mehlhaf - Acting District Conservationist, Mary Lou Woolf - Soil Conservationist, Charlene Larson - Soil Conservation Technician, Dave Bronson - Civil Engineering Technician

Natural Resources Conservation Service - Britton Field Office: Tom Martin - District Conservationist

Natural Resources Conservation Service - Sisseton Field Office: Kent Duerre - District Conservationist, June Helgeson - District Business Manager

Natural Resources Conservation Service: Roy Boschee - Ag Engineer, Ken Read - Ag Engineer

SD Ag Waste Team - Ken Benthin

SD Department of Game, Fish & Parks - Parks Division: Lori Skadsen - Manager Pickerel Lake State Recreation Area

SD Department of Game, Fish & Parks - Wildlife Division: Dave Lucchesi - Fisheries Biologist

SD Department of Agriculture, Division of Resource Conservation & Forestry: Keith Harner - Ag Program Specialist, Pete Jahraus - Ag Program Specialist

SD Department of Environment & Natural Resources: Wayne Houtcooper, Environmental Senior Scientist

Water Resources Institute: Dave German - Research Associate

Remote Sensing Institute: Mary DeVries-O'neill

Day County Commission: Arnold Anderson, Orville Hazelhorst, Leonard Naessig, Doug Smeins, Linda Walters, Sylvester Wika - Commissioners

Pickerel Lake Sanitary Sewer District: Duane Podoll - Secretary; Peter John Monzel, Jim Porter, Harold Slinden, Al Svare - Board of Directors

U.S Fish & Wildlife Service: Tom Wickstrom - Private Lands Consultant

Part I

Introduction

The Pickerel Lake Protection Project - An Introduction

Pages 1-1 to 1-18 of this introduction will give brief descriptions of Pickerel Lake and it's topography, shoreline development, inlets & outlets, and aquatic flora & fauna; the watershed's location and size, climate, soils, current land use, data on wetlands, wildlife, and the watershed's economic impact on northeastern South Dakota.

The maps included in this section were created using the Geographical Information System (GIS). Data for these maps were collected by the Protection Project, the Sisseton-Wahpeton Sioux Tribe, and the Water Resources Institute and Remote Sensing Institute - both located on the campuses of South Dakota State University. Data was digitized into the GIS format by Water Resources and Remote Sensing Institute's personnel. The soils map- Figure 3, was derived from the National Resources Conservation Service GIS soil layer. Wetland maps - Figures 6 & 6A, were derived from the National Wetland Inventory GIS layer prepared by the U.S. Fish & Wildlife Service. *** Denotes acreage determined by new watershed maps developed during the project utilizing the Geographical Information System (GIS).**

The remaining pages will provide information on water quality impairments that led to the initiation of this project, project participants, project objectives and milestones, and project funding.

Pickerel Lake

Topography

Pickerel Lake is South Dakota's deepest natural lake with a maximum depth of 43.3 feet, and a mean depth of 16.1 feet, Stewart & Stueven (1994). The lake covers 992* acres with 9.7 miles of shoreline, and is approximately 3.5 miles long and 1 mile wide at its widest point. Lake volume is 15,010 acre feet, Stewart & Stueven (1994). The lake was formerly called Lake Wilson - after C.G. Wilson, U.S. Surveyor General.

Pickerel Lake is surrounded by glacial moraines. The Pickerel Moraine begins in Roberts Co., extending west between Pickerel and Enemy Swim Lakes, then south along the eastern shore of Spring Lake located on the Waubay National Wildlife Refuge. A smaller unnamed moraine begins along the northwest shore of Pickerel Lake and extends into Marshall Co. The shoreline is uniformly regular with most bays - except North Bay, wide-mouthed and rather open. (See Figure 1)

Watts and Bright (1968) report the lake bottom as predominately rubble with scattered areas of sand and gravel, with silt and organic clay being found in the bays and deeper areas of the lake. It is reported by Watts and Bright (1968), who published a major study of Pickerel Lake's sediment, that 24 feet of sediment has accumulated in "North Bay" since the lake was formed approximately 12,000 years ago. A

small delta occurs at the mouth of Chekapa Creek. The lake is deep enough to thermally stratify during summer months.

The entire lake is surrounded by steep slopes with boulder lined shorelines that do not extend far into the lake. Natural sand beaches are uncommon. The lakes riparian border - where undisturbed by development, is comprised mainly of Bur oak (Quercus macrocarpa), and Green ash (Fraxinus pennsylvanica). Peach-leaved willow (Salix amygdaloides) is common along the shorelines base. A shrub zone exits on the outer margins of these riparian woods where overgrazing or development have not destroyed them. Where cabins and lake homes have been built much of the original shoreline and riparian buffer zone has been removed leaving well manicured lawns to the waters edge. Man-made seawalls have replaced the boulder shoreline of some lakeshore lots.

Shoreline Development

Approximately 55% of the lakes shoreline has been developed. Developments include; 322 lake homes and cottages, YMCA Camp, Pickerel Lake Bible Camp, Pickerel Lake State Recreation Area - East & West Units, one resort/restaurant, one bait shop/grocery store. Land owned by the State of South Dakota comprises the largest portion of undeveloped land along the lake's shore. The Pickerel Lake Sanitary Sewer District estimates the summer population of Pickerel Lake to be 948 people, making this seasonal community the second largest town in Day County. A complete description, and locations of shoreline developments is given in Appendix B along with data on lake property owners.

Inlets & Outlets

Surface water is supplied to the lake by two major and three minor drainage's. Chekapa creek - draining the largest portion of the watershed 6629.66* acres, is also the overflow of the 4883.13* acre One Road Lake watershed. This creek flows year-round due too a number of springs located along its course. Dry Creek drains the second largest area of the lake's watershed, 5184.33* acres. This drainage is a large glacial spillway formed during the retreat of the Late Wisconsin glacier. Dry Creek flows mainly during spring snowmelt and large rain events. More data on these drainage's and subwatersheds are found in Figure 2, page 1-9. There are two open artesian wells, located along the lake's eastern shore that flow year-round. One of these wells located near the old fish hatchery, flows at the rate of 40 gallons per minute into Hatchery Creek.

The lake is one of the recharge areas for the Basal System Pierre Aquifer, and for shallow aquifers in the Waubay Lake Basin. Leap (1988) reported that all of the lakes in Day County are surrounded by relatively thick, well developed surface aquifers which range in thickness from about 10 to 20 feet and are in direct hydraulic connection with these lakes. Figure 7, page 1-15, shows the locations of these aquifers in the Day County portion of Pickerel Lake's watershed.

Pickerel lake is one of only six lakes that maintained enough water to sustain fisheries during the severe droughts of the 1930's. It is also reported to be the only lake in the area that had water in October 1896, and was almost dry in 1840. Pickerel's water levels fluctuate by only a few feet during the year and are generally highest in early summer, and lowest in fall. A fact sheet "Pickerel Lake Water Levels 1928-1993" can be found in Appendix L. Pickerel Lake's only outlet is located in the West Unit of Pickerel

Lake State Recreation Area. The outlet is controlled by a concrete weir set at 1844.9 - 0.7 ft lower than the lakes Ordinary High Water Mark of 1845.6 feet above mean sea level. This outlet weir was reconstructed during the summer of 1993. Information on Pickerel Lake's OHWM can be found in Steffen (1982). Overflow from Pickerel Lake's outlet eventually empties into Waubay Lake east of Grenville, SD.

Aquatic Flora & Fauna

The lake is home to a warmwater fisheries made up of eighteen species of fish - 16 native, 1 introduced, and 1 exotic species. (See fact sheets - "A Pictorial Key To Pickerel Lake Fish" & "Pickerel Lake Fisheries" Appendix L) Other aquatic and semi-aquatic vertebrates include; Painted turtle (Chrysemys picta), Snapping turtle (Chelydra serpintina), Eastern tiger salamander (Ambystoma tigrinum), Northern leopard frog (Rana pipiens), and Chorus frog (Pseudacris triseriata). Large aquatic invertebrates include clams - Fat mucket (Lampsilis radiata), Stout floater (Anodonta grandis corpulenta); and Crayfish (Orconectes virilis).

The potential for new exotic aquatic species being introduced to Pickerel Lake from nearby Minnesota exists. Eurasian watermilfoil has the greatest potential of being introduced to Pickerel Lake, less likely to be introduced are the Spiny water flea and Zebra mussel. To date, these species have not been observed in Pickerel Lake. One exotic - Purple loosestrife, has been observed in Day County. Signs providing information on Eurasian watermilfoil, Purple loosestrife, and Zebra mussels have been placed at boat ramps around the lake. The Protection Project distributed several brochures procured from the Minnesota DNR and South Dakota DENR on these species. The fact sheet "WaterWise Boating" distributed to all lake property owners provided further information on these plants and animals.

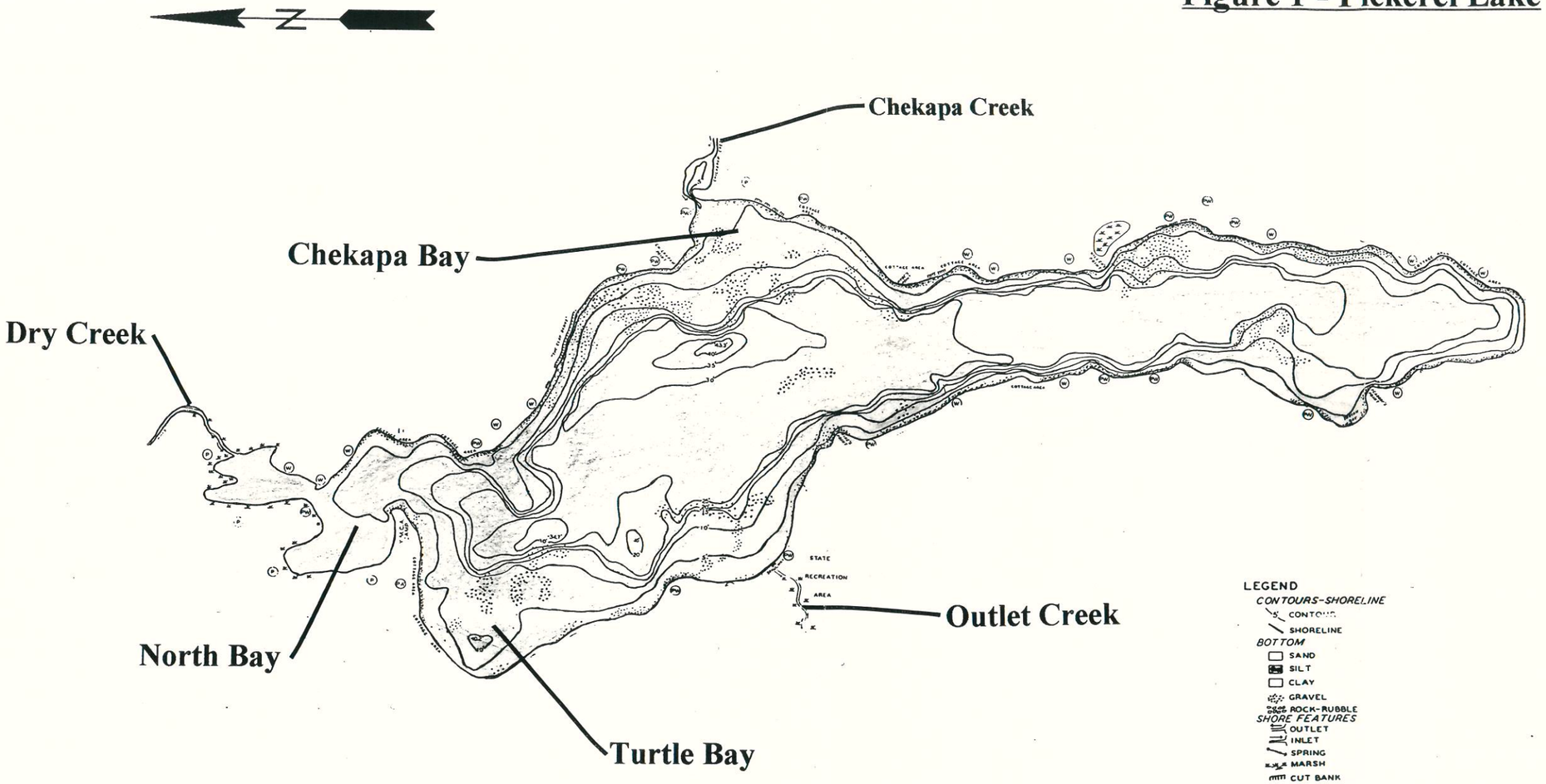
Data on aquatic macrophytes and algal species observed in Pickerel Lake are listed in Stewart & Stueven (1994).

Beneficial Uses

The State of South Dakota has designated the following beneficial uses to Pickerel Lake:

- Warmwater permanent fish life propagation
- Limited contact recreation
- Immersion recreation
- Wildlife propagation and stock watering

Figure 1 - Pickerel Lake



Pickerel Lake Watershed

Location

Pickerel Lake's 21,787.6* acre watershed - including One Road Lake, lies in Day (10,349.33* acres), Marshall (1685* acres), and Roberts (9753.25* acres) Counties of Northeast South Dakota. Figure 2, page 1-9, delineates Pickerel Lake's watershed and subwatershed boundaries. The table accompanying Figure 2 denotes the size of each subwatershed.

Climate

Climate in the Pickerel Lake watershed is continental with cold - dry winters and short springs marked by rapid weather changes. The mean annual temperature is about 44 Degrees Fahrenheit. Average annual precipitation and lake evaporation amount to 22 and 32 inches respectively.

During the winter of 1992-1993 over one hundred inches of snow fell in the Pickerel Lake watershed. There was one-hundred percent snow cover on the ground from 30 October until late March. The heaviest snowmelt occurred on 27 March 1993, when temperatures reached into the fifties. A mild October and early snow cover kept the ground from freezing, preventing spring flooding since much of the runoff soaked directly into the soil.

Above normal precipitation was received in 1993 - 26.75 inches, and 1995 - 28.04, see Table 1-1 below. On 24 July 1993, 6 -11 inches of rain fell in parts of the Pickerel Lake watershed between 5 PM and 10 PM. The rainfall caused flash flooding of all tributaries and drainage's. Pickerel Lake's water level rose approximately two feet, from 1846.0 to 1847.95, flooding low lying areas around the lakes shoreline. News releases relating to the 1993 flooding are found in Appendix J.

Table 1-1 Precipitation 1992-1995
(From Waubay National Wildlife Refuge)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
1992	0.35	0.40	0.87	0.89	0.60	6.21	2.38	1.15	1.65	0.48	1.17	0.49	16.64
1993	0.54	0.30	0.81	1.74	2.72	5.83	9.06	1.28	1.17	0.49	2.05	.76	26.75
1994	1.43	0.85	0.30	2.28	2.46	1.11	6.28	2.52	1.16	3.08	0.73	0.27	22.47
1995	1.18	0.60	2.46	2.25	2.90	2.71	5.13	4.25	3.49	2.51	0.20	0.36	28.04

Soils

The Natural Resources Conservation Service has assigned the following soil classifications for Pickerel Lake's watershed.

- **Forman-Aastad-Buse Association**. These soils are well drained and moderately well drained, gently undulating to steep loamy soils formed in loamy glacial till. This association is a glacial moraine that consists of hills, swales, and numerous depressions or potholes. Slopes are short and irregular. The drainage pattern is well defined in parts of this association, but in other areas swales and small drainage ways terminate in sloughs, small lakes and depressions. About 40% of the area is comprised of Forman soils, 20% Aastad soils, and 15% Buse soils. The remaining are minor soils. Forman soils are on the sides of rounded hills. Aastad soils are in the swales. Buse soils are in the higher parts of the landscape. In many areas of this association, soils are too steep or too stony to be cultivated. Most cultivated soils are subject to erosion. Control of erosion is the main concern of conservation management. A major portion of these soils are under cultivation. The soils are well suited to corn, small grains, flax, alfalfa, and tame grasses. Other areas remain in native grass and are used for grazing or for growing hay.

- **Renshaw-Fordville Association**. These soils are somewhat excessively drained and well drained, nearly level to steep, loam soils that are shallow and moderately deep over outwash sand and gravel. A few sloughs, small lakes, and potholes are scattered throughout the area. About 45% of the area is comprised of Renshaw soils and 30% Fordville soils. The rest are minor soils. Fordville soils generally have sand and gravel at a depth of about 22 inches. The soils are droughty. Available water capacity is low or moderate. Runoff is medium. These soils are subject to water erosion and soil blowing. Many areas of this soil association are cultivated and used for growing small grains, flax, alfalfa, and other early maturing crops.

- **Other Soils**. There are a number of minor soils including Sioux and Parnell. One of the more common soils is Parnell. It is very poorly drained and occurs in many depressions or potholes throughout the area. They generally have no natural outlets and are flooded during the greater part of the year. Nearly all of them are in grass or wetland vegetation. These soils cover nearly 7% of the watershed area.

Figure 3, page 1-10, delineates erodible soil based on K factors in the Day County portion of Pickerel Lake's watershed. This soil erodibility factor is a relative index of the susceptibility of bare, cultivated soil to erosion by rainfall and snowmelt. The K value is computed from soil composition, structure, and saturated hydraulic conductivity. K values can range from 0.02 to 0.64 or higher. The higher the K value the more susceptible the soil is to sheet erosion. The majority of soils in the Day county portion of Pickerel Lake's watershed has a K factor of 0.28.

Day County is the only portion of Pickerel Lake's watershed where the soil layer for GIS was available. This layer will be forthcoming from NRCS for Roberts and Marshall Counties.

Land Use

Land use in the 19,799.2* acres of upland in Pickerel Lake's watershed is predominately agriculture. Figure 5, page 1-12, and accompanying table provide data on current land use in Pickerel's watershed. The following criteria was used for determining land use categories mapped in Figure 5.

- **Cropland** - All land with a grain crop. Typical crops in Pickerel Lake's watershed include small grains - wheat, barley, oats, & millet, and row crops - corn, soybeans, sunflowers, canola, and buckwheat.
- **Tame Hay** - All land currently used for hay production that was former cropland.
- **Tame Pasture** - All land currently used for pasture that was former cropland.
- **CRP** - All land that was enrolled in the CRP Program. Land not currently used for crop, hay or pasture that was formerly cropland was assumed to be CRP.
- **Wild Hay** - All land used for hay that had not been previously cropped. May include some land cropped in the more distant past.
- **Rangeland** - All land used for pasture that had not been previously cropped. May include some land cropped in the more distant past.
- **Wildlife** - All federal and state land in park or wildlife management plus private non-cropland that was not currently used for crop, hay or pasture.
- **Trees** - Includes shelterbelts around farmsteads and residential areas, and riparian woods.

Land Ownership

Figure 5A denotes land ownership during the project. The majority of land in the watershed is privately owned. Land owned by the State of South Dakota includes the Pickerel Lake State Recreation Area, Lakeside Use Areas, and Game Production Areas around Pickerel and One Road Lakes. These areas are managed by the SD Dept. of Game, Fish & Parks - Wildlife Division located in Aberdeen, SD, and Parks Division located at Pickerel Lake State Recreation Area, Day County, SD. Waterfowl Production Areas near One Road Lake comprise all the Federal Land in Pickerel Lake's watershed. These areas are managed by the US Fish & Wildlife Service located at the Waubay National Wildlife Refuge, Day County, SD. Tribal and Heirship lands are managed by the Sisseton-Wahpeton Sioux Tribe located at Old Agency Village, Roberts Co., SD, and the Bureau of Indian Affairs.

Status of Farmsteads

Data on the current status of farms in the Pickerel Lake watershed were collected during a survey conducted in the projects final year. Figure 4 shows that almost half of the visible farmsteads in Pickerel

Lake's watershed have been abandoned. It was not determined how many farms at one time occupied the watershed. As stated in the Preface, almost every quarter section of Pickerel Lake's watershed was once occupied by a homesteader, however many of these sites have been farmed over or disappeared with time.

The following criteria was used:

- **Abandoned** - denotes buildings not maintained and in disrepair, or have been removed.
- **Livestock Only** - denotes no human residence, some or all buildings have been maintained.
- **Residence Only** - denotes human residence but no livestock currently present.
- **Livestock & Residence** - denotes what would normally be called a farm, with human residents and livestock present at time of survey.

Figure 4 Classification of Farms

Pickerel Lake Watershed

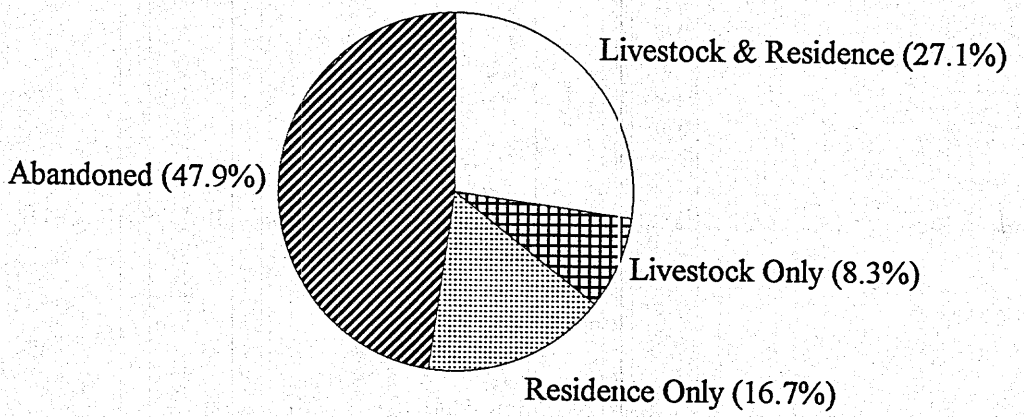
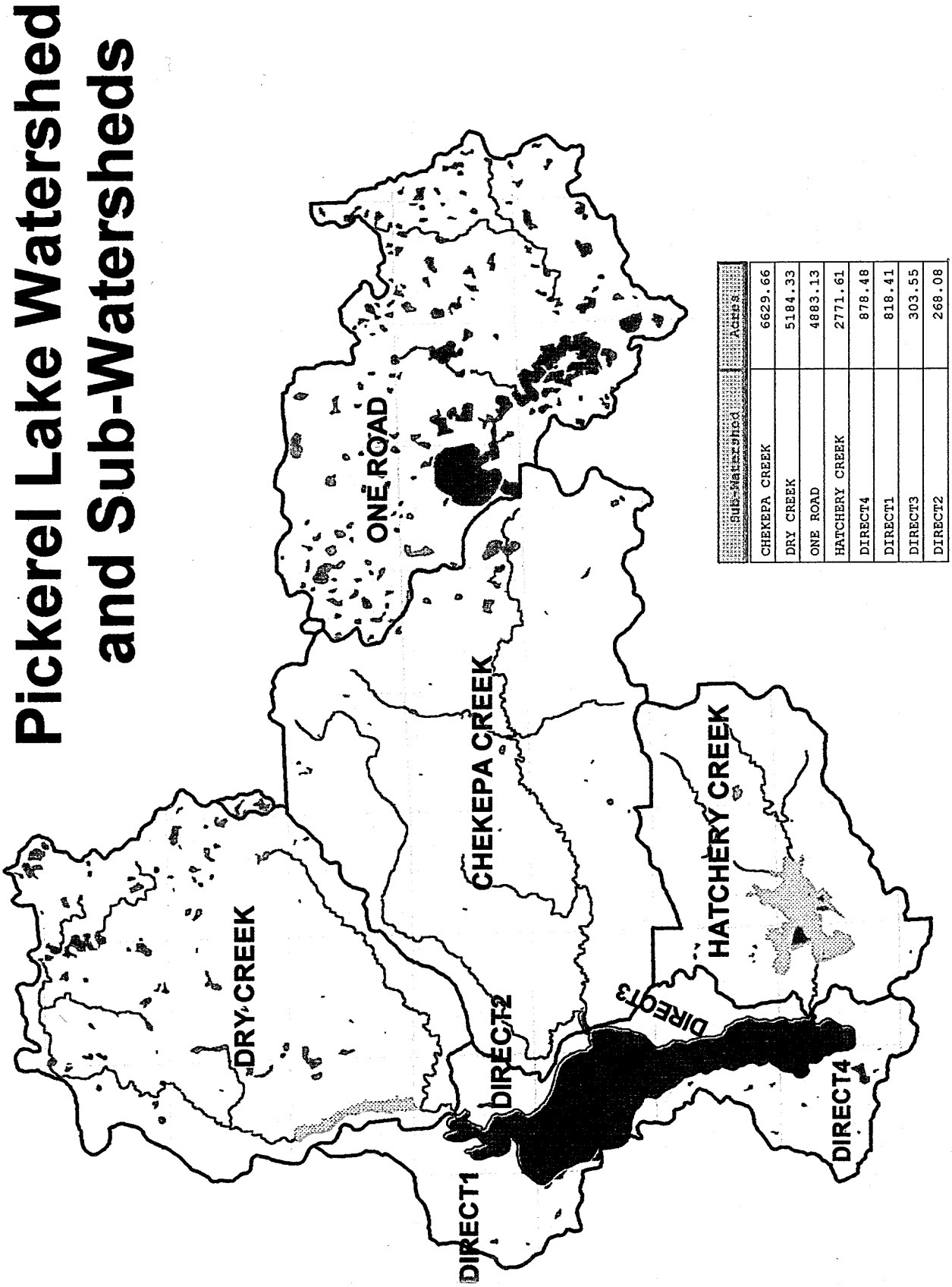


Figure 2 - Pickerel Lake Watershed



Sub-Watershed	Acres
CHEKEPA CREEK	6629.66
DRY CREEK	5184.33
ONE ROAD	4883.13
HATCHERY CREEK	2771.61
DIRECT4	878.48
DIRECT1	818.41
DIRECT3	303.55
DIRECT2	268.08

Figure 3 - Soil K Factors

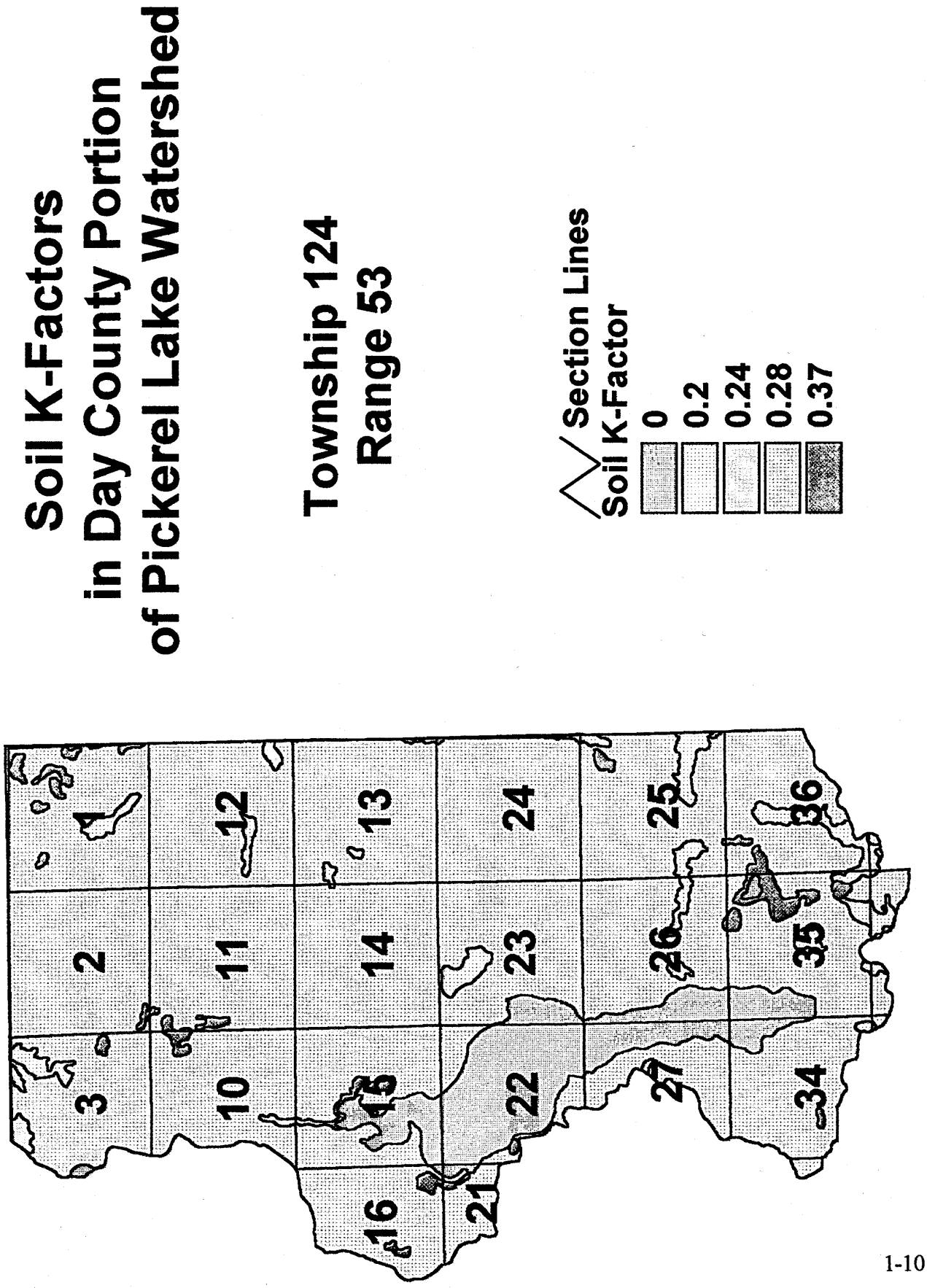
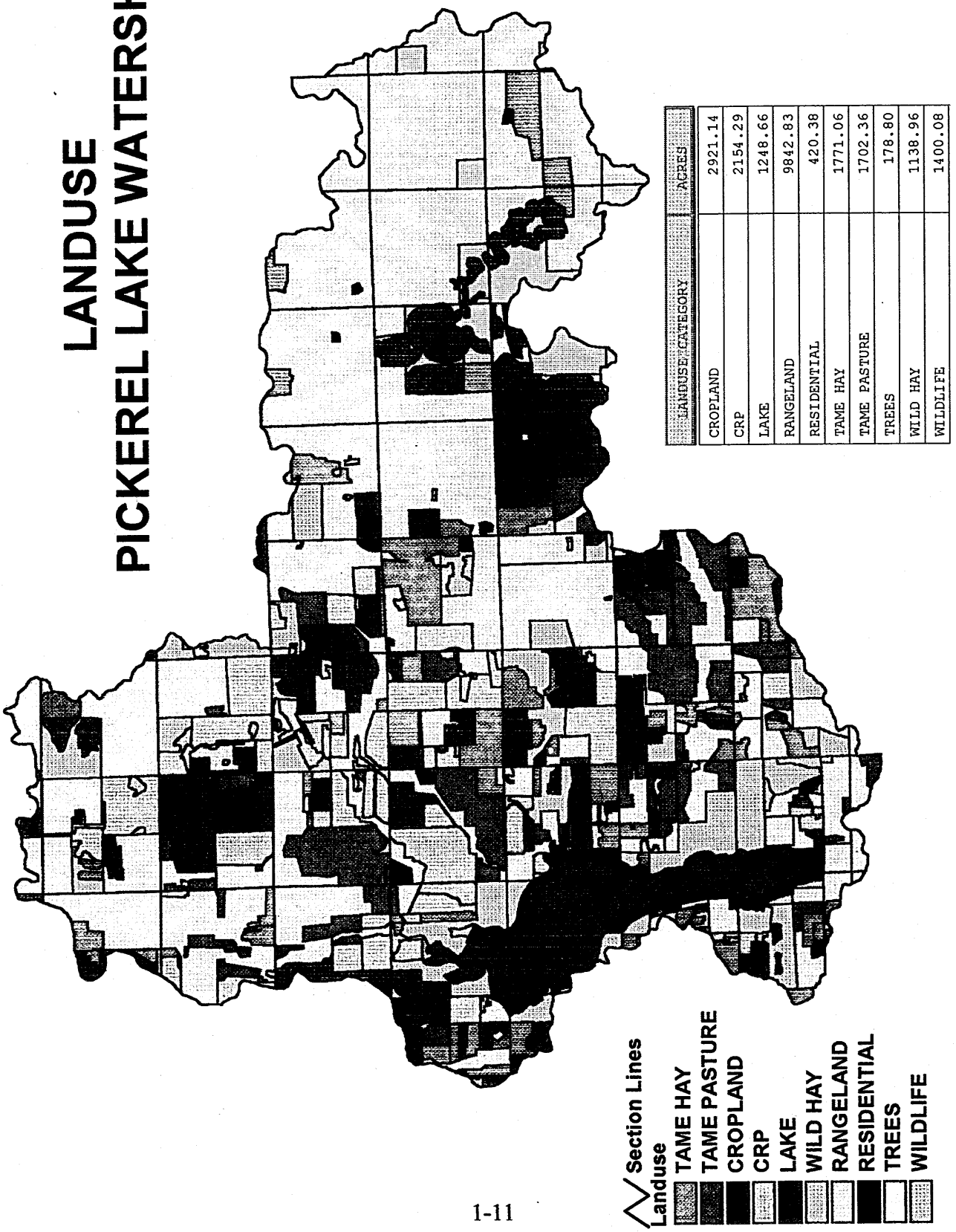


Figure 5 - Land Use



LANDUSE/CATEGORY	ACRES
CROPLAND	2921.14
CRP	2154.29
LAKE	1248.66
RANGELAND	9842.83
RESIDENTIAL	420.38
TAME HAY	1771.06
TAME PASTURE	1702.36
TREES	178.80
WILD HAY	1138.96
WILDLIFE	1400.08

Figure 5A - Land Ownership

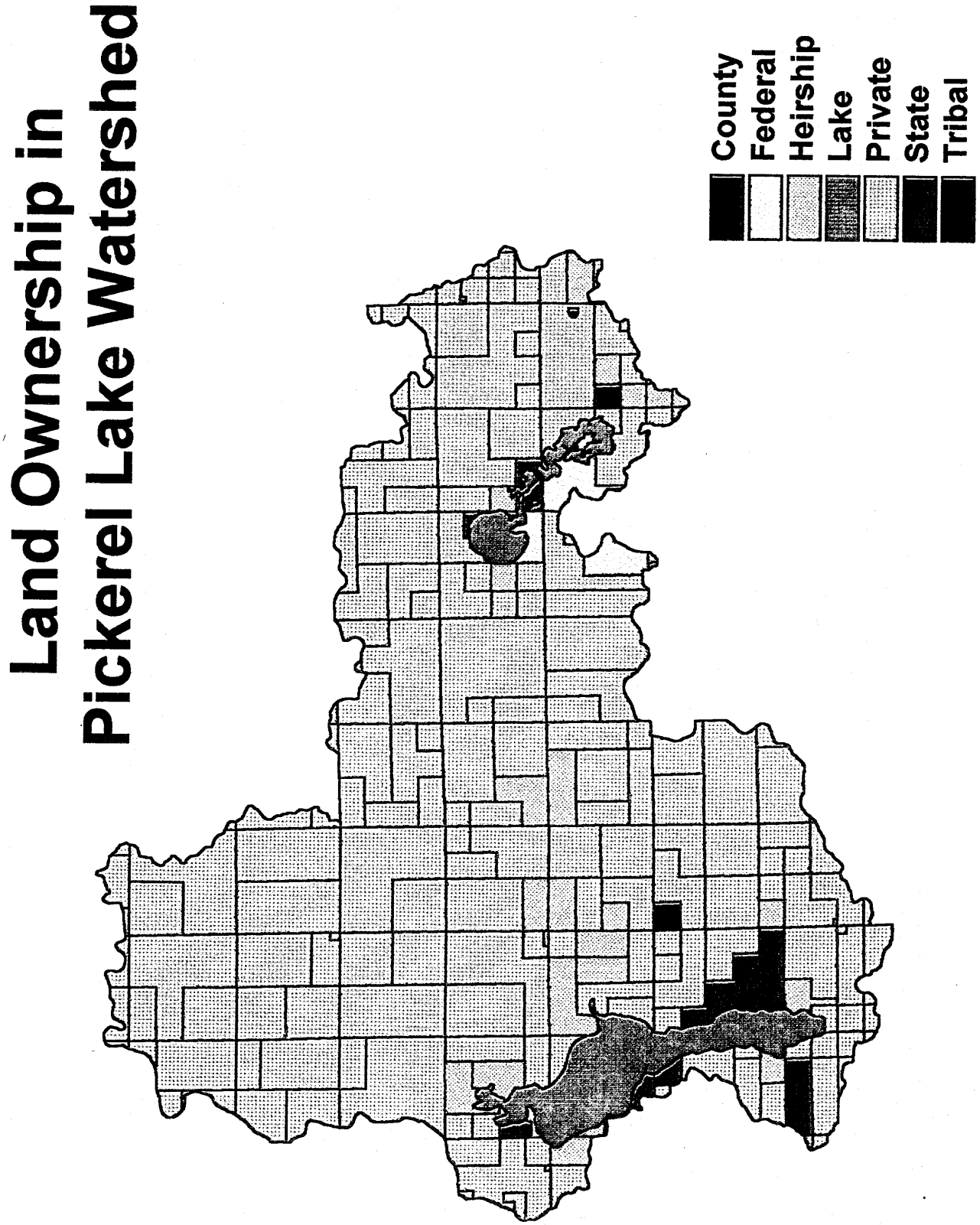


Figure 6 - Wetlands

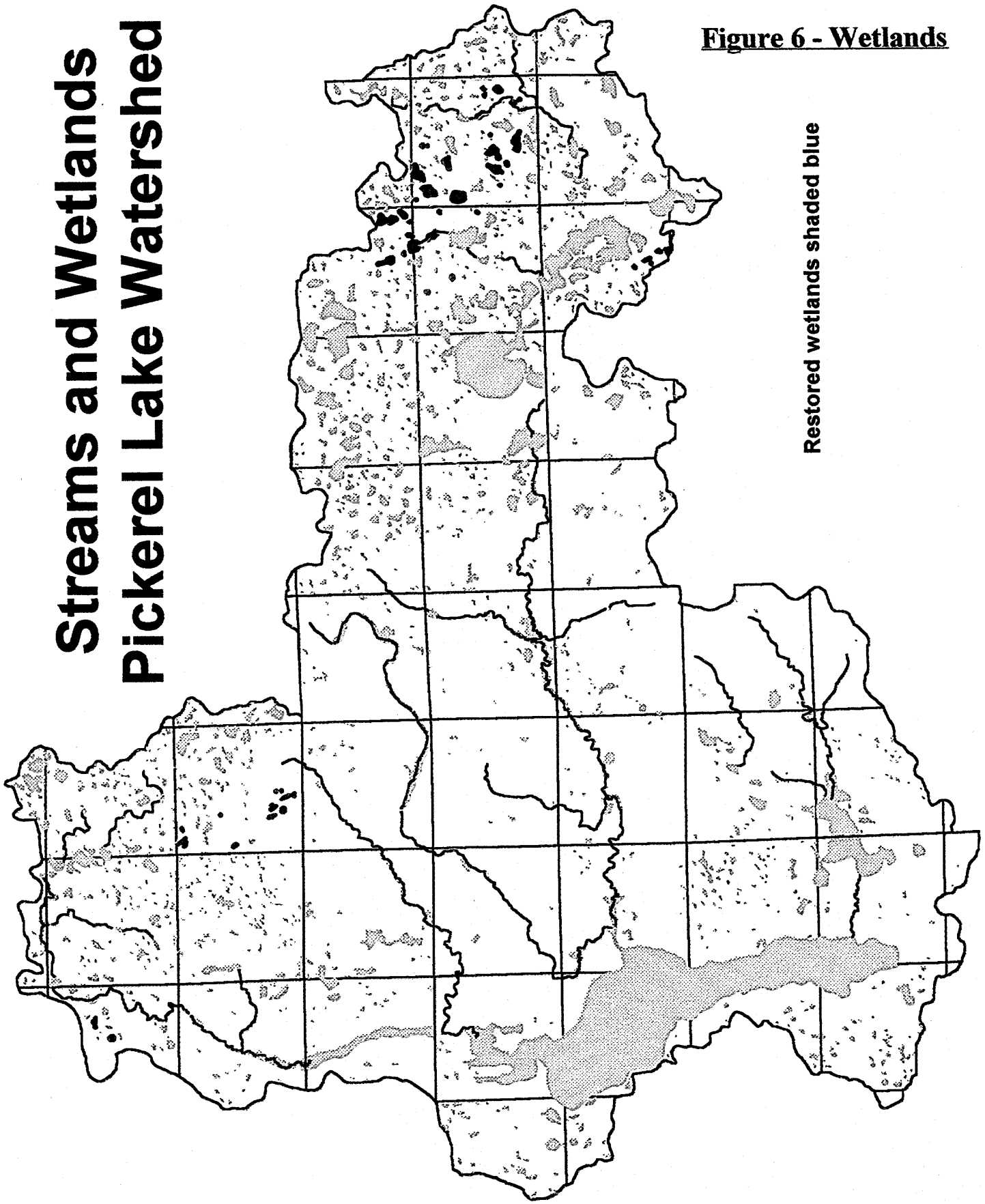


Figure 6A - Drained Wetlands

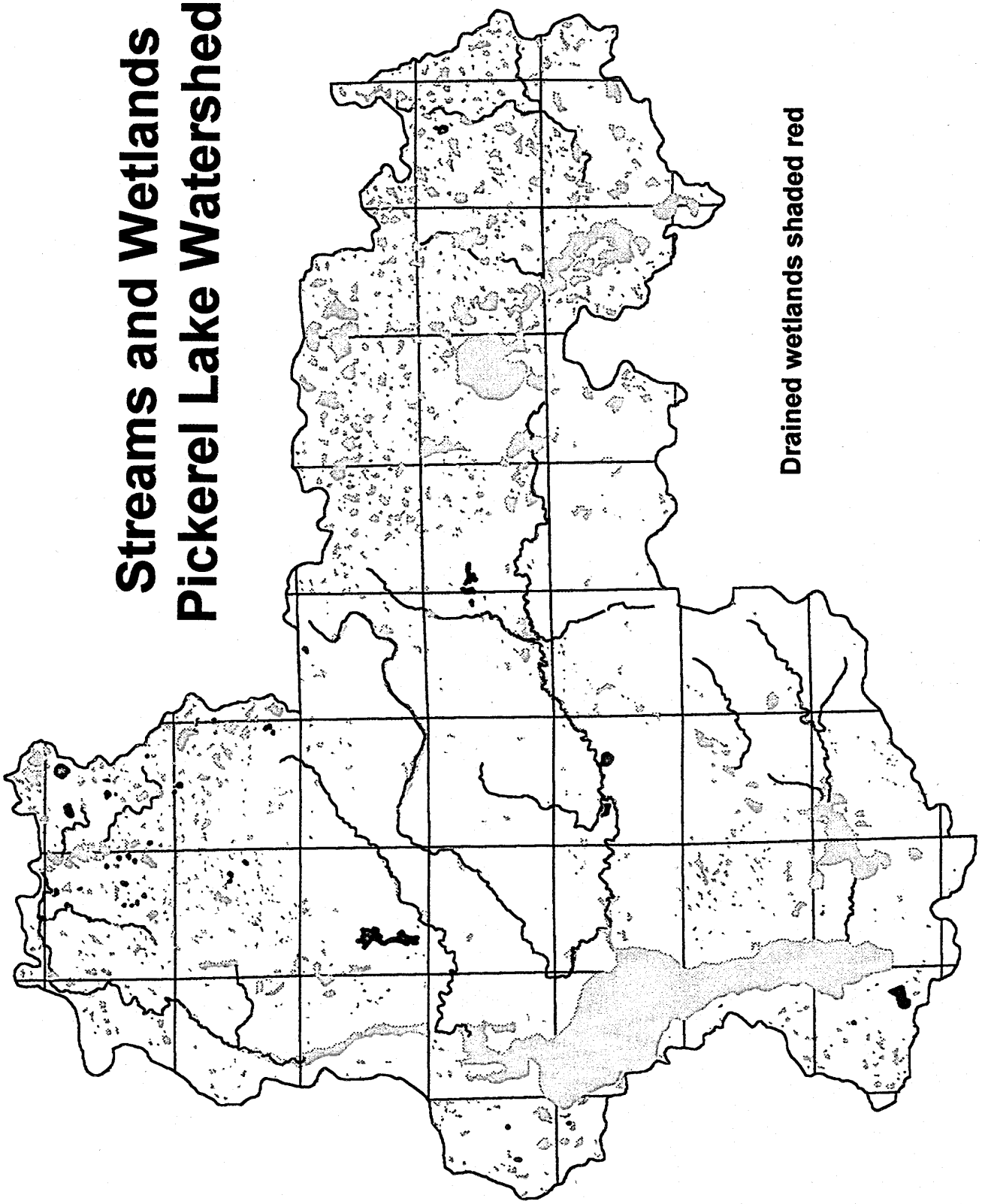


Figure 7 - Aquifers

Wetlands

There are 1744.75* acres of wetlands in Pickerel Lake's watershed, according to the National Wetland Inventory. Figure 6 , page 1-13, shows locations of these wetlands. Table 1-2 provides data on major wetland types found in the watershed. Figure 6A, page 1-14, denotes wetlands that have been drained. Between 1992 and 1995, 64 wetlands - a total of 110 acres, were restored in Pickerel Lake's watershed by the U.S. Fish & Wildlife Service. These wetlands were restored with funds from the "Partners In Wildlife" program. Restored wetlands ranged in size from 0.4 acres - the smallest, to 6.0 acres - the largest. Locations of most restored wetlands are shown in Figure 6.

Wetlands are very beneficial to water quality because they are often found between agricultural lands and larger bodies of waters such as Pickerel Lake. These wetlands intercept runoff capturing and removing harmful nutrients such as nitrates and phosphates, and trapping suspended sediments. Several large wetlands act as filter basins along Pickerel Lake's major tributaries. Both Dry Creek and Hatchery Creek drain through large wetlands, shown in green on the map in Figure 2, page 1-9. One Road Lake, a shallow 288 acre lake which overflows into Chekapa Creek - a major tributary of Pickerel Lake, acts as a filter basin treating and removing nutrients before this water reaches Pickerel Lake. Cropland that drains through wetland basins were given lower priority when determining which fields to enroll in the projects incentive programs.

Table 1-2 Major Wetland Types in Pickerel Lake's Watershed

Wetland Classification	Number	Acres
Palustrine - Emergent/Semipermanent	261	614.31
Palustrine - Emergent/Seasonal	859	411.63
Palustrine - Emergent/Temporary	244	265.15
Palustrine - Emergent/Aquatic Bed/Semipermanei	19	226.77
Palustrine - Aquatic Bed/Semipermanent	35	128.03

Wildlife

Wildlife in Pickerel Lake's watershed provides both consumptive and non-consumptive uses. Many watershed and lake property owners - as well as the general public, take part in fishing, hunting, and wildlife watching activities. Consumptive uses include big game hunting of White-tailed deer, and upland game birds - mainly the Ring-necked pheasant, and to a lesser degree the Mourning dove, and waterfowl.

Pickerel Lake is located along the Central Flyway - an important migration corridor for an estimated 1.5 million geese, 20 million ducks, and 85,000 swans. Waterfowl hunting is the number one consumptive use of wildlife in this area.

Sport fishing is another popular consumptive and - with the increase of catch-and-release, non-consumptive use of this watersheds wildlife. Pickerel Lake is known for producing record size Silver, and Smallmouth Bass. During the spring spawning season, White suckers are taken by spear in several of Pickerel Lake's tributaries and outlet.

Non-consumptive users include bird and wildlife - watchers and photographers, and bird feeders. Both consumptive and non-consumptive uses of these resources are important to the economy of Northeastern South Dakota.

Appendix D lists 6 Amphibians, 8 reptiles, 257 birds, and 41 mammals found in the larger Waubay Watershed Basin of which Pickerel Lake is part. Also included is the Natural Heritage list of Federal and State endangered, threatened, and species of special concern observed in Pickerel Lake's watershed.

Economic Impact

It is difficult to determine the full impact Pickerel Lake and it's watershed has on Northeast South Dakota's economy without a detailed study. However, the following information was obtained during the project.

Lake property along Pickerel Lake's shoreline was assessed at $14,576,000.00 in 1995, this includes improved and unimproved property. In 1995, lake property owners paid $351,316.00 in property taxes (figure does not include mobile home taxes). These taxes support both Webster and Roslyn South Dakota School Districts. In 1995, only one permanent lake resident living on taxable property was attending the Webster School District, and none attended the Roslyn School District. This is an issue raised by many lake property owners who believe their taxes are misused. A frequent comment made by persons who returned the Lake Property Owners Survey (Appendix O), was "we (lake property owners) receive no local government services for our tax dollar." Many suggested property taxes be used to improve and maintain roads in and leading to lake developments, garbage pickup, fire protection and law enforcement, and further funding of lake protection activities and construction of a sanitary sewer system.

In 1995, close to one million dollars in real estate sales ($908,770.00) were made on sixteen properties along the lakes shoreline. Ten of these sales were only for the lot. Amounts paid for this property ranged from $21,000.00 to $240,000.00. The average amount paid for lakeshore property in 1995 was $56,798.00.

Several questions asked in the 1994 Lake Property Owners Survey sought to determine the amount of money spent in surrounding communities by lake property owners. Seventy-one percent of lake property owners give permanent addresses outside of Day Co., many over 50 miles distance from Pickerel Lake. This group of property owners - many which spend the summer living at Pickerel Lake as semipermanent lake residents, report spending an average $575.00 a month for gasoline, groceries, entertainment, hardware, and lumber from businesses located in a 30 mile radius of Pickerel Lake. If this is an accurate figure for this group of property owners - approximately 220, over $375,000.00 is spent by this group in Day Co. during the typical lake season - June through August. Owners answering the survey cite Webster as the town where most of these services are sought.

Another important development along Pickerel Lake which contributes to the areas economy - is the Pickerel Lake State Recreation Area. This park has two units located along the lakes east and west shorelines. These areas - managed by the South Dakota Department of Game, Fish, & Parks, provide the general public access to Pickerel Lake for recreational and sporting activities. In 1995, the park collected $40,500.00 in fees from campers renting the parks 60 campsites and two cabins, and daily and seasonal entrance licenses. In 1995, campsites were rented 2074 times. Many campers no doubt spend money at local businesses for gasoline, bait, fishing licenses, and food while staying in the park, however it has not been determined how much local revenue is generated by this group.

There are two businesses located along Pickerel Lake's shoreline, one resort with restaurant and cabin rental, and one bait shop/convenience store with dock side gasoline service. Two other businesses are located within 1/2 mile of the lakes shoreline, a second restaurant, and a second bait shop/convenience store. The restaurants are seasonal - open from April through early December. The two bait shop/convenience stores are open year-round. It was not determined how much revenue is generated by these businesses, however it is safe to assume a portion of the approximately $125,000.00 a month lake property owners spend in this area is left at these four businesses.

Approximately 31 jobs are provided - most part-time, by the businesses and parks located along Pickerel Lake. This figure includes local people hired by lake property owners to care for their yards, house cleaning, security, and snow removal. Lake property owners report spending $11,000.00 a year for these services.

Money is also generated by sporting and recreational activities on Pickerel and other nearby lakes. The two bait shop/convenience stores located at Pickerel Lake collected $3,255.00 in fees for 315 resident and nonresident fishing licenses sold in 1995. The Day Co. Treasurer reported $7,096.00 were collected from boat licenses sold in 1995. Money generated by these fees is returned to the area to improve and maintain lake access areas and boat ramps, and improve lake fisheries.

Using the above figures, close to two million dollars in taxes, real estate sales, license fees, and sales to local businesses in Day Co. can be directly attributed to Pickerel Lake. It is clear that efforts to keep Pickerel Lake a desirable natural resource is in the best economical interest of Northeast South Dakota.

Water Quality Impairments

A detailed study of Pickerel Lake was conducted from 1979 to 1984 to determine the water quality of the lake and possible sources of nonpoint source pollution. The study was published in 1985. ***Pickerel Lake Water Quality Study Area Report*** - was funded by a Section 208 Water Quality Management Planning Grant from the U.S. Environmental Protection Agency.

This studies water quality analysis indicated the following:

- In-lake sampling indicated Pickerel Lake to be eutrophic as evidenced by high concentrations of total phosphorus and organic nitrogen.
- Pickerel Lake appears to receive dangerous nutrient loading from the watershed.
- Nutrient loads exceeded the permissible loading levels designated by Vollenwieder (1968)
- These nutrient loads will accelerate eutrophication of Pickerel Lake.
- Based on the ratio of total nitrogen to total phosphorus, Pickerel Lake may be shifting from a lake that would tend toward phosphorus limitation to one that tends toward nitrogen limitation.
- The trophic state indices calculated from total phosphorus concentrations indicate that total phosphorus is increasing in the lake over time.
- Emphasis should be placed on reducing nonpoint sources of nutrients in order to prevent lake degradation.
- Shoreline erosion contributed nearly 98% of the sediment to Pickerel Lake - an estimated 9,310 tons per year.
- Sediment contribution from the watershed was relatively minor - 208 tons/year.

The study identified nonpoint sources of pollution as runoff from agricultural lands in the watershed, feedlot runoff, faulty septic systems, and lakeshore erosion.

Further evidence of excessive nutrient loading include dense aquatic weed beds near shorelines and increased algae blooms. Algal blooms often occur in late September - early October when fall turnover takes place. A summer fish kill occurred in 1991, the first ever documented for Pickerel Lake. This fish kill followed a period of thermal stratification during which oxygen levels two days prior to the event were measured near 0% at depths below fifteen feet. Considerable concern among lake residents as to the cause of this fish kill were voiced in several news releases. Copies of related news releases are found in Appendix E.

Project Participants

A number of agencies were involved with the project and include the following:

- Day Conservation District - Served as grant applicant and project sponsor for the Pickerel Lake Protection Project. Advertised for and hired a Project Coordinator. Vouched for project grant funds when needed. District Business Manager was responsible for issuing cost share payments to project participants, paying wages & benefits of the Project Coordinator, paying project bills, and keeping accurate records of these expenditures and accounts. The District Board of Supervisors were responsible for approving project expenditures at the local level, monitoring project activities, and supervising the Project Coordinator. Time spent by the District Business Manager and Board of Supervisors on the Pickerel Lake Protection Project counted as local match towards state and federal grants.

- Water Resources Institute, South Dakota State University - Responsible for mapping current land use and highly erodible land within Pickerel Lake's watershed, and in-lake water quality monitoring. In cooperation with the Remote Sensing Institute and the Sisseton-Wahpeton Sioux Tribe - the Water Resources Institute generated GIS maps of Pickerel's watershed.

- South Dakota Department of Environment & Natural Resources - Administered EPA 319 & Consolidated Water Facilities Construction Program grant funds and provided technical assistance as warranted.

- Natural Resources Conservation Service (formerly SCS) - The NRCS provided technical assistance for and design of Best Management Practices suitable for Pickerel Lake's watershed. NRCS Ag Engineers designed three animal waste management systems constructed during the project. NRCS Soil Conservation Technicians and Civil Engineering Technicians surveyed project construction sites, and monitored the progress of each construction project. District Conservationists met with landowners & operators to plan and discuss BMP implementation and animal waste management system designs. District Conservationist monitored progress of each of these activities. NRCS provided watershed land use data for watershed inventory and mapping.

- Farm Service Agency (Formerly ASCS) - Provided cost share for landowners and operators who implemented BMPs through the Water Quality Incentive Program (WQIP); administered payments for WQIP, and provided information on land use within the Pickerel Lake watershed.

- South Dakota Department of Agriculture, Division of Resource Conservation & Forestry - Administered Coordinated Soil & Water Conservation Fund grants; provided technical assistance as warranted; developed the Coordinated Soil and Water Conservation Plan which provided the basis for development of the Northeast Lakes Hydrological Unit, and Pickerel Lake Protection Project.

- Other agencies offering local match and technical assistance include: Day County Commission; Day County Extension Service; Pickerel Lake Sanitary Sewer District; Sisseton-Wahpeton Sioux Tribe; SD Department of Game, Fish & Parks - Pickerel Lake State Recreation Area; SD Department of Game, Fish & Parks - Region 4 District Office, Webster; U.S. Fish & Wildlife Service - Waubay National Wildlife Refuge

- **Pickerel Lake Sanitary Sewer District**

In September 1992, 52 lake property owners who were registered to vote in Kosciusko Township, unanimously elected to incorporate a sanitary sewer district to address nonpoint source pollution from faulty on-site septic systems. A Board of Directors were also elected. News releases related to the sewer districts formation and progress can be found in Appendix F. District ordinances, and a map denoting district boundaries are also included in this appendix.

The Pickerel Lake Protection Project has given public support for this project in news releases, letters, and at joint public meetings. These letters are found in Appendix F. The efforts of lake property owners to construct a gray water sewer system to control nonpoint source pollution from their property - was a major factor in convincing watershed feedlot owners to cost share construction of animal waste management systems.

Project Objectives

The goal of the Pickerel Lake Protection Project was to maintain and prevent further degradation of lake water quality. There were two main objectives associated with the project; first produce detailed maps of Pickerel's watershed to direct conservation activities, and secondly implement Best Management Practices based on current watershed land use that would improve water quality.

Several tasks were outlined in the original 319 Workplan that needed to be completed to achieve the goals and objectives of this project. These are listed below.

- Prepare maps with overlays indicating where soil type, slope, and proximity to water courses combine with current land use to constitute critical areas that contribute sediment and nutrients to the lake.

- Incorporate onto watershed maps, information from the NRCS wetland inventory identifying drained wetlands that could serve as runoff storage and sediment basins if easements were negotiated for wetland recovery.

- Identify areas currently protected by grassed waterways and also those that still need protection.

- Through information and education, and individual conservation planning efforts, address the unprotected areas with grassed waterways, terraces, crop residue retention, conservation crop rotations, permanent vegetative cover, shoreline stabilization, and other pollution prevention measures.

- Complete computer model ratings of all feedlots, dairies, and winter feeding areas within the unprotected watershed.

- Identify locations of Conservation Reserve acres within the watershed and determine their contract expiration dates. Prior to expiration of CRP contracts, work with landowners and operators on best management practices which could be implemented on fields coming out of the CRP program to reduce nonpoint source pollution.

- Complete a detailed survey of the shoreline to determine the exact amount of shoreline stabilization needed. These areas will then be stabilized with rock rip-rap, earthwork construction, and permanent vegetative cover. Preliminary studies indicate that 2,400 feet of shoreline is in need of stabilization.

- Indicate areas of shallow ground water on watershed maps to identify areas where pesticides, commercial fertilizers, and manure can safely be applied, thereby reducing contamination of these aquifers.

- Compile land use information by hydrologic unit and prepare tables for each unit listing estimated land treatment needs to protect water quality.

- Utilize existing cost share programs to implement best management practices.

- Initiate an Information & Education program to inform the local citizens and publicize the protection project outside of the project area.

- Monitor water quality to detect any changes that may be due to project activities.

The following sections in Part II, III, & IV of this report will detail how project activities met the above stated goals and objectives.

Part II
- Section 1 - Project Coordinator
- Section 2 - Information & Education
- Section 3 - Shoreline Stabilization
- Section 4 - Mapping
- Section 5 - Best Management Practices
- Section 6 - Animal Waste Management
- Section 6A - Feedlot Monitoring

Part III
- Water Quality Monitoring

Part IV
- Project Disbursements

Table 1-3 Pickerel Lake Milestone Schedule

PICKEREL LAKE MILESTONE SCHEDULE

ACTIVITY	AGENCY	QTR 3 YR 1	QTR 4 YR 1	QTR 1 YR 2	QTR 2 YR 2	QTR 3 YR 2	QTR 4 YR 2	QTR 1 YR 3	QTR 2 YR 3	QTR 3 YR 3	QTR 4 YR 3	QTR 1 YR 4	QTR 2 YR 4	QTR 3 YR 4	QTR 4 YR 4
DETAILED WATERSHED MAPS															
Prepare maps of critical areas	DCCD,SDSU	XXXXXXXXXXXXXXXXXXXXXXXXXXXX													
Incorporate wetland data	DCCD,SDSU			XXXXXXXXXXXXXX											
Identify grassed waterways	DCCD,SDSU			XXXXXXXXXXXXXXXXXXXXXX											
Feedlot computer ratings	DCCD,SDSU	XXXXXXXXXXXXXXXXXXXXXXXXXXXX													
Delineate CRP areas	DCCD,SDSU			XXXXXXXXXXXXXX											
Delineate shallow aquifers	DCCD,SDSU			XXXXXXXXXXXXXXXXXXXX											
Compile land uses by HU	DCCD,SDSU	XXXXXXXXXXXXXXXXXXXXXXXXXXXX													
Compile info into document	DCCD,SDSU					XXXXXXX									
SHORELINE STABILIZATION															
Delineate areas & prelim survey	DCCD	Completed													
Detailed survey & designs	DCCD		XXXXXXXXXXXXXXXXXXXXXXXXXXXX						XXXXXXX						
Acquire permits	DCCD			XXXXXXXXXXXXXX					XXXXXXX						
Acquire materials and manpower	DCCD,SDSU			XXXXXXXXXXXXXXXXXXXX				XXXXXXXXXXXXXXXXXXXX							
Lay rip-rap	DCCD,LOCALS					XXXXXXX				XXXXXXX					
Acquire cover vegetation	DCCD					XXXXXXXXXXXXXXXXXXXX			XXXXXXXXXXXXXXX		XXXXXXXXXXXXXXXXXXXX				
Plant vegetative cover	DCCD,LOCALS								XXXXXXXXXXXXXX				XXXXXXXXXXXXX		
Follow up for plant survival	DCCD									XXXXXXXXXXXXXX					
Replant, if necessary	DCCD,LOCALS												XXXXXXXXXXXXX		
BEST MANAGEMENT PRACTICES															
Identify areas	DCCD,SDSU	XXXXXXXXXXXXXXXXXXXXXXXXXXXX													
Contact landowners	DCCD,SDSU			XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX											
Implement BMPs	DCCD,SDSU,ASCS SCS,LOCALS			XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX											
ANIMAL WASTE SYSTEMS															
Contact feedlot owner	DCCD,SDSU			XXXXXXXXXXXXXXXXXXXX				XXXXXXXXXXXXXXXXXXXX							
Complete prelim survey	DCCD,SCS			XXXXXXXXXXXXXXXXXXXX				XXXXXXXXXXXXXXXXXXXX							
Complete designs & permits	DCCD,SCS			XXXXXXXXXXXXXXXXXXXX				XXXXXXXXXXXXXXXXXXXX							
Construct AWM system	DCCD					XXXXXXXXXXXXXXXXXXXX			XXXXXXXXXXXXXXXXXXXX						

Funding

All federal and state grants for this project were received on a competitive basis. The Day Conservation District is the project sponsor, and applied - and was fiscally responsible for dispersal of these grant funds. Both federal and state grants required local match and in-kind contributions.

- **Federal Grants**

United States Environmental Protection Agency
319 Clean Lakes Program: **$95,740.00**

Grant Budget	Project Coordinator	$28,609.00
	Travel	$ 4,000.00
	Mapping	$12,187.00
	Shoreline Stabilization	$11,000.00
	Animal Waste Systems	$35,000.00
	Information & Education	$ 4,944.00

- **South Dakota State Grants**

Consolidated Water Facilities Construction Program: **$40,000.00**

Grant Budget:	Animal Waste Systems	$40,000.00

South Dakota Department of Agriculture
Coordinated Soil & Water Conservation Fund: **$77,591.00**

Grant Budget:	Project Coordinator	$22,091.00
	Best Management Practices	$30,500.00
	Technical Assistance	$25,000.00

- **Contributed Funds**

These funds were contributed to the project by local, state, and federal agencies for use by the Pickerel Lake Protection Project. These funds did not require a local match, however several counted as local match towards both federal and state project grants.

Natural Resources Conservation Service: **$25,000.00**

Project Budget:	Technical Assistance	$25,000.00

- **Contributed Funds cont.**

Farm Service Agency:		**$51,000.00**
Project Budget:	Best Management Practices	$31,000.00
	Animal Waste Utilization	$19,500.00
Day County Commission:		**$ 5,000.00**
Project Budget:	Administration	$ 5,000.00
Day Conservation District:		**$ 1,000.00**
Project Budget:	Administration	$ 1,000.00
Total Project Grants & Contributions:		**$295,331.00**

To qualify for these grants, the project sponsor was responsible for providing matching funds for both state and federal grants. Required match for the EPA 319 grant is **$79,915.00**. Required match for the SD Coordinated Soil & Water Conservation Grant is **$81,397.00**.

Project disbursements, local match, and in-kind contributions are detailed in Part 4 of this report. A unqualified audit of project expenditures and accounts will be conducted and published separately.

Part II

Project Activities

Section 1 - Project Coordinator

Introduction

Do to the numerous activities planned for this project, and with the number of agencies and individuals that needed to cooperate - the Day Conservation District determined there was a need for a Project Coordinator. A "Help Wanted" notice describing the position and qualifications was published in local newspapers. (See appendix J) Dennis Skadsen was hired as Project Coordinator in February 1993, at 1/2 time. The Project Coordinators hours were increased to 3/4 time when additional funds were obtained through a state grant. $28,609.00 were budgeted for Project Coordinator wages & benefits from the EPA 319 Grant, and $22,091.00 from the SD Coordinated Soil & Water Conservation Fund Grant. The Project Coordinator worked 5036 hours on this project.

Responsibilities

Responsibilities of the Project Coordinator were to include, but were not limited to the following activities:

- Coordinate activities of participating agencies and local organizations, and secure participation of local groups and individuals as required for successful completion of this project.

- Design and prepare a presentation for use when soliciting cooperation from local land users, promoting implementation of best management practices. The presentation must clearly define the need for best management practices, and the benefits to the landowner from implementation of these practices.

- Communicate one on one with land users in the watershed. This communication is essential for successful implementation of best management practices for control of nonpoint source pollution.

- Gather information on the economic value of Pickerel Lake and it's watershed to Northeastern South Dakota.

- Generate progress reports as required by workplan and related contracts.

- Conduct an extensive Information & Education program as outlined in the workplan.

Information on how the above responsibilities were met are given on the following pages.

Activities & Accomplishments

Coordinate activities of participating agencies and local organizations, and secure participation of local groups and individuals as required for successful completion of this project.

The Project Coordinator implemented the Northeast South Dakota Water Quality Conference (See Page 2-9, Section 2).

Design and prepare a presentation for use when soliciting cooperation from local land users, promoting implementation of best management practices. The presentation must clearly define the need for best management practices, and the benefits to the landowner from implementation of these practices.

A slide presentation was developed and given during the first "Lake Awareness Seminar" held at the Pickerel Lake Bible Camp on 9 July 1994, however no watershed landowners or users attended. Programs and public meetings held during the winter months may have been more successful, however no heated public meeting spaces are available within the lakes watershed. Meeting space was available in Webster or Sisseton, approximately 24 miles from Pickerel Lake.

Communicate one on one with land users in the watershed. This communication is essential for successful implementation of best management practices for control of nonpoint source pollution.

The Project Coordinator worked one on one with landowners constructing Animal Waste Management Systems, often accompanied by NRCS Technicians and District Conservationist. NRCS District Conservationist and Soil Conservationists met often with land owners under contract to implement Best Management Practices in Pickerel Lake's watershed, the Project Coordinator accompanied these persons on occasion. Project Coordinator worked one on one with lake property owners interested in receiving cost share for stabilizing eroding shoreline or technical assistance.

Gather information on the economic value of Pickerel Lake and it's watershed to Northeastern South Dakota.

A survey written by the Project Coordinator and mailed to all lake property owners gathered data on money spent for goods and services from area businesses, and in local communities. Results from this survey are given in the February 1995 Newsletter found in Appendix K. Other economic data are given in Part 1, pages 1-17 to 1-18 of this report.

Generate progress reports as required by workplan and related contracts.

The Project Coordinator wrote and distributed Quarterly Reports and Newsletters to all federal, state, and local agencies, lake property owners, and watershed landowners and users, see Section 2. Oral progress reports were given at public meetings, lake association annual meetings, and the Day Conservation Districts annual banquet.

Conduct an extensive Information & Education program as outlined in the workplan.

Section 2 - Information & Education, details activities and accomplishments for this part of the workplan

Other Activities & Accomplishments

- Aided NRCS Technicians in surveying animal waste management system sites, and shoreline stabilization sites.
- Co-wrote application for a SD Coordinated Soil & Water Conservation Fund Grant with District Conservationist. Grant was awarded to the Protection Project in May 1993.
- Wrote application for a SD Consolidated Water Facilities Construction Program Grant. Grant was awarded to the Protection Project in March 1994.
- Testified the need for Day County to help fund Protection Project during the 1994 County Commission Budget Hearings. Day County Commission voted 4 to 1 to allocate $5,000.00 to the Protection Project for administrative expenses, and further funding of Information & Education activities.
- Wrote specifications for animal waste management systems and shoreline stabilization project. Advertised bids in local papers and building exchanges. Conducted pre-bid meetings with landowners, potential contractors, and project engineers.
- Wrote contracts for and obtained signatures from landowners building Animal Waste Management Systems, Shoreline Demonstration Site, and shoreline stabilization.
- Kept accurate records of project expenditures, and local match & in-kind contributions. Completed vouchers to receive state and federal grant funds.
- Collected water quality samples above and below two animal waste management systems prior to and after construction. Aided Water Resources Institute personnel collect in-lake water quality samples.
- Accompanied SD Game, Fish & Parks personnel during fisheries and tagging studies to learn more about Pickerel Lakes fisheries and ecology.
- Worked with nearby Blue Dog Lake Association in developing a Blue Dog Lake Restoration Project. Testified at the SD Nonpoint Source Task Force on behalf of the Day Conservation District on the need for funding a Blue Dog Lake Assessment Study, funding was successfully obtained for a project slated to begin in 1996.
- Testified at the Water Congress's 1995 Fall Legislative Forum on the need for continued funding of lake protection and restoration projects.

During the project, the Coordinator attended the following meetings, workshops, and training seminars;

- May 1, 1993: "WacinTanka, Healing Relationships with Earth and Each Other" - Forum sponsored by the SD Peace & Justice Center at NeSoDak Bible Camp, Enemy Swim Lake, SD.
- June 26, 1993: "Volunteer Lake Monitoring" - Forum sponsored by the SD Lakes & Streams Association at the Hamlin Sportsmen's Club, Lake Poinsett, SD.
- September 14, 1993: "Richmond Lake Water Quality Project Tour" - Richmond Lake, SD.
- October 4, 1993: "South Dakota Association of Conservation Districts, 53rd Annual Convention" - Aberdeen, SD.
- October 12, 1993: "Sisseton-Wahpeton Dakota Nation Environmental Protection Forum - Sisseton, SD.
- March 21 - 23, 1994: "EPA Region 6, Clean Lakes Conference" - Sioux Falls, SD.
- July 21, 1994: "South Dakota Association of Conservation Districts, Area 1 Annual Meeting - Webster, SD.
- September 7,8, 1994: "Roy Lake Rendezvous" - NRCS training workshop held at Roy Lake, SD.
- October 25, 1994: "South Dakota Water Congress Fall Forum" - Pierre, SD.
- February 6,7 1995: "Coordinated Resource Management Community Training" - Sioux Falls, SD.
- February 8, 1995: "Watershed Management Workshop" - Huron, SD.
- February 22, 1995: "Coordinated Resource Management Informational Meeting" - Webster, SD.
- March 14-16 1995: "Coordinated Resource Management Facilitators Training" - Pierre, SD. Registration, travel, meals, and lodging paid for by the U.S. Fish & Wildlife Service.
- April 20, 1995: "Governors Public Hearing on Day County Flooding" - Webster, SD.
- July 20, 1995: "South Dakota Association of Conservation Districts, Area 1 Annual Meeting" - Webster, SD.
- October 3, 1995: "Lake Project Coordinators Forum" - Pierre, SD.
- November 7, 1995: SD Water Congress, Fall Legislative Forum - Pierre, SD.
- November 27, 1995: "South Dakota Association of Conservation Districts, Area 1 & 3 Legislative Banquet" - Webster, SD.
- November 28, 1995: "Principles of Ecology" - NRCS training workshop in Huron, SD.

- January 16, 1996: "Management and Restoration for Wetland Functions & Values" - NRCS forum at Huron, SD.

- Monthly meetings of the Pickerel Lake Sanitary Sewer District - Pickerel Lake, SD.

A breakdown of the percentage of time the Project Coordinator spent on major project activities and short description of each activity is given below.

Information & Education - All activities as outlined in the 319 Workplan and Section 2.

Administration - Includes time spent keeping records of project expenses and in-kind match, Conservation District Board of Supervisors Meetings, writing grant applications, grant hearings, project vouchers

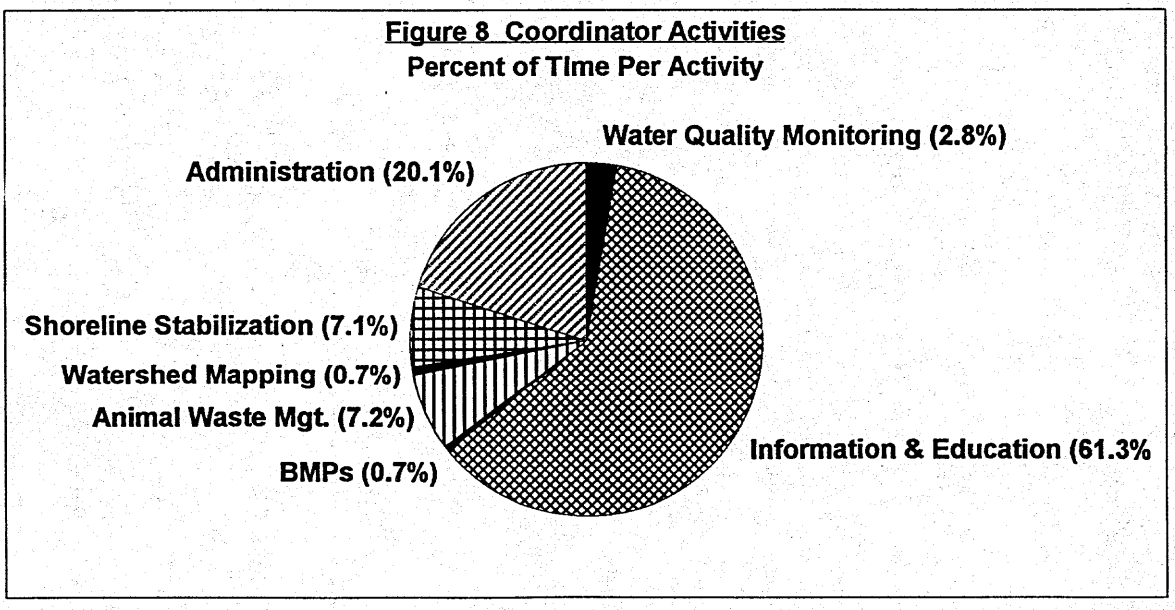
Animal Waste Management - Surveying construction sites, meetings with operators, writing specifications, on-site inspections.

Shoreline Stabilization - Surveying construction sites, labor at demonstration site, one on one meetings with lake property owners, writing specifications, technical assistance.

Water Quality Monitoring - Collecting upstream and downstream water samples of two Animal Waste Management Systems prior to and after construction. Helping Water Resources Institute personnel collect in-lake water samples and water quality data. Collecting grab samples on various tributaries of the lake.

Watershed Mapping - Collecting data for input on watershed maps.

Best Management Practices (BMPs) - Working with NRCS District Conservationists and Soil Conservationist to encourage watershed landowners and operators to implement BMPs on their land.



Section 2 - Information & Education

Introduction

A lake protection plan such as Pickerel's required extensive interaction with the public and with various State and Federal agencies. The 319 project workplan defined several activities to accomplish this need. $4,944.00 were budgeted for Information & Education activities.

319 Project Workplan

- Initiate and participate in local meetings with watershed land users and lake property owners as needed. These meetings will be used to solicit local input and provide a focal point for distribution of pertinent information to the public.
- Write new releases for local media to publicize the project.
- Produce and distribute annual reports to all interested persons.
- Document project progress by routinely taking photographs of various project elements.
- Provide technical assistance for shoreline stabilization and best management practices to watershed land users and lake property owners as needed.
- Organize annual tours for local landowners, participating agencies, and others.
- Construct signs and place at strategic locations around Pickerel Lake and its watershed to increase public awareness and encourage personal involvement in the protection project.
- Produce and distribute fact sheets targeted towards local governments, private groups, and local landowners. Fact sheets will describe the history and past water quality of Pickerel Lake, and summarize the present situation and trends. Fact sheets will explain the impact that lake protection measures can have on the lakes water quality, best management practices landowners can implement to improve water quality, and the resulting economic and aesthetic benefits.
- Prepare and distribute quarterly reports to all appropriate entities and watershed landowners. These reports will help keep landowners appraised of project progress providing educational information on how they can assist in correcting specific water quality problems.

Project Activities

Based on the 319 Project Workplan, the Project Coordinator compiled a list identifying the various audiences and groups the projects Information & Education Programs needed to reach. A copy of this work outline is found in Appendix G. A database of lake property owners, and watershed landowners/users was developed and updated as needed. The database showed a 6:1 ratio of lake property owners to watershed landowners/users. Because of this ratio, the Project Coordinator spent a majority of the Information & Education efforts to inform lake property owners of project activities, and Best Management Practices they could implement to reduce nonpoint source pollution.

The following pages will describe project accomplishments as per the 319 Project Workplan.

Local Meetings

Initiate and participate in local meetings with watershed land users and lake property owners.

- 7/18/92 - Public meeting held at the Pickerel Lake Lodge to provide background information on the Protection Project, project work plan, and time schedule for implementing watershed practices. The meeting was attended by 16 watershed and lake property owners, and 10 resource personnel from the SD Dept. Game, Fish & Parks, U.S. Fish & Wildlife Service, Natural Resources Conservation Service, Day County Extension Service, Day County Commission, Day Conservation District and Water Resources Institute. Notes from this meeting are found in Appendix H.

- 7/17/93 - Joint public meeting with the Pickerel Lake Sanitary Sewer District held at Camp Wisagoma, located at Pickerel Lake. This was an informational meeting on the recently formed Pickerel Lake Sanitary Sewer District attended by 160 people. The Project Coordinator provided data on Pickerel lake water quality, and efforts underway by the Pickerel Lake Protection Project to reduce nonpoint source pollution from the lakes watershed. See the news release "Plans, cost for Pickerel project are explained" in Appendix F.

- 7/9/94 - First "Lake Awareness Seminar" held at Pickerel Lake Bible Camp. Approximately 75 people in attendance to hear updates on the Pickerel Lake Protection Project and Sanitary Sewer District, information on lake water quality monitoring, and fisheries studies being conducted by the SD Game, Fish, & Parks. Project brochures and fact sheets were distributed at this meeting. Flyers (see Appendix I) announcing this meeting were mailed to all lake and watershed property owners, along with announcements in local papers, radio and TV stations calendar of events.

- 6/17/95 - Second "Lake Awareness Seminar" held at Pickerel Lake Bible Camp. Approximately 20 people attended to hear updates on the Pickerel Lake Protection Project, controlling exotic aquatic plants and animals, fisheries, and tour an animal waste management system.

Programs

Programs were presented by the Project Coordinator to the following civic groups, organizations, resource agencies, and campers at Pickerel Lake State Recreation Area. A slide presentation was developed showing the lakes geological history, ecology, water quality, and efforts by the Pickerel Lake Protection Project to reduce nonpoint source pollution. Slides documenting project activities were used in this presentation. Project brochures and fact sheets were distributed at these programs.

- 05/29/93 - Pickerel Lake State Recreation Area
- 06/12/93 - Pickerel Lake State Recreation Area
- 06/20/93 - Webster-Pickerel Lake Park Subdivision Association, Annual Meeting
- 06/24/93 - Pickerel Lake State Recreation Area
- 09/04/93 - Pickerel Lake State Recreation Area
- 10/20/93 - Knights of Columbus, Webster SD
- 12/13/93 - Day Conservation District, Annual Banquet
- 01/12/94 - NRCS Regional Meeting, Brookings SD
- 02/17/94 - Izaak Walton League, Webster SD
- 03/07/94 - Kiwanis Club, Webster SD
- 05/07/94 - Enemy Swim Sanitary Sewer District
- 06/05/94 - Pickerel Lake State Recreation Area
- 08/27/94 - Pickerel Lake State Recreation Area
- 12/05/94 - South Dakota Association of Conservation Districts, Area 1 & 3 Legislative Banquet, Webster SD
- 08/05/95 - Blue Dog Lake Association
- 09/12/95 - Pickerel Lake State Recreation Area

Brochures and fact sheets were also distributed at the Webster Farm and Home Show in 1994 and 1995. Several displays were developed for these shows including; photo enlargements of project activities, posters describing nonpoint source pollution and eutrophication, and lake ecology demonstrations such as viewing zooplankton through a microscope, and live specimens of nongame fish found in Pickerel Lake.

Northeast SD Water Quality Conference

In 1994, the Project Coordinator initiated the first Northeast South Dakota Water Quality Conference. This meeting brought together representatives of local, state, and federal agencies involved with water quality issues in Northeast South Dakota, specifically the counties of Day, Marshall, and Roberts. Current projects were reviewed and future projects discussed. Participants looked for overlapping or duplicated efforts, and water quality issues not currently addressed in the northeast region of SD. The meeting was held February 7, at NeSoDak Bible Camp located on Enemy Swim Lake. Representatives included; Dennis Skadsen - Pickerel Lake Protection Project, Tim Nordquist - NRCS District Conservationist Day County, Kent Duerre - NRCS District Conservationist Roberts County, Ken Madison - SD Dept. Environment & Natural Resources, Sheila Oliver - Water Resources Dept. Sisseton Wahpeton Sioux Tribe, Gary Johnson - Planning Director Sisseton Wahpeton Sioux Tribe, Dave German - Water Resources Institute, and Doug Leschisin - US Fish & Wildlife Service.

On 22 March 1995, the Second Northeast SD Water Quality Conference was held at the same location. 1995 participants included; Curt Hanssen - Coordinator Big Stone Lake Restoration Project, Kent Duerre - NRCS District Conservationist Roberts Co., Judi Schultz - NRCS Soil Conservationist, Terry Hagen and Tommy Knutson - Enemy Swim Sanitary Sewer District, Lyle Hjellming - President Blue Dog Lake Association, Tom Wickstrom - U.S. Fish & Wildlife Service, Dan Mehlhaf and Charlene Larson - NRCS Webster Field Office, Gary Johnson - Planning Director Sisseton Wahpeton Sioux Tribe, Wanda Franzen - Business Manager Marshall Conservation District, Tom Martin - NRCS District Conservationist Marshall County, Tim Nordquist - NRSC District Conservationist Day County, Dave German - Water Resources Institute, Bill Stewart - SD Dept. Environment & Natural Resources, Ken Madison - SD Dept. Environment & Natural Resources, Bruce Kunze - NRCS Soil Scientist, Matt Hubers and Dave Lucchesi - SD Dept. Game, Fish & Parks, and Dick Gilbert - Manager Waubay National Wildlife Refuge.

On 28 February 1996, the Third Northeast SD Water Quality Conference was again held at the Ne-So-Dak Bible Camp. 1996 participants included; Wanda Franzen - Business Manager Marshall Conservation District, Charlene Larson - NRCS Webster Field Office, Mike Kuck - NRCS State Office Huron, Dale Johnson - NRCS District Conservationist Grant County, Ken Madison - SD Dept. Environment & Natural Resources, David German - Water Resources Institute, Dan Mehlhaf - NRCS Acting District Conservationist Day County, Curt Hanssen - Coordinator Big Stone Lake Restoration Project, Tom Wickstrom - U.S. Fish & Wildlife Service, Tom Martin - NRCS District Conservationist Marshall County, Mike Williams - Coordinator Lake Kampeska Watershed Project, Kent Duerre - NRCS District Conservationist Roberts County.

Agendas for the second and third conferences followed that of the first.

News Releases

Write news releases for local media to publicize the project.

The majority of news releases were published in the official paper of Day County - The Reporter & Farmer. Both Aberdeen and Watertown papers were contacted by the Project Coordinator soliciting articles about this project. Only the Watertown paper responded - publishing two articles. TV stations were also contacted about project activities. Only one station - KABY of Aberdeen ran a story, this at the beginning of the project. Radio interviews were broadcast on two weekly programs - "Outdoors in the Glacial Lakes," a local program carried on KBWS located in Eden, SD; and "Dakota Farm Talk" - a statewide radio program carried locally by KBWS. Copies of all printed news releases are found in Appendix J.

- Webster Reporter & Farmer

  1992) Pickerel Project Is Okayed
  Lake Project Meeting Set
  Project Begins At Pickerel Lake
  Special Funds Are Available
  1993) Help Wanted
  Is Project Coordinator
  1994) Busy Buddies Clean Shoreline
  Lake Awareness Seminar
  1995) Pickerel, Enemy Swim Lakes Clean
  Project Completed to Protect Pickerel

- Watertown Public Opinion

  1993) Runoff Dirties Lake Pickerel
  Project Aims At Protection To Avoid Restoration
  1994) Residents Unite For Water Quality At Pickerel Lake

- Aberdeen American News

  1994) Lake Awareness Seminar

- KABY -TV Aberdeen, SD

  1992) Story on project
  1994) Community Calendar Announcement - "Lake Awareness Seminar"

- KBWS Radio Station - Eden, SD

  1992) Outdoors In The Glacial Lakes Program - interview with District Conservationist
  1994) Community Calendar Announcement - "Lake Awareness Seminar"
  Dakota Farm Talk Program - interview with Project Coordinator

Annual Reports & Newsletters

Produce and distribute annual reports to all interested persons.

Project accomplishments and milestones were published yearly in the Day Conservation District's annual report. This annual report is published in the "Reporter and Farmer" - Webster, South Dakota's weekly newspaper. Oral annual reports were given yearly at the Day Conservation District's Annual Banquet. Yearly updates were also published in project newsletters mailed to all watershed property owners, land users, and lake property owners - in 1993, 1994, 1995, and 1996.

The first newsletter in 1993, introduced readers to the Pickerel Lake Protection Project outlining project goals, sponsors, funding, and reasons for the projects implementation. The second newsletter mailed in March 1994, updated readers on the projects progress, who controls a lakes ordinary high water mark, and the importance of a lakes watershed in retaining floodwaters. In the 1995 newsletter, along with a project update, information on the following subjects were published - aquatic weed management, exotic aquatic animals and plants, and results of a lake property owners survey. Dave Lucchesi, a Fisheries Biologist with the SD Game, Fish & Parks provided a article on Pickerel Lake fisheries studies and stocking program. The 1996 newsletter was a final report to the public on project accomplishments and expenditures.

Copies of project newsletters are found in Appendix K.

Photographic Documentation

Document project progress by routinely taking photographs of various project elements.

Slides were the format commonly used to document project activities. The project expended $342.82 for film, processing, slide duplication, and enlargements. Over 600 slides and photos were taken of project activities including; construction of animal waste management systems, shoreline stabilization demonstration site construction, cropland practices, 1993 flooding and resulting damage to watershed, information & education activities, and recreational activities on the lake. Many of these slides were used in presentations to civic groups, organization, resource agencies, and campers at the Pickerel Lake State Recreation Area.

Aerial slides of Pickerel Lake, and the Pickerel Lake watershed were obtained from Farm Service Agency files, and the EROS Data Center. The U.S. Fish & Wildlife Service took aerial slides of animal waste management system sites before and after construction. Several slides were produced from graphical illustrations by the Water Resources Institute. These slides illustrated limnological concepts, water quality data, and lake ecology. Five slides were purchased from the American Fisheries Society of nongame species found in Pickerel Lake. Many lake residents were unaware these fish existed in Pickerel Lake prior to the projects start.

Technical Assistance

Provide technical assistance for shoreline stabilization and best management practices to watershed land users and lake property owners as needed.

Technical assistance was provided to several lake property owners interested in stabilizing eroding shoreline. A fact sheet "Controlling Shoreline Erosion" was written by the Project Coordinator and distributed to interested parties. A copy of this fact sheet is found in Appendix L. More information on shoreline stabilization will be found in Section 3 of Part 2.

Technical assistance for watershed landowners and land users was provided by the National Resources Conservation Service. Conservation plans were written for nine watershed land users who participated in project cost share programs. More information on the types of Best Management Practices implemented and cost share rates are found in Section 5 of Part 2.

Watershed Tours

Organize annual tours for local landowners, participating agencies, and others.

On 24 August 1993, the Project Coordinator conducted a tour of the Pickerel Lake watershed for several agency representatives including; Dennis Skadsen - Pickerel Lake Protection Project, Tim Nordquist - NRCS District Conservationist, Dave German - Water Resources Institute, Duane Murphy & Bill Stewart - SD Dept. Environment & Natural Resources, Ken Read and Roy Boschee - NRCS Ag Engineers, Pat Kuck - NRCS Liaison, Gerald Montgomery and Dan Merkel - NRCS, Noel Anderson - Business Manager Day Conservation District, Dave Rathke - U.S. Environmental Protection Agency, Claire Bierschbach, Marvin Bury, Robert Duerre, Alden Hanson, and Rodney Tobin - Day Conservation District Supervisors. Visited were proposed sites of animal waste management systems, cropland receiving best management practices, areas damaged by summer flooding, and riparian areas adjacent to the lake and its tributaries.

On 13 September 1994, the Project Coordinator conducted a tour for Wayne Houtcooper - Environmental Senior Scientist for the SD Dept. Environment & Natural Resources, and Pete Jahraus - SD Division of Resource Conservation & Forestry. Both were updated on project activities, and toured animal waste management system sites, shoreline stabilization sites, and the lake's watershed.

On 17 June 1995, a tour of completed animal waste management systems was offered at the Second Lake Awareness Seminar. This seminar was poorly attended and only two attendees were interested in touring the site.

On 20 June 1995, the Project Coordinator conducted a tour of two completed animal waste management systems and the shoreline stabilization demonstration site for the Day Conservation District Board of Supervisors, U.S. Fish & Wildlife Service personnel, and local Natural Resources Conservation Service personnel.

Project Signs

Construct signs and place at strategic locations around Pickerel Lake and it's watershed to increase public awareness and encourage personal involvement in the protection project.

In 1993, four project signs promoting the Pickerel Lake Protection Project and listing project participants were placed along the lakes shoreline at the east and west boat ramps located in Pickerel Lake State Recreation Area, the boat ramp located at the old hatchery site, and at the Pickerel Lake Lodge parking lot located on the lake's south end. These signs were put in place by employees of Pickerel Lake State Recreation Area as an in-kind contribution towards the project. A fifth project sign was placed along the Shoreline Stabilization Demonstration Project Site, in 1995.

Project Fact Sheets

Produce and distribute fact sheets targeted towards local governments, private groups, and local landowners. Fact sheets will describe the history and past water quality of Pickerel Lake, and summarize the present situation and trends. Fact sheets will explain the impact that lake protection measures can have on the lake's water quality, best management practices landowners can implement to improve water quality, and the resulting economic and aesthetic benefits.

Nine fact sheets were written by the Coordinator during the project. Four fact sheets detailed best management practices lake property owners should implement to reduce nonpoint source pollution to Pickerel Lake. A fact sheet specifically designed for boaters and campers visiting the lake's two state recreation areas - provided tips for reducing nonpoint pollution from camper septic systems, and boats. Two fact sheets described the lake's fisheries, one fact sheet described how Pickerel Lake was formed, and one fact provided data on the lake's ordinary high water mark and previous lake levels.

Fact sheets were distributed at local meetings and at programs given to civic groups, organizations, and resource agencies. 618 fact sheets were distributed through mail order. A flyer promoting fact sheets and other printed material available from the Protection Project was mailed in July 1995. A copy of this flyer is found in Appendix I. The fact sheets; Lake Protection Tips; Understanding & Maintaining Your On-site Septic System; and WaterWise Boating, were mailed to all lake property owners with the final newsletter, in 1996.

The following fact sheets were published by the protection project. Copies are found in Appendix L.

- A Brief Geological History of Pickerel Lake
- Pickerel Lake Water Levels 1928-1993
- A Pictorial Guide to Pickerel Lake Fish
- Pickerel Lake Fisheries
- Controlling Shoreline Erosion
- Lake Protection Tips
- Understanding & Maintaining Your On-site Septic System
- WaterWise Boating
- Wanted - A Clean Lake, Lake Protection Tips for Boaters & Campers

The following fact sheets published by other conservation agencies were also distributed. Copies are found in Appendix L.

- Managing Lawns to Protect Water Quality
- Water Get the Facts - Volume 1
- Water Get the Facts - Volume 2

In addition to these fact sheets, the Project Coordinator wrote and published "A Self-Guided Tour of Pickerel Lake's Watershed". The tour has 26 stops along a 30 mile route through the lakes watershed. Tour stops include animal waste management system sites, various land use practices, historical and geological points of interest. The guide explains the benefits of implementing best management practices, pollution controls, and wetlands. The guide was available through mail order. A copy of this guide is found in Appendix M.

A report published in January 1994 by Dave German, Water Resources Institute - "A Summary Report of Water Quality in Pickerel Lake - Day County, South Dakota for Study Years 1991-1993" was distributed at public meetings and through mail order. The report acquainted readers on the type of water quality testing being conducted on Pickerel Lake, and test results. A copy of this report is found in Appendix N.

The Pickerel Lake Sanitary Sewer District has agreed to distribute several of the facts sheets produced by the Protection Project to new cabin and lake property owners after the Projects completion in 1996.

Quarterly Reports

Prepare and distribute quarterly reports to all appropriate entities and watershed landowners. These reports will help keep landowners appraised of project progress providing educational information on how they can assist in correction specific water quality problems.

Quarterly reports were published on a semi-annual basis to provide a lengthier report and save on postage. Reports were sent to forty agencies and individuals including; National Resource Conservation Service, U.S. Fish & Wildlife Service, S.D. Dept. Game, Fish & Parks, Farm Service Agency, Sisseton-Wahpeton Sioux Tribe, S.D. Dept. of Agriculture, S.D. Dept. of Environment and Natural Resources, Water Resources Institute, S.D. Water Congress, S.D. Association of Conservation Districts, Day County Commissioners, Pickerel Lake Sanitary Sewer District, area Legislators, and Day Conservation District Board of Supervisors. Quarterly reports were not sent to watershed landowners and users, or lake property owners. Information on project accomplishments were published in a yearly newsletter mailed to all lakeshore and watershed landowners and users.

Quarterly reports were mailed as follows:

- 09/01/93 - Year 1 Report, 1 April 1992 - 31 March 1993
- 09/01/93 - Quarterly Report, 1st Quarter Year 2, 1 April - 31 July 1993

Quarterly Reports cont.

- 02/11/94 - Quarterly Report, 2nd/3rd Quarters Year 2, 1 August - 31 December 1993
- 08/23/94 - Quarterly Report, 4th Quarter Year 2, 1st Quarter Year 3, 1 January - 30 June 1994
- 02/22/95 - Quarterly Report, 2nd/3rd Quarters Year 3, 1 July - 31 December 1994
- 08/28/95 - Quarterly Report, 4th Quarter Year 3, 1st Quarter Year 4, 1 January - 30 June 1995
- 01/22/96 - Quarterly Report, 2nd/3rd Quarters Year 4, 1 July - 31 December 1995

Other Information & Education Activities

In addition to activities outlined by the 319 Project Workplan, the Project Coordinator undertook several additional Information & Education activities.

Adopt-A-Stream

On 24 April 1994, the Busy Buddies 4-H Club picked up litter along the Pickerel Lake Outlet Creek - from the mouth of the creek to the culvert under Day Co. Highway 1. Eleven 4-H members and their leaders volunteered to participate in this program. Over 500 pounds of debris were removed from the creek including tree branches, tires, railroad ties, pieces of dock, aluminum and plastic containers, and one water ski. The Adopt-A-Stream program is sponsored by the S.D. Dept. of Environment & Natural Resources. A flyer promoting this program at Pickerel Lake was mailed to several local youth groups such as 4-H, Boy and Girl Scouts. A copy of this flyer is found in Appendix I.

Lake Atlas

In 1994, a "Pickerel Lake Atlas" was published showing locations of lake cabins and homes, and listing the owners names and home addresses. Several of the previously mentioned fact sheets were included in the atlas, along with emergency phone numbers, and phone numbers of several conservation and resource agencies. The directory was available to lake property owners for a $6.00 contribution. One-hundred eleven atlases were sold raising $666.00 which were used to fund additional Information & Education activities. These dollars count as local match towards both Federal and State Grants. The Project Coordinator will give atlas maps to the Pickerel Lake Sanitary Sewer District who have agreed to distribute updated atlases to lake property owners.

Lake Property Owners Survey

In July 1994, a "Lake Property Owners Survey" was mailed to 310 Pickerel Lake property owners. One-hundred ten surveys (35%) were answered and returned to the Project Coordinator. Participants answered 25 questions which provided the Protection Project with data on the economic impact the lake has on the surrounding area, attitudes and opinions about the lakes use, water quality, and future development. Survey results were published in the February 1995 Newsletter (see Appendix K). Data

from this survey is included in various sections of this report. A copy of the "Lake Property Owners Survey" is found in Appendix O.

South Dakota Conservation Digest

The Project Coordinator wrote a 1500 word article for the South Dakota Conservation Digest entitled "Protecting A Jewel On The Prairie", published in the July/August 1996 edition of the magazine. The article described the history and geology of Pickerel Lake, and the efforts being made to protect the lakes water quality.

Lake Ecology Curriculum

A lake ecology curriculum was developed by the Project Coordinator and the Education Coordinator of the NeSoDak Environmental Learning Center, located at NeSoDak Bible Camp on nearby Enemy Swim Lake. The curriculum includes; hands-on testing of water quality including pH, nitrates, dissolved oxygen & temperature, collecting & identifying aquatic invertebrates for bio-assessment of water quality, fish collecting & identification with an 18 ft seine with emphasis placed on nongame species as indicators of water quality, collecting & identifying zooplankton, and the "Lake Game."

The "Lake Game" was developed by the Minnesota Sea Grant Extension Program. The goals of this role-playing exercise are to have or help participants:

- understand how many people depend on a lake for drinking water, recreation, and employment
- better understand the economic complexity of decisions facing those polluting a lake
- understand how they can change their own actions and habits to minimize the impact on the lake
- the types of nonpoint source pollution and their effects on water quality

The game is played using a large container of clean water as the lake. Role-playing cards are distributed to each student. Students may or may not have a choice as to whether they pollute the lake or not. As the game progresses different pollutants are added to the container including red and yellow food color depicting various pollutants from oil to animal waste, pieces of toilet paper to represent failing septic systems, small pieces of yarn representing exotic aquatic plants, and dirt representing sediment from eroding cropland and shoreline. The leader discusses each type of pollutant and the possible consequences as the game progresses. The Minnesota version of the game was adapted to reflect the types of nonpoint source pollution threatening Northeast South Dakota lakes.

This curriculum has become one of the standard classes offered to schools visiting the learning center. Over 900 4th-6th grade students from Bristol, Britton, Enemy Swim Day School, Milbank, Rosholt, Summit, Tiospa Zina, and Webster, South Dakota schools have participated in this class since 1993. Many of these students parents have or know persons with cabins on Northeast South Dakota lakes or live and farm within one of these lakes watersheds. Parts of this curriculum have also been used for the Youth Conservation Camp held each July at NeSoDak. The Project Coordinator also has taken the lake game to the Brookings, SD Water Festival in 1994 and 1995.

Aquatic Exotics

Information on aquatic exotics were distributed at public meetings and through mail order. Brochures and identification cards - "A Field Guide to Aquatic Exotic Plants & Animals", & "Eurasian Watermilfoil Identification Card", were obtained from the Minnesota Dept. Of Natural Resources. The brochure " Purple Loosestrife in SD, Threatening Our Aquatic Resources" was obtained from the South Dakota Dept. of Environment & Natural Resources. Information taken from these brochures and other resources were provided in the fact sheet "WaterWise Boating" published by the project (see Appendix L). This fact sheet was distributed to all lake property owners with the final newsletter in 1996. In addition, an article written by the Project Coordinator on aquatic exotics was published in the 1995 newsletter (see Appendix K).

Conclusions

It is hard to gauge the success of a project's Information & Education activities. If one looks at the attendance of public meetings promoting the project, success could be considered low. No watershed landowners and operators attended the lake seminars held during the summer months. Flyers announcing these meetings were mailed to all watershed landowners and operators in addition to notices in local newspapers, and on local radio & TV stations. Only five watershed landowners and operators attended the first informational meeting held in 1992. Winter meetings may have attracted more watershed landowners/operators, however there are no heated buildings in the lake's watershed large enough to hold public meetings. Attendance by lake property owners was higher when discussion of the proposed sanitary sewer district was on the agenda. The majority of lake property owners live outside Day County, and it was assumed weekend meetings would attract more people.

Distribution of fact sheets through mail order and public meetings were low. Door to door distribution was considered, however not all lake property owners are at their cabins every weekend. Lake property owners expressed concern about leaving fact sheets and other project information in their doors, fearing these papers would end up blowing around their property. Fact sheets providing information on best management practices for lakeshore property owners were distributed with the final newsletter in April 1996.

News releases written by the Project Coordinator were distributed only to the Webster Reporter & Farmer. Distribution of these releases to Sioux Falls, and Aberdeen papers would have reached a large portion of lake property owners who reside in these cities. Calls to these papers - including the Webster Reporter & Farmer, to solicit articles by staff writers were accepted only by the Watertown Public Opinion.

Many lake property owners considered the Pickerel Lake Protection Project and the Pickerel Lake Sanitary Sewer District one and the same even though news releases and project newsletters distinguished the two as separate projects. Many lake property owners were opposed to the formation of the sanitary sewer district, and may have ignored the Protection Project for the above stated reason.

In spite of these problems many lake property owners who completed the Property Owners Surveys commented favorable on the project's goals, and the information provided.

Section 3 - Shoreline Stabilization

Introduction

The 319 Project Workplan called for a complete survey of Pickerel Lake's shoreline to determine where stabilization work was needed. Areas identified would be stabilized with rock rip-rap, earthwork construction, and or permanent vegetative cover. The 319 Grant provided $11,000.00 for shoreline stabilization activities.

Shoreline Survey

A shoreline survey was completed in October 1992 by NRCS and Water Resources Institute personnel. The survey included a map of Pickerel's shoreline and detailed notes on the type of stabilization needed. On 24 July 1993, a 6 to 10 inch rain fell in the lakes watershed causing Pickerel to rise approximately three feet above the lakes ordinary high water mark. This sudden rise in water levels was followed by two days of high northwest winds causing additional erosion to the lakes shoreline. On 30 July 1993, the Project Coordinator and Dave German of the Water Resources Institute conducted a second shoreline survey to locate areas of shoreline damaged by high water, however high water covered much of the shoreline and a third survey was conducted on 5 October 1993. Extensive erosion was observed on this date along a portion of the lakes northwest shoreline on Bullhead Bay, and portions of the eastern shoreline along Chekapa Bay. The survey map - Figure 9, and notes were revised following the second survey.

Survey Notes

Bullhead Bay/Turtle Bay

1. Eroding shoreline in front of brown cabin, bank area 7-8 ft. high with rock below and exposed dirt above. Leased cabin site.

2. Large eroding gully on steep bank formed during 24 July 1993 rainfall and subsequent flooding. (Block's)

3. Steep bank with trees, grass, and shrubs, little rock at base to protect bank, approximately 150 yards long. Undeveloped shoreline at this time.

4. Ice ridge in front of wetland, some rock but stabilized mainly by tree roots. Undeveloped shoreline at this time.

5. Stable sand with a few isolated areas of erosion at edge of lawn. Leased cabin site.

North Pickerel Lake Subdivision

6. Lots 6-8 Section 16 (Grorud) - eroding 3-4 foot high sand and rock bank - mostly sand, approximately 150 feet long, erosion accelerated after 1993 flooding. Lots 1 & 2 Section 15 (Riley) - 10-13 foot bank, erosion occurring along approximately 150 feet of the slopes toe at waters edge. Lots 2-6 Section 15 (Bell) - 4 foot bank eroding on west end of property.

7. YMCA Camp - banks 5-15 feet high, big boulders at base of banks but rip-rap fill needed along approximately 80 feet of shoreline to improve stabilization.

North Bay

9. Exposed 3-8 foot high dirt bank, approximately 100 feet long. Owned by State of South Dakota.

10. 4-8 foot bank with some exposed areas, small rocks at base, fairly well vegetated with shrubs and trees. Owned by State of South Dakota

11. 3 feet of exposed shoreline on 5-8 foot bank, approximately 50 feet long. Undeveloped trust land.

12. 5-15 foot high wooded bank, mostly vegetated but some bare spots exist. Undeveloped trust land.

13. 10-13 foot bank with an active undercut at waters edge, upper slope mostly vegetated with a few bare spots. Site just north of first cabin in Beal's Subdivision.

Beal's Subdivision

14. Erosion occurring on upper slope of bank.

15. Undercut bank held by trees. Could use riprap. Site below abandoned cabin.

16. Clay banks - a few bare spots in need of vegetation, large active bank formed during the 1993 flood. Undeveloped shoreline at this time.

17. A few bare areas needing vegetation on a 5-15 foot high steep bank, good rock base at shoreline. Leased cabin site.

Chekapa Bay Subdivision

17.5. Active 4 foot high bank, some undercutting. Could use riprap.

Du-Lynn Couteau Beach

18. Shoreline from Lot 7-16 Section 23 requires riprap fill above existing rock base on 3-5 foot high banks. Shoreline damaged during 1993 flooding. Privately owned cabins/lake homes along this shoreline.

Hyde Park Subdivision

19. High bank with good rock base at shoreline, however thin vegetation in some areas. Lots 35 -39 Section 26 (McMillan).

20. Exposed bank eroding behind dock. Lots 43 & 44 Section 26 (Dell).

44. Erosion occurring along ravine used for driveway, gully forming to lake shore, riprap washed out in 1993 flooding, Lots 50 - 52 & Lot A of Lot 52 Section 26 (Kienow/Ziebel). Need improved drainage from farmland east of cabins.

Pickerel Lake State Recreation Area - West Unit

21. Erosion from foot traffic on 4-10 foot high banks just south of swim beach. Good rock base at waters edge, requires elevated foot paths as in other areas of park.

22. East end of state land. Need retaining wall and back fill in gully. Some areas of bank need vegetation.

Tahahe Point and Tipi-ota Beach

23. Erosion above rocks on 2 foot high bank. Need riprap to fill in between natural rock shoreline. Lots 8 - 10 Section 22 (Reyner/Sandve).

Duncan's 1st Addition

24. Lots 16 & 17 Section 27 (Kluck) - 20 foot high bank in need of some vegetative treatment, rock base could use additional riprap for better stabilization. Lot 19 Section 27 (Knebel) - exposed bank approximately 20 feet above water line. Lots 23 & 24 Section 27 (Johnson) - additional riprap below steps to dock. Exposed shoreline below platform dock - Lots 20 & 21 Section 27 (Rix/Monson).

Jewett's Addition

25. Eroding shoreline in need of riprap below Lot 31 Section 27 (Rhinehart).

26. High banks with trees, requires riprap to stabilize base of shoreline, Lot 30 Section 27 (Looyenga).

27. Undeveloped Lots 25 - 17 Section 27, banks 4 to 15 foot high, good rock base at waters edge but could use some riprap fill. Undercut bank north of Lot 16 Section 27 (Slinden) but tree roots stabilizing shoreline.

28. Rock seawall broken and undercut by high water in 1993.

Ramona Beach Subdivision/Lamont Lakeside Addition

29. Shoreline in need of riprap from Lots 1 - 4 Section 27 Lamont Lakeside (Pastian/Lamonts) to Outlot A of Lot 1 Section 34 (Shaffer's). Thin vegetation south on Outlot B of Lot 1 Section 34 (Undeveloped shoreline).

Ralph Johnson's Subdivision

30. Low one foot high bank in Indian Bay from Lot 1 - 9 Section 34, appears stable, however no rock or sand. Bay protected from most winds.

31. Eroding bank 4-8 feet high above a fair rock base, approximately 100 feet long east to Peabody Point. Treat with riprap. Some erosion at mouth of drainage just east of C. Chilson residence. On north side of Peabody Point, undercut bank damaged by high water in 1993, tree roots preventing further erosion.

Peabody Gardens Subdivision

32. High banks with rock base, some vegetation needed otherwise well wooded. Active bank just north of Lot 1 Section 34.

33. 1-2 foot eroding bank under boat lift. 10-15 foot high banks with little vegetation, rock base is good. Some seawalls.

33.5. 2-3 foot high bank undercut where natural rock removed, Lot 2 Section 34 (Eckrich).

Webster-Pickerel Lake Park Subdivision

33.6. Riprap needed by boat house on Lots 7-9 Section 35 (Morton).

34. Good rock base requires riprap to fill bare spots.

35. Same as 34, however vegetative treatment recommended.

Pickerel Lake State Recreation Area - East Unit

36. Foot traffic eroding shoreline.

37. Foot traffic eroding shoreline, however good rock base present.

38. Gravel ice ridge west of boat ramp parking lot. Stabilized only by tree and shrub roots. Slumping of jetty at mouth of boat bay. Minor erosion along shoreline north of jetty.

39. Below high bank, area undercut by high water in 1993, could use riprap at base. Some areas need vegetative treatment.
40. 100 to 200 feet of shoreline south of swim beach in need of vegetation in 3-4 foot area of bank above rock base. Some erosion due to human traffic.
41. Some erosion north of swim beach. Vegetation improved in 1993 survey.
42. Some vegetation needed on upper banks, vegetation improved in 1993 survey.
42.5. Bank undercut by high water in 1993 along undeveloped state land.
43. Erosion along old road cut on north end of state land.

Survey Comparisons - 1985 & 1993

The Pickerel Lake Water Quality Study Area Report - published in 1985, conducted a shoreline survey which used the direct volume method to determine lakeshore erosion. The lakes shoreline was divided into 31 segments (see Figure 10) which were measured and computed to determine sediment yield. Segments yielding the most tons per year included; 9 - 742.5 tons, 12 - 750.0 tons, 13 - 3,140 tons, 20 - 465.75 tons, 22 - 1,245 tons, 26 - 405 tons, and 28 - 735 tons. This study indicated that 9,310 tons of sediment per year were entering the lake from eroding shoreline. The study identified two areas which the authors felt contributed 55% of this sediment load, one area named the clay banks, and an area adjacent to Bullhead Bay. Comparisons between the 1985 and 1993 surveys of each of these segments follows.

Segment 9) Notes 19 & 20, 41- 43, 1993 survey. Some cabins in the Hyde Park area have used Crown vetch to improve vegetation coverage on the upper banks. This area also includes the Pickerel Lake Recreation Area - East Unit, where improvements in vegetative coverage were noted between the 1992 and 1993 surveys. Stabilization along private property probably occurred after the 1985 survey.

Segment 12) Note 17, 1993 survey. Only vegetative treatment recommended in 1993 survey.

Segment 13) Note 16, 1993 survey. Clay banks, southern end of this area slumped 4-5 feet after the 1993 floods, however improvements in vegetative cover were noted between 1992 and 1993 surveys. Area formerly used as pasture for cattle, now privately owned and surveyed for development. In 1995, a contractor reshaped this area to make surveyed lots more desirable to buyers, removing a portion of the active bank. The 1985 survey indicated that this segment and segment 22 contribute 55% of the sediment load to the lake.

Segment 20) Note 7 & 9, 1993 survey. Area still requires riprap to fill in between natural rock shoreline.

Segment 22) Note 2, 1993 survey. Area further damaged by 1993 flooding. Bank collapsed almost taking trailer house with it. There is evidence a similar event occurred in the past north of this site that had healed as vegetation returned. This is the only site utilizing 319 Funds for shoreline stabilization. (See pages 2-33 to 2-35)

Segment 26) Note 24 & 25, 1993 survey. Area still requires stabilization. Project failed to receive competitive bids for shoreline stabilization along two lots in this area. (See page 2-24)

Figure 9 - 1993 Shoreline Survey Map

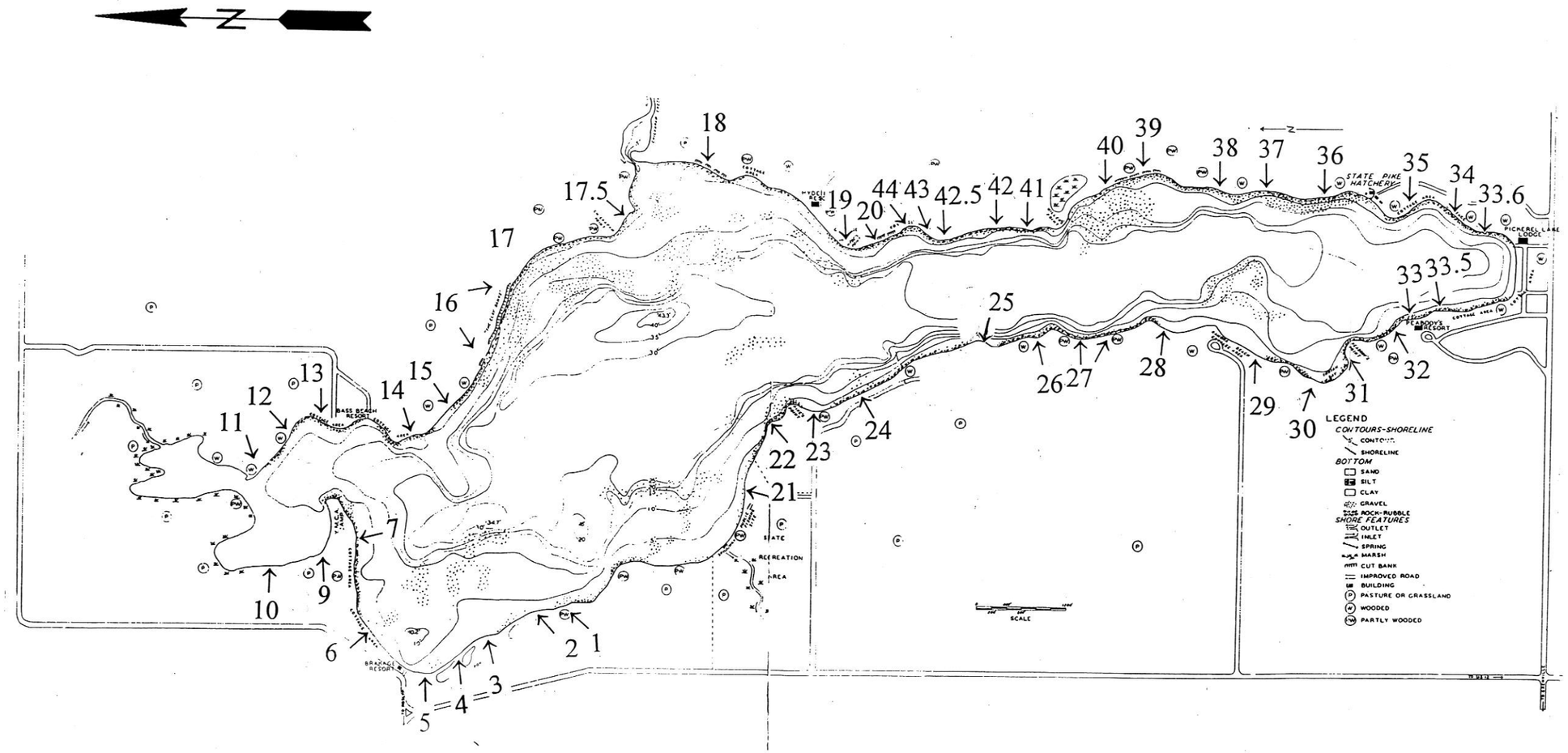
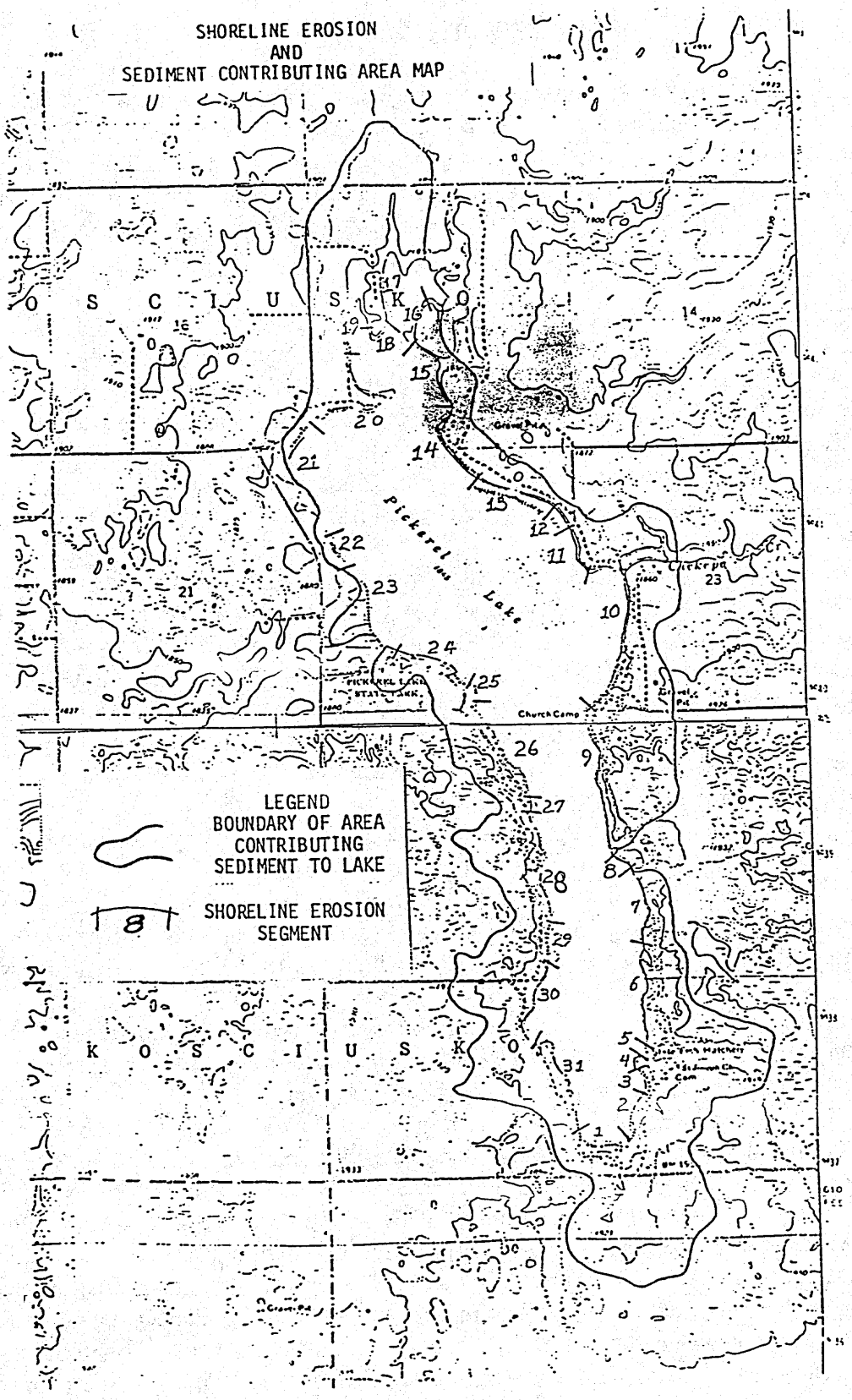


Figure 10 - 1985 Shoreline Erosion Map



Stabilization Activities

Shoreline Stabilization - Private Property

On 10 May 1994, 213 fliers were mailed to Pickerel Lake property owners advertising cost share for shoreline stabilization. A copy of this flier is found in Appendix I. Sites leased from the Sisseton-Wahpeton Sioux Tribe were not included in this mailing since permission would have to be gained from all trustees. The Sisseton-Wahpeton Sioux Tribe did not have funds to cost share shoreline improvements on tribal trust land. A letter from the Sisseton-Wahpeton Sioux Tribe is found on page 2-25.

Eighteen property owners returned completed forms. Each site was visited by the Project Coordinator and NRCS personnel. Sites were prioritized according to the extent of erosion occurring, and size of lot. Six of these sites were selected and surveyed by NRCS personnel during the summer of 1994. Designs for stabilizing four sites were completed by NRCS Engineers, and specifications were prepared by the Project Coordinator. Specifications included NRCS standards; SD-1 Clearing, SD -5 Excavation, SD-8 Rock Riprap & Bedding, SD-10 Salvaging & Spreading Topsoil, SD-28 Seeding, and SD-34 Geotextile. A cross section drawing of the shoreline design is found in Figure 11.

The project was advertised for bids in February 1995. Federal regulations require that construction projects utilizing federal funds be let for competitive bids. Agreements were made with each property owner to pay 40% of the final construction cost with 319 Grant Funds. Engineers estimated the cost for stabilizing these four sites to be $18,928.19, approximately $47.0 per lineal foot of shoreline. The project was let on 21 March 1995, with only one bid received. The total bid was $51,505.25, $127.0 per lineal foot of shoreline. It was felt a competitive bid was not received with only one bidder. Many construction companies and contractors were finishing projects bid in 1993 and 1994 to repair and rebuild flood damaged roads in Northeastern South Dakota, thus not bidding on additional work in 1995. The project was not rebid. Design plans and specifications were given to each property owner for use in hiring their own contractor without use of federal cost share funds. To date none of these property owners have completed shoreline stabilization. This project would have stabilized 405 feet of Pickerel Lake's shoreline, requiring 741 cubic yards of rock riprap, and 695 square yards of geotextile fabric. Locations of these sites are found in Figures 12 through 14 - marked "Technical Assistance".

Technical assistance was given to many of the lakeshore property owners who signed up for cost share, and others who called or wrote the Project Coordinator seeking information on shoreline stabilization. Twelve lakeshore property owners - including eight who signed up for possible cost share, completed approximately 1200 feet of shoreline stabilization on their own. These sites are noted in Figures 12 & 15. The Protection Project strongly encouraged the use of filter cloth in conjunction with properly sized riprap, however none of these sites incorporated the use filter cloth. In most cases the size of riprap used appeared adequate, however little reshaping of these shorelines was completed and many banks may be too steep to hold riprap for any length of time. Several small construction companies were hired by property owners to complete these jobs. The skills of these contractors varies, one sold oversized gravel as riprap. Many contractors dislike hauling large riprap fearing damage to their equipment, and tend to haul stones no bigger than one foot in diameter. Fieldstone was used for riprap and was easily obtained from surrounding farm fields, in some cases at no cost. Five lakeshore property owners

provided the Protection Project with documentation of costs incurred for shoreline stabilization. These costs qualified as $14,000.00 in local match towards federal and state project grants.

A fact sheet "Controlling Shoreline Erosion" was written by the Project Coordinator for lake property owners interested in shoreline stabilization. A copy of this fact sheet is found in Appendix L.

Sisseton-Wahpeton Dakota Nation
LAKE TRAVERSE RESERVATION
OLD AGENCY BOX 509 • AGENCY VILLAGE, SOUTH DAKOTA 57262-0509 • PHONE: (605) 698-3911

May 13, 1994

Dennis Skadsen
Project Coordinator
Pickeral Lake Protection Project
R.R. Box 113
Grenville, South Dakota 57239

Dear Dennis:

I appreciated your call regarding the Project's plans for protecting and restoring various lake shore areas on Pickeral Lake.

The Sisseton-Wahpeton Dakota Nation has been and will always be interested in protecting and restoring these fragile lake shore areas.

However, we don't currently have the funds available to participate in any cost sharing projects. This may change as our environmental protection program expands and we're able to obtain additional public or private resources. We may also be able to reprogram some of our gaming revenues for projects like this.

In the meantime, we will be unable to share the costs of any of the lake shore work you propose, but we would like to be kept informed of your program and future opportunities to participate.

Sincerely,

Gary Johnson, Director
Planning and Development

Figure 11 - Cross Section Drawing of Shoreline Stabilization Design

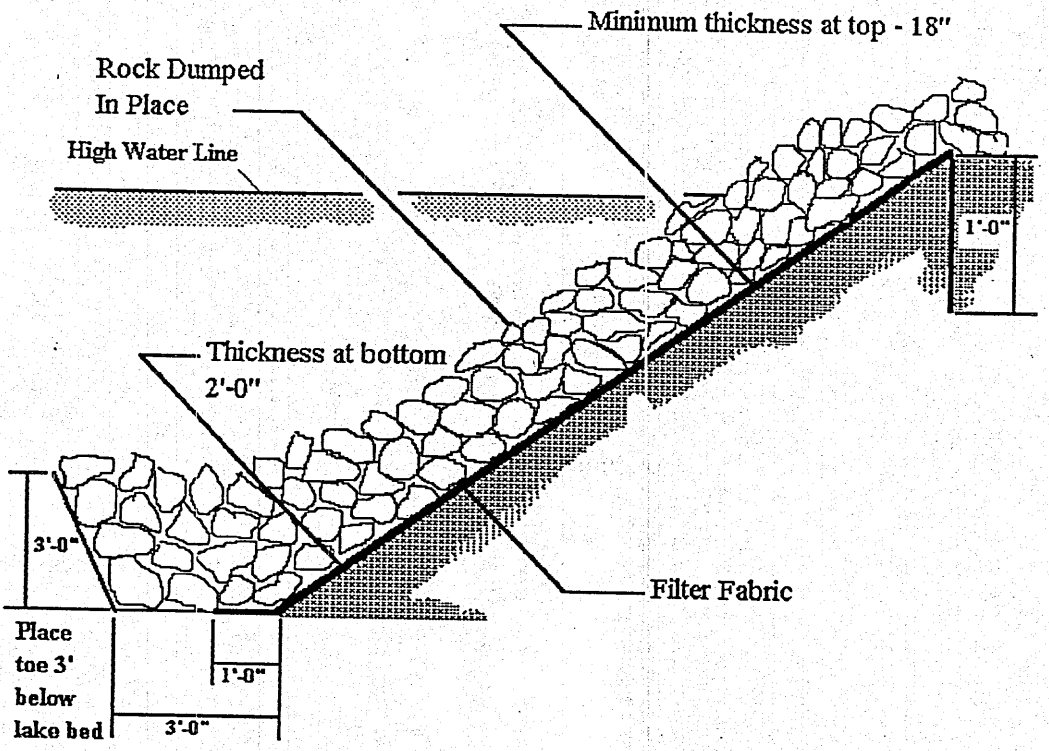
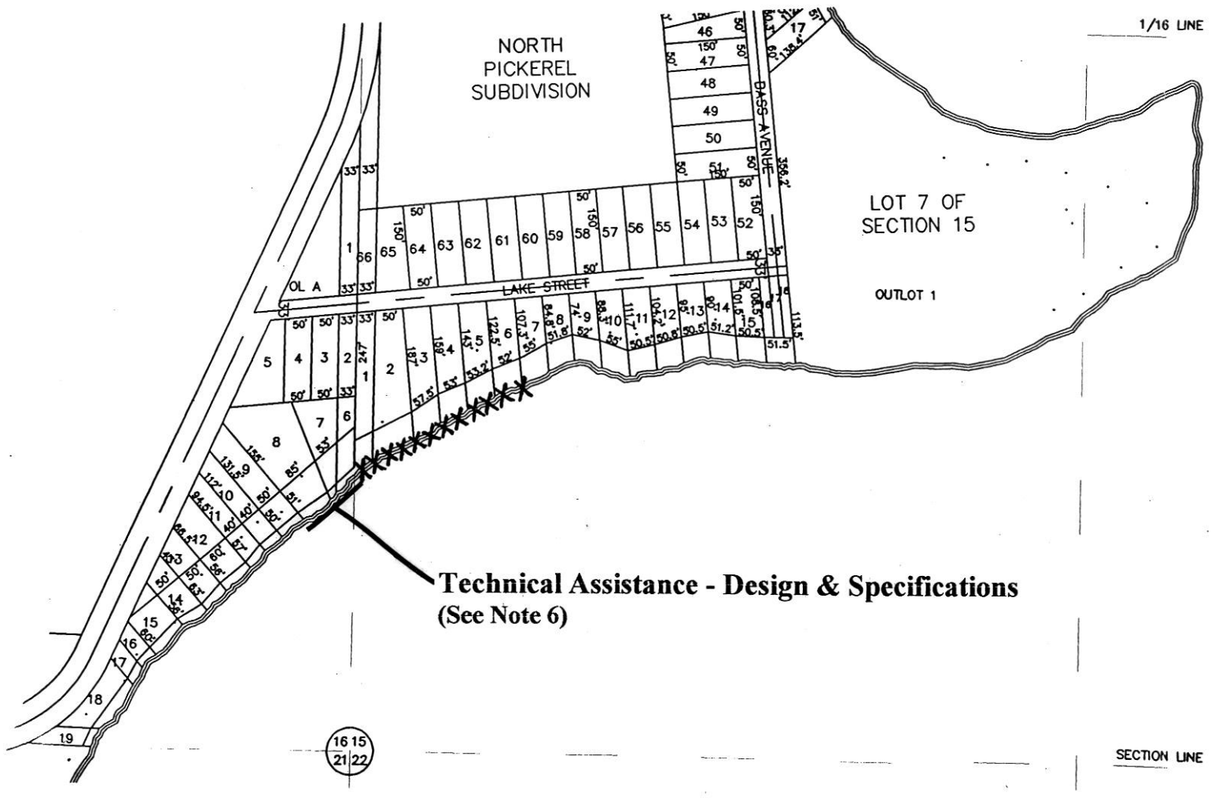
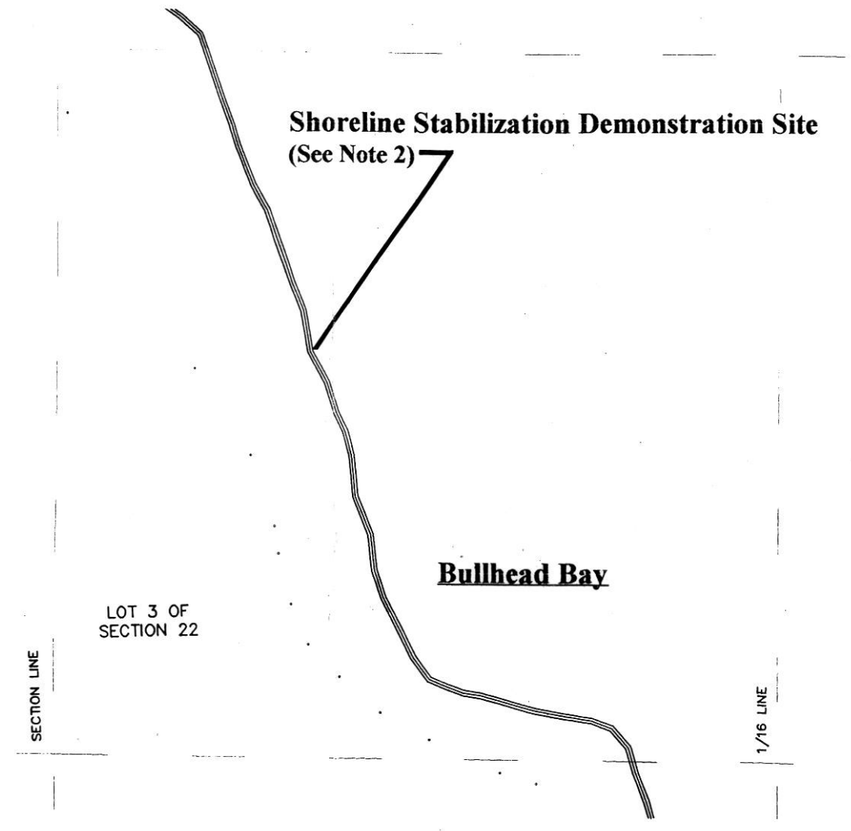


Figure 12 - Location of Shoreline Stabilization Activities





XXXXX Denotes area where shoreline stabilized by property owner.

Figure 13 - Location of Shoreline Stabilization Activities

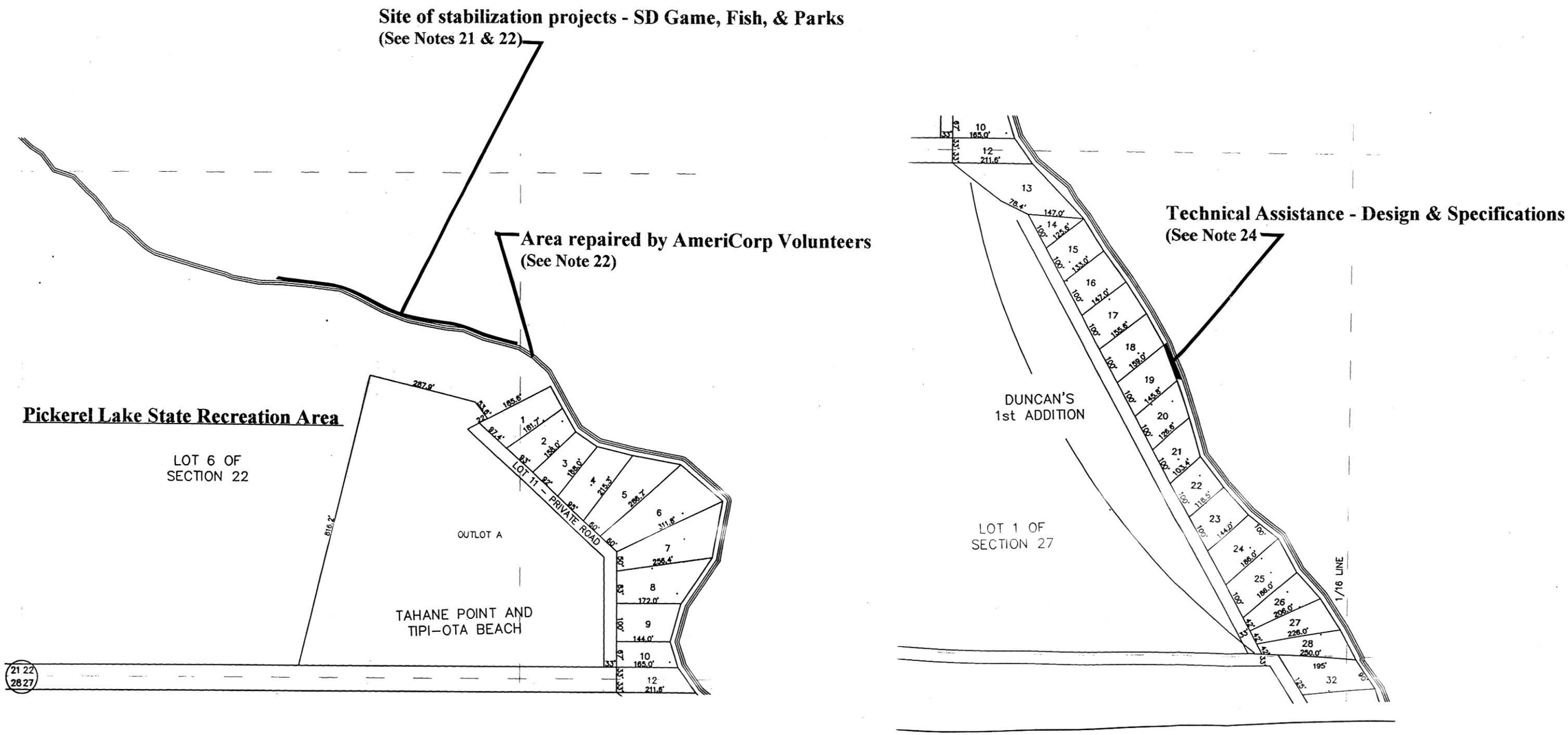


Figure 14 - Location of Shoreline Stabilization Activities

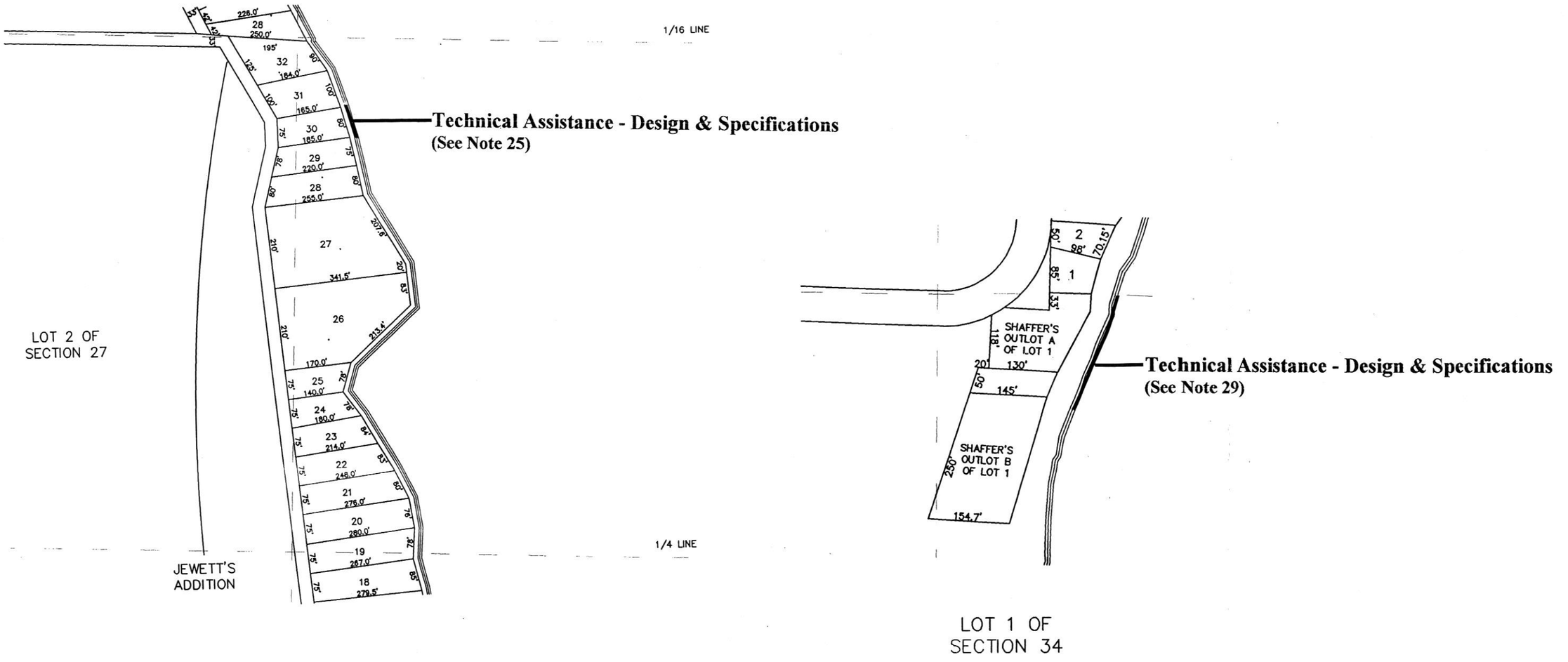
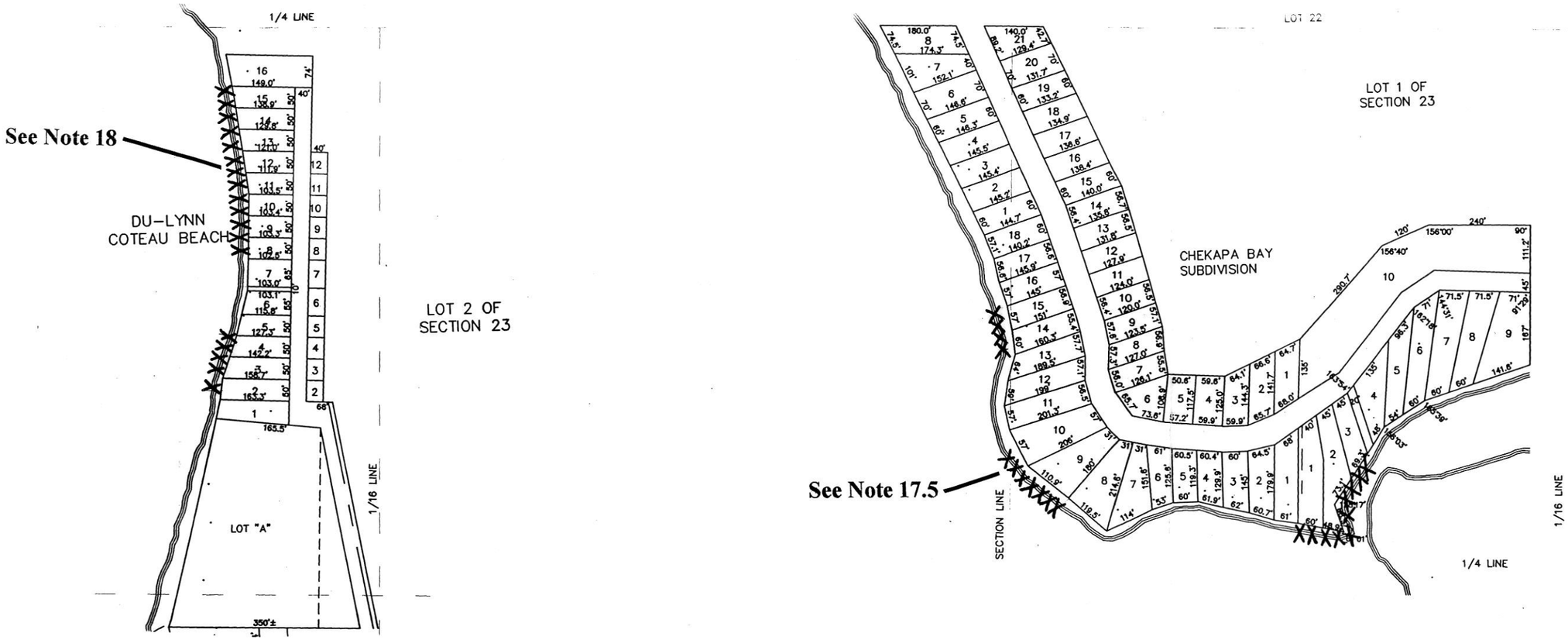


Figure 15 - Location of Shoreline Stabilization Activities



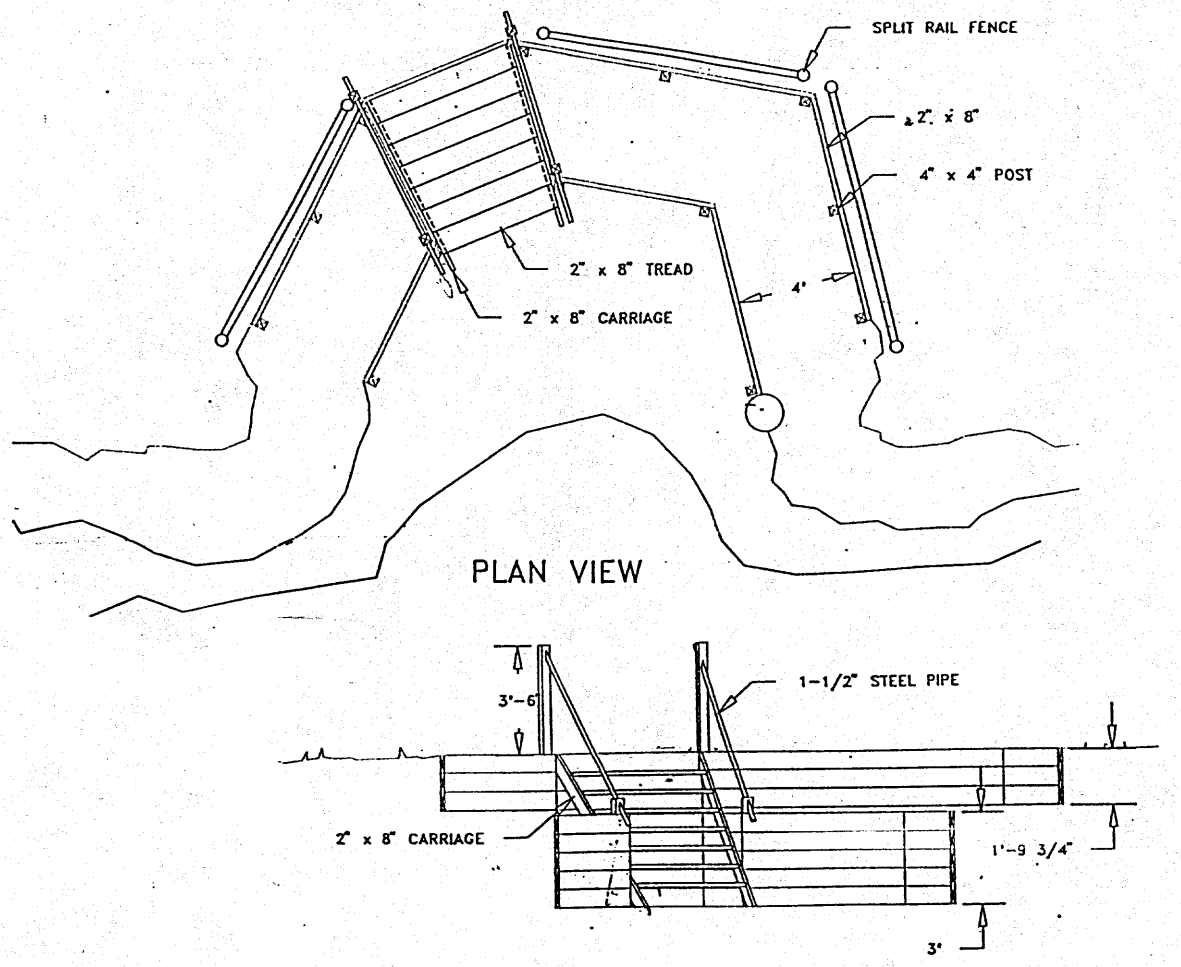
XXXXX Denotes area where shoreline stabilized by property owner.

Shoreline Stabilization - Pickerel Lake State Recreation Area

During the first year of the Protection Project - 1992, the SD Dept. of Game, Fish & Parks undertook a project to reduce erosion caused by human traffic along the shoreline of the West Unit of Pickerel Lake State Recreation Area - see Figure 13. Park personnel repaired eight areas along the shore where heavy use by campers and fisherman had damaged vegetation, thus initiating erosion along footpaths on the upper banks, and along the shoreline. Designs included seawalls to stabilize banks, and elevated platforms & stairways to reduce the impact from human traffic, allowing footpaths to revegetate. Geotextile fabric and riprap were also used to stabilize the banks. This activity was not part of the Pickerel Lake Protection Project, however the cost incurred by the state counts as $3,261.79 of local match towards the EPA 319 Grant.

Several of the eight sites were damaged by high water during the 1993 flood. The 1993 survey identified sites - notes 21 & 22, where additional stabilization efforts should be made. In June 1995, AmeriCorp Volunteers working on a Shoreline Stabilization Demonstration Site for the Protection Project repaired these sites included one area in need of additional work identified by note 22. It is hoped further work will be undertaken by the State to stabilize the shoreline identified during the 1993 survey, however shrinking state budgets may eliminate future stabilization projects.

Figure 16 - Shoreline Stabilization Site Design

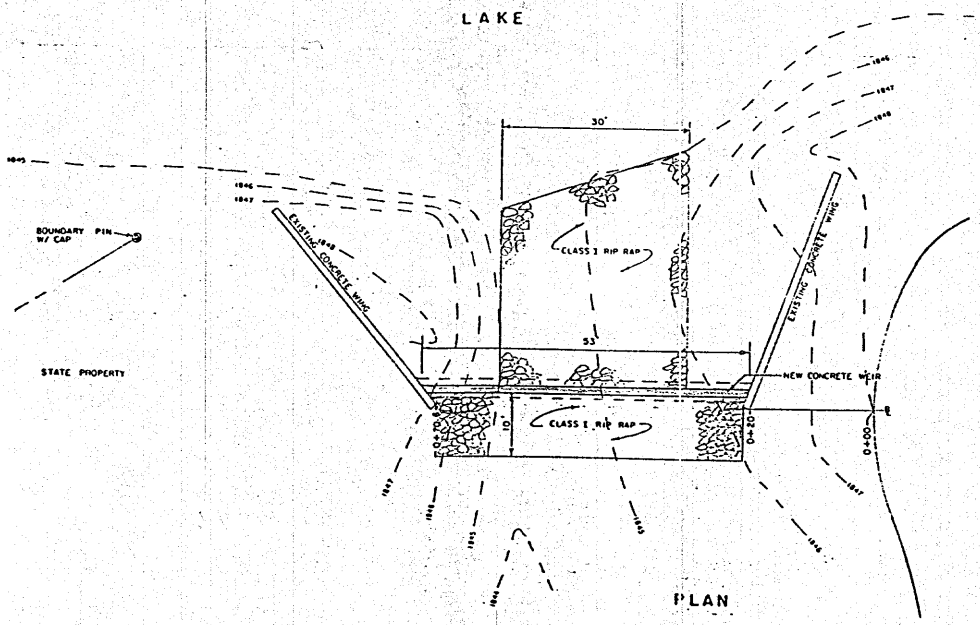


Outlet Weir and Spillway Reconstruction

High water from Pickerel Lake is discharged from a creek winding through the Pickerel Lake State Recreation Area, located along the lakes west shore - see Figure 1. The lakes level is controlled by a concrete weir set at an elevation 0.7 feet lower than the established Ordinary High Water Mark. The original weir and spillway were built in 1929. During the winter of 1991-92, ice pushed the deteriorating weir and spillway up. Lake property owners complained that the damaged weir had raised the lakes level, causing increased erosion along their shoreline. Plans were made to repair the outlet weir and spillway in the Spring of 1993, however high water prevented the contractor from beginning work. The floods of 1993 increased concerns of lake property owners, thus personnel from the SD Game, Fish & Parks removed the remaining sections of the weir and cleared several shrubs and trees from the spillway in an effort to increase the creeks flow and lower the lakes level.

Work on a new weir and spillway was completed in August of 1993. The elevation of the weir was kept at 1844.9, 0.7 feet below the OHWM, the same elevation used for the original weir built in 1929. (See Steffen 1982) After completion of the new weir and spillway several lake property owners complained the lake had been lowered too much. Lake elevations are measured twice a year by the SD Dept. of Environment & Natural Resources. This activity was not part of the Protection Project, however costs incurred for the reconstruction of the outlet weir and spillway counted as $7,750.00 in local match towards the EPA 319 Grant.

Figure 17 - Outlet Weir Reconstruction



Shoreline Stabilization Demonstration Site

After failing to secure bids for stabilizing the four shoreline sites previously described, it was decided to undertake the construction of a single demonstration site that would utilize several stabilization techniques. The site chosen, located along Bullhead Bay - see Figure 12, was identified in the 1985 shoreline survey - Segment 22, as one of two sites contributing over half of the sediment load to Pickerel Lake, and in the 1993 Survey as an area further damaged during the 1993 flooding - Note #2. The area is located on land managed by the Sisseton-Wahpeton Sioux Tribe, however there is only one trustee listed for this site. An agreement was signed between the trustee and the Day Conservation District to construct the project using 319 funds, and allow the District and general public reasonable access to the project to view stabilization techniques. The agreement also called for the owner to maintain and repair structures, and provide water and care for trees and vegetation planted to stabilize the shoreline and upper banks as in-kind match. NRCS technicians had surveyed the site in October of 1994, and a preliminary design to stabilize this area had been drawn up. Several piles of fieldstone were inspected by the Project Coordinator and NRCS Technicians for proper size and quantity. Fieldstone that satisfied the size and quantity of riprap required were found on the property of a watershed landowner who had constructed an Animal Waste Management System the previous year using Project funds. This system needed further improvements and a deal was made to pay for the riprap if the operator would use this money to make said improvements.

The District began to obtain materials for the project in early June 1995 which included; 100 yards of rock riprap from a local farm, 500 square yards (one 300 foot roll - 15 foot wide) of geotextile fabric, 50 Golden willows, 5 Redosier dogwoods, and 50 Red cedar handplants obtained from the Day Conservation District, 20 lbs. of Crown vetch seed, 12 lbs. of Smooth brome seed, 6 - 40 foot telephone poles purchased from the Codington-Clark Electric Co-op and hauled to the site by US Fish & Wildlife Service personnel from the nearby Waubay National Wildlife Refuge, and surplus erosion control matting obtained from the SD Dept. of Agriculture's - Big Sioux Nursery. Two contractors were hired - one to load and haul riprap, and a second to provide and operate a dragline for use in reshaping the steep upper and lower banks, and placing riprap along the shore. Manual labor would be provided by nine AmeriCorp Volunteers who were available to work on NRCS related projects. Personnel from the Pickerel Lake State Recreation Area managed by the SD Dept. of Game, Fish & Parks agreed to help with this project by providing free camping facilities and cabin for the AmeriCorp Volunteers, and equipment such as shovels, rakes, chain saw etc., in exchange for technical assistance and help in repairing flood damaged shoreline within the parks west unit.

AmeriCorp volunteers began work on shoreline repairs at the Pickerel Lake State Recreation Area on 19 June 1995 - finishing during the afternoon of June 20. Actual construction of the demonstration site began on the morning of 20 June with the dragline removing debris buried by the collapsing bank - decks and dock, and removal of trees and shrubs. By the afternoon of June 20, the lower bank and shoreline had been reshaped, and AmeriCorp Volunteers were able to lay geotextile fabric along the 80 feet of the lower bank and shoreline. Riprap was immediately placed on top of the fabric, several feet above the ordinary high water mark. On the second day work began on the upper bank to fill in the large washout formed during the 1993 flood. Two retaining walls were constructed using six 40 foot telephone poles cut into 20 foot lengths. These walls would be used to stabilize the upper bank and retain sediment removed from the lakeshore during the first day. This sediment had washed into the lake from the eroding bank. The dredged sediment was placed in several piles to dry during the first day of

construction. Geotextile fabric was placed along the inside face of both retaining walls to allow water to travel toward the shoreline while holding the fine silt that typified the type of soil found at this site.

Once the retaining walls were completed the dredged sediment was placed behind them. This effectively filled the area washed out by the heavy rains of 1993. Approximately 250 square yards of Geotextile fabric were used at this site along with 96 yards of riprap. On the third day AmeriCorp Volunteers had left to begun another project so the Districts Tree Crew were assigned to complete work on the demonstration site. Topsoil was placed over disturbed areas, and a mixture of Crown vetch and Smooth brome was hand broadcast over the area. Rye was also seeded as a fast growing nurse crop for the slower growing Crown vetch and brome. Erosion control mats were placed and securely staked on the slopes of both upper and lower banks to hold topsoil and seeds in place. Golden willows were planted along the bottom and sides of the lower bank. Red cedar was planted on and along the sides of the upper bank. A dike was constructed on the western edge of the property to divert water away from the site during future storms.

The Project Coordinator and NRCS Technicians monitored the site throughout the summer. Erosion controls worked holding both topsoil and seed in place during several downpours throughout July and early August. Both Crown vetch and Smooth brome successfully germinated due to these timely rains. The Golden willows were growing, however all Red cedars had died by the end of the summer. Some of these may be replaced during the 1996 growing season. A two foot by four foot sign was placed along the shoreline denoting the Shoreline Stabilization Demonstration Site. The owner of the site built an elevated stairs from the upper bank to the shoreline to prevent future erosion from human traffic.

Expenses incurred for constructing this demonstration site are as follows:

Codington - Clark Electric Co-Op: 6 - 40 ft. Telephone Poles	$ 180.00
Hansmeir & Sons: 20 lbs. Crown Vetch, 12 lbs. Smooth Brome	$ 182.00
H.F. Jacobs & Son: 500 square yards-Geotextile Fabric	$ 550.00
Day Conservation District 50 Golden willows, 5 Redosier dogwoods, 50 Red cedars	$ 80.25
Day Conservation District Wages & Benefits for Tree Crew	$ 244.73
UBC: Wood Stakes	$ 15.90
Allan Hollatz, Contractor: Dragline	$1,981.35
Opitz Gravel, Contractor: Load & Haul Riprap	$ 998.40
David Gruby: 96 yds. Fieldstone	$ 420.00
Dick Dargatz: Fieldstone	$ 75.00

Roman Okroi: Straw Bales	$ 17.00
Stein Sign: Project Sign	$ 60.00
Project Total:	**$4,804.63**

The AmeriCorp Volunteers worked 157 man hours which provided $1,099.00 of in-kind cash towards both Federal and State grants. Equipment and personnel provided by the SD Dept. of Game, Fish & Parks added $729.00 of in-kind match towards the 319 EPA Grant.

Drainage Problems & Lakeshore Developments

During the Protection Project several lake property owners contacted the Project Coordinator with questions concerning drainage. In many cases cabins and access roads leading to cabins have been built blocking natural drainage's or in close proximity to natural drainage's. (In one case a creek runs through a culvert beneath a cabin built over the natural drainage) Due to above average precipitation during the years 1992, 1993 & 1994, many property owners experienced flooding and severe erosion of yards, driveways, and access roads. Township roads leading to the lake were also damaged by flooding. Many of these township and lake access roads are repaired after each event with the addition of more gravel and grading - without resolving the drainage problem; cleaning plugged culverts and blocked ditches, placing culverts were needed or undersized culverts.

This type of erosion increases the sediment load to Pickerel Lake, however this work was not part of the project workplan and funds - including FEMA, were not available to correct these problems. In future projects, drainage and road stabilization should be incorporated into watershed assessments. County and Township Boards need to work more closely with Lake Property Owners to solve these types of problems, and fund corrective measures. Lake property owners experiencing drainage problems were told to contact the Day County Commission who have authority to act on drainage issues around Pickerel Lake.

Conclusions

Providing shoreline stabilization on private lakeshore property proved to be one of the most difficult tasks of this project. Foremost, was the lack of interest shown by local contractors to bid this type of work. Again, many contractors were busy repairing flood damaged roads throughout Northeastern South Dakota. Only one bid was received for the proposed shoreline stabilization project. Secondly, each privately owned site required separate bid documents, permits, and contracts between property owner & project sponsor. This required that each site be treated as Add Alternates when bid, with the Project deciding after bid opening which properties could be treated with the funds budgeted for this activity. The lake property owner also had the choice at this point - to decide whether or not to proceed with the work on his property. This method of bidding may account for higher than estimated bid prices.

In future projects only technical assistance should be offered - site surveys, plans & specifications, and inspections. Lake property owners could then hire and pay a contractor on their own. The cost incurred by the property owner for this work would count as local match towards the federal funds expended for technical assistance. Contracts with lake property owners could require reimbursing the project for technical assistance if shoreline stabilization is not completed, or contractors or property owners deviate from the plans & specifications provided by the project. Projects could promote the use of geotextile fabric by paying a cost-share for its use. A demonstration site built at the beginning of the project could be used to promote shoreline stabilization activities. The shoreline stabilization demonstration site for this Project was built during the projects final year.

Section 4 - Mapping

Introduction

The 319 Workplan called for the preparation of maps to indicate where soil erodibility (K factor), slope, and proximity to water courses combine with current land use practices to constitute critical areas in the watershed that contribute sediment and nutrients to Pickerel Lake. Other watershed maps would delineate watershed and subwatershed boundaries, identify drained wetlands, Conservation Reserve Program acres, current land use, and locations of shallow aquifers. $12,187.00 of EPA 319 Grant funds were budgeted for this activity. The Water Resources Institute provided $8,138.10 in local match for the development of these maps.

Overlay Maps

Overlay maps were prepared by Water Resources Institute personnel. These maps were prepared with two acetate overlays - one denoted slope, another K factors, for each section of land located in Pickerel Lake's direct watershed. Slope categories consisted of 0-6%, 6-9%, and over 9% slope. Five erodibility factors were used. When the layers were combined, a third layer was created (Figure 18) with six levels of critical areas. These overlay maps were used by Natural Resources Conservation Service, and Water Resources Institute staff to prioritize cropland offered during the WQIP sign-up period in 1993 (See Section 5). Table 2-1 page 2-42, denotes the percentage of critical areas for each field contracted to receive treatment. Other fields offered during the sign-up were rated using the same methods but are not shown in Table 2-1. The slope overlay proved the most useful for this task since K factors for most of the soils were similar, dominated by .28 soils. (See Figure 3, page 1-10). Figure 18, page 2-39, is an overlay map of Section 20, One Road Township, Roberts County showing the location of critical areas, - denoted by colored areas, and where best management practices - denoted by cross-hatching, were implemented during the project.

Detailed Watershed Maps

One of the first tasks completed was accurately defining the boundaries of Pickerel Lake's watershed. The watershed line was drawn first on existing USGS topographic maps. The accuracy of boundary lines were field checked in March 1993 during and after snowmelt had occurred. The new Pickerel watershed map included the watershed of One Road Lake which overflows into Pickerel during high water years. The updated Pickerel watershed map allowed WQIP sign-ups to be limited to only cropland located within the lakes drainage.

All watershed maps called for in the original 319 Workplan were completed. Several are included in this report. These maps were generated using the GIS - Geographical Information System. GIS was not part of the original 319 Workplan, however a cooperative project between the Sisseton Wahpeton Sioux Tribe and the Remote Sensing Institute at South Dakota State University mapped various watersheds in Northeast South Dakota using the GIS format. Pickerel Lake's watershed boundaries were digitized into

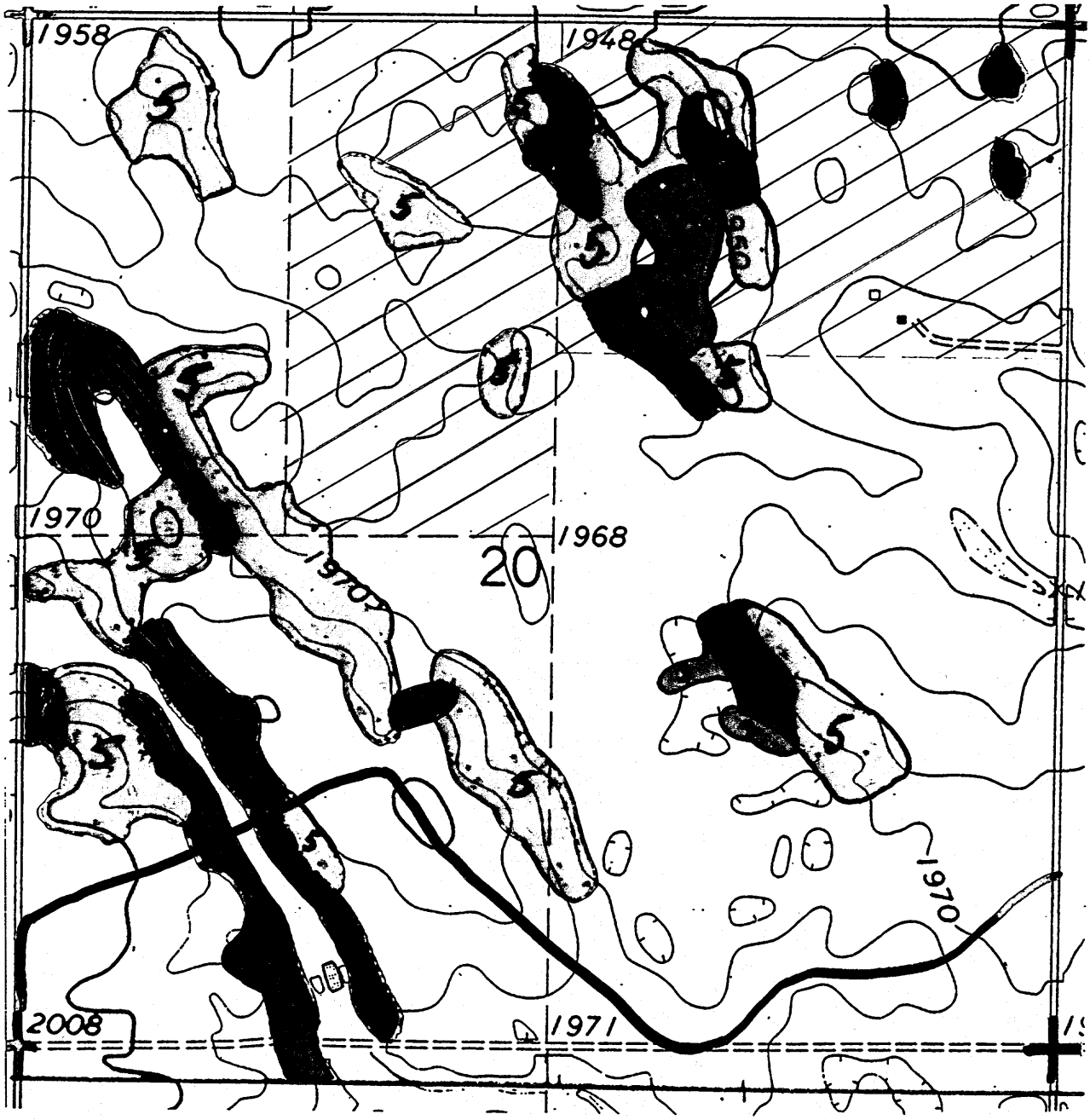
GIS for this project, and data collected for the Pickerel Lake Protection Project were added by Water Resources Institute personnel to produce several layers of GIS information used to generate the maps reproduced in this report; Figure 2 - Pickerel Lake Watershed, Figure 3 - Soil K Factors, Figure 5 - Land Use, Figure 5A - Land Ownership, Figure 6 - Wetlands, Figure 6A - Drained Wetlands, Figure 7 - Aquifers, and Figure 20 - Contracted Fields. GIS is the standard computer mapping method being implemented by several state, federal, and local agencies who participated in the Protection Project including; U.S. Fish & Wildlife Service, National Resources Conservation Service, and Sisseton Wahpeton Sioux Tribe.

Figure 19, page 2-40, is an example of the type of GIS map available for use by resource planners. This map shows land located in Section 20 of One Road Township, Roberts County of Pickerel Lake's watershed. The map denotes current land use.

Conclusions

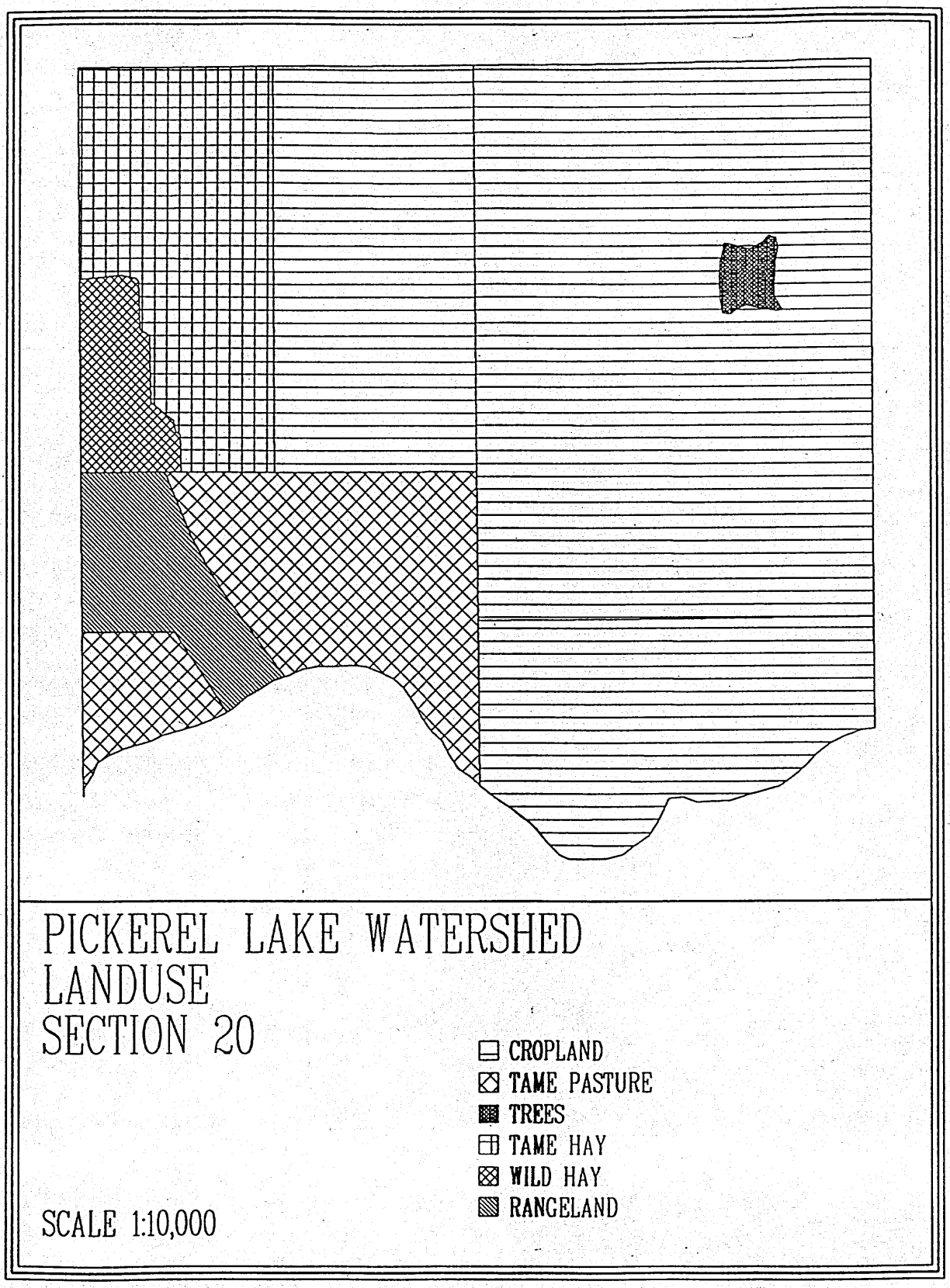
Considerable effort was expended to create critical area maps to prioritize cropland for application of Best Management Practices (BMPs). A combination of soils maps and land use probably would have been just as useful for this task, at a lower cost. A GIS system would work well to combine the land use and soil layers.

Figure 18 - Critical Area Overlay Map



1 - K<0.28 & Slope <6	4 - K=0.28 & Slope >9
2 - K=0.32 or K=0.37 & Slope 6-9	5 - K=0.28 & Slope 6-9 or K=0.24 & Slope >9
3 - K=0.32 or K=0.37 & Slope <6	6 - K=0.24 & Slope 6-9 or K=0.20 & Slope >9

Figure 19 - GIS Section Map



Section 5 - Best Management Practices

Introduction

The Day Co. ASC Committee submitted a request for WQIP (Water Quality Incentive Project) funds - to assist the Pickerel Lake Protection Project in reducing nonpoint source pollution from agricultural land. In 1991, there was 2921 acres of cropland and 14,455 acres of grassland (excluding CRP acres) in Pickerel Lake's watershed. Figure 5, page 1-11 denotes the location of cropland and several categories of grassland in the watershed. The goal of this project activity was to treat the 2000 most critical acres of cropland that were contributing sediments and nutrients via soil erosion, and treat 4000 acres of grassland. The Project received $51,000.00 from WQIP to be used as financial incentives to secure the cooperation of watershed landowners and operators in implementing best management practices on cropland, and constructing animal waste management systems on feedlots located within Pickerel Lake's watershed. The SD Coordinated Soil and Water Conservation Fund grant provided an additional $30,500.00 to be used as incentive for implementation of best management practices, and $10,000.00 to pay for technical assistance in conservation planning. No funds were received to provide incentives for improving grassland management. In 1994, an additional $10,650.00 in WQIP funds were made available to the project.

Watershed landowners and operators were notified through press releases and letters of the availability of these funds. Applications for these incentive payments were available at Farm Service Agency office's in Britton, Sisseton, and Webster, South Dakota from 11 thru 29 January 1993.

Information on WQIP payments for waste management and waste utilization is found in Section 6 - Animal Waste Management.

Selection of Fields to Receive Best Mgt. Practices

Nineteen applications were received during the January 1993 sign-up. Five applicants had applied to receive incentive payments for grazing and grassland management, however funds were not received for these types of BMPs.

The remaining fourteen landowners and operators who applied for cropland incentive payments were rated per field using distance from field to water course, and the percent of critical areas per field. Critical areas were a combination of field slope and soil K factors (RKLS). Critical areas were identified on overlay maps developed during the projects first year (See Section 4). Sixty-one fields were signed-up to receive incentive payments for implementation of BMPs - forty-two fields were accepted into the program. Table 2-1 shows the data used to prioritize the fields which received treatment during the project. Figure 20, page 2-45 shows locations of these fields. The number prior to the landowner/operators name denotes how each applicant was rated among the fourteen applicants. The third rated landowner was not eligible to receive WQIP incentive payments due to his failure to implement a conservation plan on highly erodible land prior to the projects start. Another landowner

contracted to receive WQIP payments failed to implement the required BMPs, and was ineligible to receive incentive payments.

Only fields located within Pickerel Lake's direct watershed were eligible for enrollment into the WQIP program. The area within One Road Lake's watershed was given a lower priority for BMP application because some degree of treatment and nutrient removal is assumed to occur as runoff passes through the One Road Lake basin.

TABLE 2-1 CRITERIA USED FOR PRIORITIZING WQIP CROPLAND

OPERATOR	FIELD NO.	ACRES	RKLS	DISTANCE TO WATER COURSE	VULN.	% CRITICAL
1 - T. Kulesa	T1366-1	36.2	25	.25-.5 miles	High	35%
	T1367-1-3,5,6	87.8	25	.13-.5 miles	High	70%
	T1368-3A	10	25	.5 miles	High	100%
	T1368-5	18.3	25	.5 miles	High	60%
	T1369-3,5	19.9	25	.13-.25 miles	High	60%
	T1371-1	82.8	18	.13-.5 miles	High	10%
2 - D. Gruby	T1224-1	32	20	.25 miles	High	50%
	T1227-2	24.2	20	.25 miles	High	90%
	T1227-3	12.9	20	adjacent	High	65%
	T1356-2	27.9	<10	.25 miles	Med.	0%
	T1359-1,2	74.2	25	adjacent	High	30%
	T3521-1	25	<10	.13-.5 miles	Med.	5%
	T3521-8,9,11	41.1	12	adjacent		30%
4 - R. Okroi	T1314-2	8.8	12	.75 miles	High	10%
	T1314-7A	34.5	30	.25-.5 miles	High	85%
	T1315-1	40.1	20	.75-1 mile	High	45%
	T1319-1D	35.7	20	.75-1 mile		30%
5 - J. Gronke, Jr.	T1272-1	17.6	30	.13-.25 miles	High	75%
6 - S. Julius	T623-1	51.3	20	.5 miles	High	30%
	T626-1	37.9	40	.25 miles	High	80%
7 - C. Finnesand	T583-1	36	<10	adjacent	Med	<10%
	T584-6	63.8	20	.13-.25 miles		25%
	T584-9	12.6	15	.13-.5 miles	High	25%
	T584-11	53.7	12	.13-.25 miles	High	15%
	T584-12	11.3	5	adjacent	Med.	0%
8 - R. Kulesa	T1338-1	3.2	12			30%
	T1338-2	22.7	12			30%
	T1338-3	41.4	12	.75 mile		25%
	T1338-4	77.6	15	.25-.5 miles		100%
9 - D. Waletich	T664-1	91.7	12	.25 miles to adjacent	High	15%
	T665-1	45	25	.25 miles	High	20%
10 - H. Skaarhaug	T1680-1	117.7	25	.5 - 1 mile	Med.	20%
	T1680-2	80.2	25	.5 - 1 mile	Med.	0%
	T1681-1	66	12	1 mile	Med.	40%

Incentive Payments

In most lake restoration and protection projects the Best Management Practices (BMPs) and pollution controls installed (such as Animal Waste Management Systems) will provide a greater benefit to society (lake property owners, recreational users, fisherman etc.) than to the individual landowner or operator. Thus, some type of incentive must be provided to ensure that BMPs are implemented. There are two types of incentives, external and internal.

External incentives offer some type of reward to the landowner or operator - in most cases a cash incentive payment for implementing BMPs or cost-sharing the construction of pollution controls. The incentive payment or cost-share percentage rate must be high enough to compensate the landowner or operator for perceived and real risks associated with implementing BMPs and pollution controls. External incentives however, are short term and once the incentive is removed many landowners and operators will revert to their old ways. The incentive payments offered for the Pickerel Lake Protection Project were made on a short term basis over a period of three years.

Internal incentives require the landowner/operator to be self-motivated and willing to implement BMPs without external incentives. Internal incentives are most likely to provide the long term behavioral changes needed to reduce nonpoint pollution. However, prompting individuals to become self-motivated and implementing BMPs and pollution controls because it's the right thing to do is a difficult task. Information and education programs, and technical assistance from conservation agencies are required to provide the landowner/operator with the "what to do" and "how to do it", which will build the confidence needed for self-motivated implementation of these practices.

The Pickerel Lake Protection Project offered several external incentive programs for landowners and operators participation. The following paragraphs will describe how these programs were funded, payment rates, and results.

WQIP Incentive Payments

WQIP payments totaling $22,791.00 were made during the 1994, 1995 & 1996 growing seasons to five landowner/operators who completed the requirements of their conservation plans. WQIP incentive payments were made at the rate of $5.00/acre for Conservation Cropping Sequence, $12.00/acre for Conservation Tillage, and $15.00/acre for Grasses & Legumes In Rotation. Table 2-2 lists total acres enrolled under the WQIP program, and total incentive payments made with these funds.

SD Coordinated Soil & Water Conservation Fund Incentive Payments

The Coordinated Soil & Water Conservation Fund grant paid $30,499.38 to five landowner/operators who followed the requirements of their conservation plans during the 1994, 1995 & 1996 growing seasons. These conservation plans were identical to WQIP. This fund provided an incentive payment of $9.00, $9.30, and $9.49 per acre for Conservation Tillage, and Conservation Cropping Sequence

practices to three landowner/operators. Table 2-2 lists total acres enrolled under this program, and total incentive payments made with SD Coordinated Soil & Water Conservation Funds.

Field Checks

NRCS personnel conducted field checks, and status reviews of contracted land for each landowner/operator enrolled in the program. These field checks and status reviews were conducted each year before incentive payments were delivered. Residue cover and crop type were checked during these field checks. Letters were sent to each landowner/operator reviewing conservation plan requirements, and the type of planting and tillage required for the next growing season.

Figure 20 - Contacted Fields In Pickerel Lake's Watershed

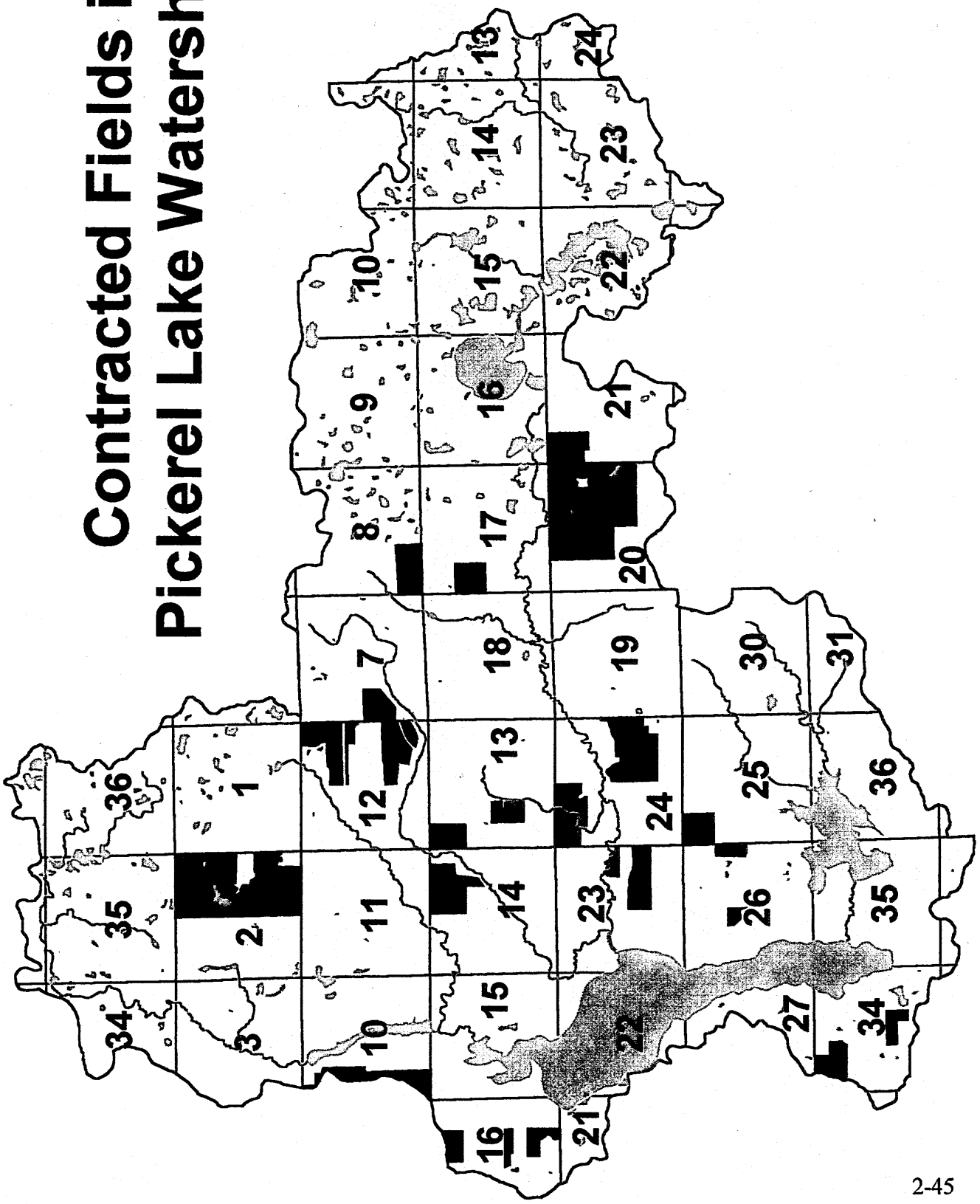


Table 2-2 Project WQIP Acres & Incentive Payments 1994-1996

	WQIP				Coordinated Soil & Water Grant	
	Grasses & Legumes In Rotation		Conservation Cropping Sequence & Conservation Tillage		Conservation Cropping Sequence & Conservation Tillage	
Operator	Acres	Payments	Acres	Payments	Acres	Payments
C. Finnesand					177.4	$4,949.46
J. Gronke, Jr.			17.6	$897.00		
D. Gruby					237.3	$6,620.67
S. Julius	87.5	$3,939.00				
R. Kulesa			144.9	$7,392.00		
T. Kulesa			88	$4,488.00	167.1	$4,512.00
R. Okroi			119.1	$6,075.00		
H. Skaarhaug					263.9	$7,512.00
D. Waletich					247.5	$6,905.25
Totals:	87.5	$3,939.00	369.6	$18,852.00	1093.2	$30,499.38

Cropland Best Management Practices

Landowner/operators were required to implement WQIP Practice Components to receive incentive payments. The following WQIP practices were implemented:

- **#328 Conservation Cropping Sequence** - Growing crops by using a combination of needed cultural and management measures. Cropping systems include rotations that contain certain grasses and legumes, as well as rotations in which the desired benefits are achieved without using these crops.

- **#329 Conservation Tillage** - A form of noninversion tillage that keeps protective amounts of residue mulch on the surface throughout the year.

- **#411 Grasses And Legumes In Rotation** - Establishing grasses and legumes or a mixture of them and maintaining the stand for a definitive number of years as part of a conservation cropping sequence.

Best Management Practice Implementation

Best management practices were implemented by nine landowner/operators on 1,463 acres of cropland in Pickerel Lake's watershed. An additional 88 acres of cropland were planted to grass or alfalfa.

Conservation plans written by NRCS personnel were signed by landowner/operators which required that the above listed practices be implemented. These requirements called for conservation cropping sequences in which low residue crops such as corn for silage, sunflowers, buckwheat, canola, and soybeans could be planted no more than once during the three growing seasons covered by the Project. High residue row crops - corn or sorgnum for grain, or forage sorghum for grazing could be substituted for any of the low residue crops. Small grains - rye, oats, wheat, barley, millet or flax, and alfalfa/grass could be planted anytime. The landowner/operator was required to implement tillage, grazing and haying practices to reduce soil erosion. A minimum of 30% residue cover was required on the soil surface after harvesting. No-till planting was required on fields if low residue crops were planted the previous growing season. Table 2-3 provides data on the types of conservation cropping sequences implemented on fields contracted to receive incentive payments for this practice. Not all fields contracted are shown in Table 2-3. Table 2-4, page 2-48, denotes the total acres per crop planted on contracted acreage's during the three years of the Project.

53% of the 2,921 acres of cropland present in 1992 received some type of best management treatment during the Protection Project.

Use of No-Till Planting

The practice of no-till was implemented at least once on 1,039 acres during the 3 years of the Project, 71% of the 1,463 acres of cropland enrolled in the Projects incentive programs. No-till practices were implemented on 145 acres all three years of the project by one operator. This operator has purchased a

no-till drill and will continue the practice after the Projects end in 1996, on highly erodible land in Pickerel Lake's watershed. A second operator is also considering continuation of this BMP.

Table 2-3 Conservation Cropping Sequences

Field No.	Acres	Cropping Sequence		
		1994	1995	1996
T1366-1	36.2	Canola	Wheat (no-till)	Corn
T1367-1	16.4	Buckwheat	Alfalfa	Alfalfa
T1367-3	48	Wheat (no-till)	Sunflower	Wheat (no-till)
T1367-5,6	19.8	Canola	Wheat (no-till)	Corn
T1368-3A,5	28.3	Alfalfa	Alfalfa	Alfalfa
T1369-3,5	19.9	Buckwheat	Alfalfa	Alfalfa
T1371-1	82.8	Barley	Corn	Soybeans/Corn (no-till)
T1319-1D	35.1	Wheat	Canola	Wheat (no-till)
T583-1	36	Barley	Buckwheat	Wheat (no-till)
T584-6,9,11,1	141.4	Barley	Buckwheat	Wheat (no-till)
T1338-4	77.6	Soybeans (no-till)	Wheat (no-till)	Soybeans (no-till)
T1338-1,2,3	67.3	Wheat (no-till)	Soybeans (no-till)	Wheat (no-till)

Table 2-4 Total Acres Per Crop Type Planted On Contracted Fields

Crop Type	Acres Per Year 1994	1995	1996*	Total
Alfalfa	250.2	235.2	230	715.4
Barley	317.9	99.9	71.7	489.5
Buckwheat	36.3	167.9	10	214.2
Canola	56	30	0	86
Corn	94.9	171	167.1	433
Millet	0	115.3	0	115.3
Oats	52.4	51.5	0	103.9
Soybeans	74	165.9	350.6	590.5
Sunflowers	0	48	0	48
Wheat (Spring)	352	190.4	439	981.4
Total:	1233.7	1275.1	1268.4	**3777.2**

* acres not confirmed

Other Conservation Programs

Resource and conservation agencies offer a number of programs aimed at reducing soil erosion and other forms of nonpoint source pollution. Although not a part of the 319 Workplan, these conservation programs supplemented the activities of the Pickerel Lake Protection Project and are described below.

Conservation Reserve Program (CRP)

A goal of the 319 Workplan was to identify total acres of CRP and determine their contract expiration dates. Currently there are 2154 acres (64 contracts) of CRP in Pickerel Lake's watershed. (See Figure 5, page 1-11 for locations). The majority of CRP contracts - 839 acres, expire in 1996. Table 2-5 gives data on CRP acres and expiration dates. Most landowner/operators extended contracts that were to expire in 1995. These contracts were extended for only one year, and several were extended for a second year in 1996. Landowner/operators with contracts expiring in 1996 have been given the option to graze or hay CRP acres at a reduced payment. The number of animal units and grazing days were pre-determined by NRCS personnel to prevent these acres from being overgrazed.

Table 2-5 CRP Acres & Contract Expiration Dates

Expiration Year	No. of Contracts	Acres
Unknown	18	330.82
1995	6	433.87
1996	23	838.59
1997	6	157.26
1998	9	229.44
1999	2	164.31
Total:	64	**2154.29**

Priority was given to Pickerel Lake's watershed in the 13th Conservation Reserve Program sign-up offered by the U.S. Dept. Of Agriculture in 1995. Special notices were mailed to all watershed landowners and operators by the Protection Project. Approximately 95 acres of cropland in Pickerel's watershed were accepted during this sign-up.

Major land use changes effected by release of CRP in Pickerel Lake's watershed could have a negative affect on the lakes water quality.

Great Plains Conservation Program

One Great Plains Conservation Program contract exits in Pickerel Lake's watershed. 766 acres are enrolled under this contract on which the following practice components have been implemented; 328 - Conservation Cropping Sequence, 329 - Conservation Tillage, 382 - Fencing, 510 - Pasture and Hayland Management, 516 - Pipeline, 528 - Proper Grazing Use, 556 - Planned Grazing System, 614 - Water Tank, and 644 -Wildlife Wetland Habitat Management.

U.S. Fish & Wildlife Service

Several landowner/operators are participating in the U.S. Fish & Wildlife Services - "Partners In Wildlife" program. Two landowners have implemented rotational grazing systems on 1,593 acres of pastureland in Pickerel Lake's watershed. One agreement will protect a critical riparian area located near the south end of Pickerel Lake. This area has been overgrazed and currently contributes sediment due to stream bank erosion.

To date, 64 wetlands totaling 110 acres have been restored under the Partners program in Pickerel Lake's watershed. Figure 6 shows locations of these wetlands.

Best Management Practices on Lakeshore Property

A major goal of the projects Information & Education program was to inform lake property owners of best management practices they could implement to reduce nonpoint source pollutants from their property. Poor land practices often observed on developed property along Pickerel Lake's shores included the burning of leaves and other debris on beaches, failure to leave buffer strips of native vegetation along the waters edge, dumping sand to create beaches along lakeshore property, and aquatic vegetation raked onto beaches and left to rot. Two fact sheets were distributed to lake property owners citing best management practices they could implement. "Lake Protection Tips" written by the Project Coordinator listed nine BMPs addressing the above noted problems and additional tips on using detergents and cleaning solvents near the lake. A fact sheet produced by the Cooperative Extension Service "Managing Lawns to Protect Water Quality" was also distributed to lake property owners.

Poor boating habits which increase shoreline erosion, stir up sediments, and disperse aquatic vegetation in shallow areas were also observed on Pickerel Lake. The fact sheet "Water Wise Boating" written by the Project Coordinator suggested several BMPs for boaters which included; reducing speed near shorelines and in shallow areas, preventing fuel tank overflows and spills, and stopping the spread of exotic aquatic species such as Eurasian watermilfoil, Zebra mussels, and the Spiny water flea. The fact sheet also offered suggestions for time and space zoning to reduce conflicts between fishermen and other recreational users such as jet skis and other high powered water craft.

Although a gray water sanitary sewer system is planned for construction around Pickerel Lake, the Project Coordinator wrote and distributed a fact sheet " Understanding & Maintaining Your On-site Septic System." This fact sheet provided information on how an on-site system works, signs of system failure, and several maintenance tips. Maintenance tips included several suggestions as to what not to

flush down the system - cigarette butts, coffee grounds, cleaning solvents and other toxic substances, etc. A list of water conservation practices designed to lessen the load to the system was also included. Many of the septic system best management practices can also be applied to gray water sanitary sewer systems. Copies of this and other fact sheets are found in Appendix L of this report.

Conclusions

Land use in Pickerel Lake's watershed has changed dramatically during the past few decades. Forty percent of the land in Pickerel Lake's watershed has at one time been utilized as cropland. Major changes in land use began in the late 1970's when landowners and operators converted several thousand acres of cropland to tame hay and pasture. With the onset of the Conservation Reserve Program in 1986, an additional 2,100 acres of cropland were converted to grassland. Today only 2,921 acres, thirteen percent of the watershed, is farmed cropland. Of these acres, fifty percent received best management treatment during the Protection Project.

No-till planting was successfully implemented to the satisfaction of three operators in the lake's watershed. One of these operators has purchased a no-till drill for continued use in the watershed as a direct result of the project's incentive program. A fourth operator who attempted no-till planting was displeased with the results and believed his field soil conditions were unsuitable for no-till. A fifth operator implemented no-till for the 1996 growing season. Comments on no-till by this operator were unavailable for this report. Most operators felt the practices implemented not only benefited the lake, but also their operations. A few expressed interest in receiving further incentive payments to pay for conservation practices. It is unclear at this time whether these operators will continue conservation practices implemented during the project without incentive payments. State and Federal Resource Agencies should track future land use practices after projects such as this are concluded to determine if any long term benefits are derived, and if best management practices are continued by land owners and operators after incentive payments are terminated.

Since 1991, Pickerel Lake's water quality (see Part III) has shown an improvement for some parameters - from a eutrophic to mesotrophic lake. These improvements could be attributed to land use changes, however only minimal water quality data exists prior to 1986 making any statements about changes in the lake's water quality inconclusive. Further in-lake and tributary testing is needed to determine changes in water quality brought about by the end of project incentives and the Conservation Reserve Program. Unfortunately, funding for in-lake water quality testing of Pickerel Lake has been discontinued by state and federal agencies. An opportunity for determining the benefits of conservation programs such as CRP to surface water quality exists if funding for these tests can be obtained. The Sisseton Wahpeton Sioux Tribe has initiated water quality testing on lakes within reservation boundaries including Pickerel Lake, but lack of funds and personnel has limited the number of samples being taken. Regardless, conservation programs such as the Conservation Reserve Program and other best management practices should be continued and strongly promoted in watersheds of high quality lakes such as Pickerel Lake.

Section 6 - Animal Waste Management

Introduction

The original 319 Workplan called for two Animal Waste Management Systems (AWMS) to be built in Pickerel Lake's watershed. The EPA 319 Grant provided $35,000.00 for this construction. The Day Conservation District applied for and was awarded a $40,000.00 grant from the South Dakota Consolidated Water Facilities Construction Program. This state grant provided the necessary funds to construct a third AWMS. The SD Coordinated Soil & Water Conservation Fund grant provided $15,000.00 for technical assistance in ag waste design and layout. This technical assistance included surveying sites, system design & layout, and construction inspection & certification.

Site Selection

Sites for AWMS were selected using the following criteria;

- proximity to Pickerel Lake or major tributary,
- dairy operation,
- number and size of animals,
- willingness of owner operator to cooperate on a voluntary basis
- willingness of owner to pay at least 40% of the total cost of the system.

Using this criteria the following sites were chosen. Locations of these sites are shown in Figure 21, page 2-54.

1) Gruby Dairy Operation - 363 dairy cow/calves & stock cows, feedlot located approximately 200 feet from a main tributary to Pickerel Lake, site currently the largest dairy operation in the lakes watershed.

2) Kulesa Winter Feedlot - 150 dairy heifers/calves & stock cows/calves, feedlot located approximately 500 feet from Pickerel Lake.

3) Gronke Dairy Operation - 140 dairy cows/calves, feedlot located approximately 3/4 mile from Pickerel Lake.

System Design and Construction

System Design

Systems were designed by NRCS Ag Engineers. Sites were surveyed by members of the South Dakota Ag Waste Team, NRCS Technicians, and the Project Coordinator. Plans for these systems were drawn up by the SD Ag Waste Team. NRCS Construction Specifications were used which included the following; SD-4 Stripping, SD-5 Excavation, SD-7A Earth Fill-Class A, SD-7S Earth Fill-Class S, SD-

10 Salvaging and Spreading Topsoil, SD-14 Wood and Steel Structures (AWMS), SD-19 PVC Sediment Basin Drain (AWMS), SD-28 Seeding, SD-30 Fencing, and A1-34 AWMS Pond Clay Lining. The Project Coordinator compiled these plans, specifications, and other forms and specifications into a package to be let by competitive bids.

Systems are designed to operate as follows:

- 1) Gruby System designed to control lot runoff and collect wastes from the following: 135 Dairy Cows @ 1,400 pounds in the lot 365 days per year, 108 Dairy Calves @ 400 pounds in the lot 183 days per year, and 120 Stock Cows @ 1,150 pounds in the lot 183 days per year plus 50 gallons wash water per day.

- 2) Kulesa System designed to control lot runoff and collect wastes from the following: 50 Dairy Heifers @ 1,000 pounds, 20 Stock Cows @ 1,000 pounds, and 60 Dairy Calves @ 600 Pounds all kept in the lot 180 days per year plus 20 Stock Calves @ 600 pounds kept in the lot 90 days per year.

- 3) Gronke System designed to control lot runoff and collect wastes from 70 Dairy Cows with an average weight of 1,300 pounds kept in the lot 365 days per year, and 70 Dairy Calves with average weight of 300 pounds kept in the lot 210 days per year.

- All sediment basins are designed to be cleaned one time per year.

- All ponds are evaporation ponds designed to handle runoff under normal conditions, but in extremely wet years it maybe necessary to pump ponds to maintain adequate capacity. The bottom of these ponds are to be kept covered with water at all times to protect the clay lining. The permanent marker in each pond indicates whether enough capacity remains to store runoff and rainfall on the pond surface from a 25-year storm event. Sizes of these ponds are as follows 1) 1.7 acres - 143,266 cubic feet of storage, 2) .8 acres - 67,772 cubic feet of storage, 3) .7 acres - 58,563 cubic feet of storage.

System Construction

Bid Notices were published for three AWMS in the Webster Reporter and Farmer, on the 21 & 28 March 1994. A pre-bid meeting was held at the Day Conservation Districts office on 11 April 1994 with only one contractor attending. Bid opening was held on 20 April 1994 with only one Bid each received for the Gronke and Kulesa AWMS. No Bids were received for the Gruby AWMS. The District Board of Supervisors awarded Contracts to Annett Construction for $18,870.70 for the Gronke AWMS, and $28,899.70 for the Kulesa AWMS. The Gruby AWMS was readvertised for Bids June 20 & 27, for a 20 July 1994 Bid opening. One Bid was received from MCS Construction for $65,000.00. This Bid was accepted by the District Board of Supervisors.

Construction of the Kulesa and Gruby AWMS began in the fall of 1994. The Kulesa AWMS was completed in October 1994 at a final cost of $31,686.85, $2,787.15 over the original Bid price. This cost overrun was caused by the contractor having to move four more power poles than the original plans called for. Federal and State cost-share included $9,132.31 from EPA 319 Funds, and $10,432.79 from SD Consolidated Water Facilities Construction Program Funds. The operators cost-share totaled $12,121.75. The Gruby AWMS was completed in November 1995 at a final cost of $64,096.68 Federal

and State cost-share included $19,904.55 from EPA 319 Funds, and $22,754.89 from SD Consolidated Water Facilities Construction Program Funds. The operators cost-share totaled $21,437.24.

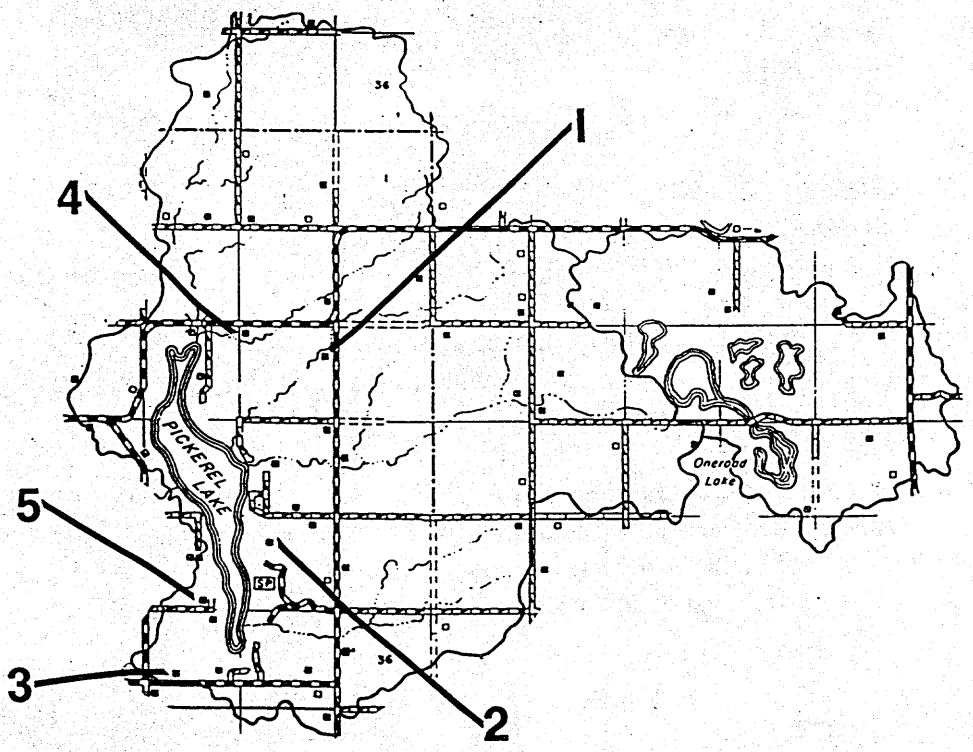
Construction of the Gronke AWMS was delayed due to the operators health. This system was built in October 1995. The final cost of this system was $21,666.75, $2,796.05 more than the original bid. Cost overrun was due to the need to excavate more dirt for the ponds clay lining. Federal and State cost-share included $7,895.64 from EPA 319 Funds, and $6,812.32 from SD Consolidated Water Facilities Construction Program Funds. The operators cost-share totaled $6,958.79.

The following table provides a breakdown and total of all funds utilized to construct these systems.

Table 2-6 Animal Waste Management System Cost-Share

Operator	Operators Cost-Share	EPA 319	Consolidated	Total
Gronke	$6,958.79 (32%)	$7,895.64	$6,812.32	$21,666.75
Gruby	$21,437.24 (33%)	$19,904.55	$22,754.89	$64,096.68
Kulesa	$12,121.75 (38%)	$9,132.31	$10,432.79	$31,686.85
Total:	$40,517.78	$36,932.50	$40,000.00	**$117,450.28**

Figure 21 - Locations of Animal Waste Management Systems



System Inspection, Operation & Maintenance

Operators must comply with NRCS Operation and Maintenance 312 Guidelines. These guidelines include the following:

Inspection

a) Entire system annually.
b) Entire system after major runoff events.
c) Vegetation to determine need for spraying, mowing, or revegetation.
d) Earthwork for signs of seepage, rodent damage, settlement, misalignment, or erosion.
e) Appurtenances and/or pipes for signs of damage and needed repairs.
f) Fences and safety signs.
g) Amount of stored sediment, debris, and liquid.

Operation

a) Confine travel of vehicles and livestock to designated areas to prevent erosion and enhance vegetation.
b) Remove stored waste in a timely manner to maintain adequate volume for the system to function as designed.
c) Apply wastes as determined by nutrient tests and/or nutrient utilization plan, in accordance with crop needs.
d) Apply wastes downwind from any residences.
e) Do not apply waste on snow or frozen ground.
f) Do not apply waste material immediately after rain or within 12 hours of forecasted rain unless it can be incorporated into the soil.
g) Do not apply liquid at a rate which exceeds the soil intake rate or the consumption use of the crop. No more than 2 inches should be applied at any one time.
h) Facility will be emptied to maintain design freeboard.
i) All clean water should be diverted unless needed for dilution.

Maintenance

a) Repair and revegetate any areas of significant erosion.
b) Repair any earth work to original grade.
c) Repair any damaged appurtenances or tanks.
d) Seal any areas where seepage is noted.
e) Repair fences and safety signs to original specifications.
f) Remove and dispose of trash and debris that will affect the aesthetics or functioning of the system.

Owner/operators of systems constructed during the Protection Project agreed upon and signed - operation and maintenance agreements which included the above requirements. These systems will be inspected once a year for the next ten years to insure compliance with the above operation and maintenance guidelines. The first inspection of these systems was completed in 1996 by the Project Coordinator.

Post Construction Problems

Both the Kulesa and Gruby ponds remained dry until snowmelt in the Spring of 1995. The Kulesa pond remained full all summer, however the Gruby pond went completely dry by July of 1995. There is some concern that this pond may be leaking.

Other problems have been encountered with the Gruby system. In the Spring of 1995, the sediment basin drain tube was frozen backing water into and flooding the adjacent feedlot. The drain tube eventually thawed allowing the feedlot runoff to enter the evaporation pond. Problems were also encountered late Summer 1995, when manure blocked and nearly flowed over the trash screen surrounding the basin drain tube. It was suggested by NRCS Technicians that a wood barrier be constructed between the piston pump outlet and basin drain pipe to hold back solid waste, yet allow liquids to run freely to the basin drain tube. At the time of this report the barrier had not yet been constructed.

During spring snowmelt in 1996, the drain tube entering the Kulesa evaporation pond was frozen - backing feedlot runoff into the temporary holding area. This runoff eventually spilled over the adjacent dike, flowing around the west pond dike into a drainage leading to Pickerel Lake. It has been suggested by the Project Coordinator that the outside dikes be raised to prevent the feedlot runoff from spilling outside of the system. An agreement was also made with this operator to limit use of a pole barn and adjacent lot located outside of the system. The operator is to use this area only during inclement weather. However, manure cleaned out of this building is being stored in the adjacent lot, outside of the system just above a small direct drainage to Pickerel Lake. The operator has agreed to remove this manure in 1996, and store solid waste cleaned from this building within the systems sediment basin in the future.

Previous Built AWMS's

There are now five AWMS operating within Pickerel Lake's watershed - three constructed during this Protection Project, and two constructed prior to the projects start in 1992 (See Figure 21, page 2-54). One system #4 was constructed in 1972. This site is currently used as a winter feedlot and calving lot. This system was inspected during the project by the Project Coordinator and NRCS Technicians at the request of the operator. It was suggested an additional dike be constructed north of the feedlot to divert clean water away from the system. This water drains from the north half of the farmstead, and during spring snowmelt and heavy rains causes the pond to back into the feedlot. A fifth AWMS - #5, is located on a dairy farm above the lakes west shoreline. This system was constructed in 1983.

Future AWMS Construction

There remains twelve farms in Pickerel Lake's watershed with feedlot's that do not have AWMS's. Future construction of AWMS's at three of these sites would benefit Pickerel Lake if additional funds, and the owner/operators cooperation were obtained. Two of these farmsteads feedlots drain directly into Chekapa Creek - one of the lakes largest tributaries.

One small farmstead currently used as a winter feedlot, drains directly into the lake through a culvert which runs onto a beach in front of several cabins. Lake property owners complained verbally to the Project Coordinator about this situation. The operator is well aware of the situation, however is not interested in constructing an Ag waste system. There were no cost share incentives available that could have been used to resolve the situation. It should be known that this is one of the smaller feedlots in the lake's watershed, however it is one of the most visible feedlots to the general public.

Solid Waste Management & Utilization

In addition to the Federal and State cost share paid to contractors for construction of AWMS, owner/operators of these systems received incentive payments from the Farm Service Agency for implementing Animal Waste Management Systems, and utilization of solid waste.

These incentive payments were made for the following WQIP practices;

- **#312 Waste Management System** - Animal wastes generated in areas where livestock are concentrated for extended periods of time will be managed in a manner that does not degrade the water resource.

- **#633 Waste Utilization** - Agricultural wastes will be used on the land in an environmentally acceptable manner while maintaining or improving soil and plant resources. Wastes will be tested for nutrient content, and wastes and other fertilizers will be applied as per soil test recommendations.

A total of $10,020.00 in Water Quality Incentive Program (WQIP) funds were dispersed. Payments were based on a flat rate of $0.01/cf (cubic foot) of solid waste that NRCS Engineers estimated would have to be removed from these three systems sediment basins yearly.

An additional WQIP incentive payment was made for proper management of the solid animal waste that accumulates in the sediment basins of these three AWMS. To qualify for these incentive payments, owner operators had to remove manure from sediment basins, and spread on cropland in an environmentally acceptable manner. Manure could not be spread on frozen ground, or snow and ice covered soil. Incentive payments totaling $14,385.00 were made to three operators who spread approximately 1,002,000 cf. (cubic feet) of manure on 421 acres of cropland at either a flat rate of $10.00 (2 contracts) or $15.00/acre (1 contract).

Field checks were made by NRCS staff to insure operators compliance with these plans. Both Waste Utilization and Waste Management System incentive payments were made over a period of three years. Table 2-7 provides data on incentive payments made to operators for waste utilization and management.

Some problems encountered with the application of solid wastes in the watershed are noted in Section 6A.

Table 2-7 WQIP Waste Utilization & Management Incentive Payments 1994 - 1996

Operator	Utilization Payment	Acres	Management Payment	Total
Gronke	$5,265.00	117	$2,640.00	$7,905.00
Gruby	$6,120.00	204	$4,380.00	$10,500.00
Kulesa	$3,000.00	100	$3,000.00	$6,000.00
Total:	$14,385.00	421	$10,020.00	**$24,405.00**

Conclusions

Of all Protection Project activities, construction of the three Animal Waste Management Systems (AWMS) will have the greatest effect in reducing the amount of phosphate and animal waste reaching Pickerel Lake. However, AWMS are the most expensive pollution controls to construct, and the most difficult to justify cost-share from the owner/operators point of view. AWMS effect farm operations and layout with the construction of dikes, lagoons, and sediment basins, and operators do not readily see the benefits to their operations, and are less likely to see the benefits to the water resource without abundant information from resource agencies involved with the design and implementation of these systems. Operators need to be involved with the planning and design process from the start, possibly in the assessment phase of future projects. The lack of operator involvement has caused some problems with the successful implementation of AWMS during this project.

Two of the three operators who implemented animal waste management systems are displeased with system designs. One operator is upset about the shape and size of the evaporation lagoon, another over the location of the sediment basin drain tube. Additional on-site meetings between the operator, engineers, technicians, and project coordinator may have increased the operators understanding of the systems size, design, and purpose. The Ag Engineer met once with operators to explain the proposed systems design and estimated construction costs. Operators were invited to - but did not attend, pre-bid meetings and bid openings. NRCS technicians had the most contact with operators during preconstruction and construction, however operators showed little interest in accompanying NRCS technicians as they surveyed and staked sites. Operators need to attend pre-bid meetings, and accompany technicians during preconstruction activities, and on-site inspections as construction progresses.

Problems with funding and cost-share were also encountered due to cost overruns by contractors or engineers underestimating the amount of earthwork required to properly construct the system. Only one system was finished at a cost near or under the original bid. A disagreement over final construction costs of one system developed after the contractor failed to follow the specifications provided. This angered

the operator who initially refused to pay his cost-share for the system if payment for the bid item in question was made. The bid item in question was not paid at the request of the operator and the Day Conservation District Board of Supervisors. The cost of this system was already $2,800.00 over the original bid quote. As of this report the issue may still be unresolved.

In future projects, alternative methods of feedlot pollution control should be considered for funding, such as relocating feedlots. Currently one small winter feedlot, holding 35 head of cattle, is located near a heavily traveled highway adjacent to Pickerel Lake across the road from several cabins. Although not the largest feedlot in the watershed, this feedlot was one of the most visible to the public. The operators main reason for wintering these cattle at this site was the availability of good abundant water. The operators were willing the move this feedlot if abundant water could be made available at a second feedlot located outside the lakes watershed. However, the project could not find any cost-share funding to help this operator obtain additional water. It should be noted that the operator did have the chance several years ago to obtain rural water at the location of the second feedlot.

Section 6A - Feedlot Monitoring

Introduction

Cattle feedlots, dairies and hog production operations are a potential source of surface water and ground water contamination. Large quantities of nutrients are contained in the manure that accumulates in concentrated feeding areas. During periods of rain and melting snow, manure comes in contact with water which leaves the site as contaminated runoff. The runoff has the potential to degrade downstream water resources such as lakes, rivers and shallow aquifers. Keeping the manure on site until it can be recycled to the soil can reduce contamination of water resources.

The Pickerel Lake Watershed contains several animal feeding or wintering areas that were identified early in the project. The objective of this phase of the project was to reduce non point source pollution by improving management of manure. The objective of the monitoring portion of the project was to document the water quality benefits of installing animal waste management systems. Two of the three sites where animal waste systems were built were selected as monitoring sites.

Site Descriptions

Gruby Site

The Gruby site is a beef and dairy operation located adjacent to the north fork of Chekapa Creek. The approximately 2-3 square mile watershed contained pasture, hay and cropland. An evaporation pond was designed to control lot runoff and collect wastes from 135 dairy cows with an average weight of 1,400 lbs. in the lot 365 days per year, 108 dairy calves with an average weight of 400 lbs. in the lot 183 days per year, and 120 stock cows with average weight of 1,150 lbs. in the lot 183 days per year. The animal waste management system was completed in the fall of 1994.

Kulesa Site

The Kulesa site is a beef and dairy operation located at the top of a hill draining to a stock dam, and then to Pickerel Lake on an intermittent drainage. The watershed was small and contained farm yard, pasture, and some cropland. An evaporation pond was designed to control lot runoff and collect wastes from 50 dairy heifers with average weight of 1,000 lbs., 20 stock cows with average weight of 1,000 lbs., and 60 dairy calves with average weight of 600 lbs. These animals were kept in the lot 180 days per year. Twenty stock calves with average weight of 600 lbs. were kept in the lot 90 days per year. The animal waste management system was completed at this site in the fall of 1994.

Methods

Water quality samples were collected above and below the Gruby and below the Kulesa site by grab sampling. Most grab samples collected represent runoff due to melting snow although rain induced runoff was collected on several occasions. The samples were held at 4°C and transported to the Water Resources Institute's Water Quality Lab for analysis. Fecal coliform samples were collected at selected sites on days when they could be sent to the State Health Lab within the recommended holding times. EPA approved methods were used for all analyses.

Parameters analyzed included:

1. **Total phosphorus**
2. **TKN or Organic nitrogen**
3. **Ammonia**
4. **Nitrite**
5. **Nitrate**
6. **Suspended solids**
7. **Fecal coliform bacteria**

Total Phosphorus

Phosphorous is often the nutrient limiting algal growth in lakes so the addition of phosphorous through contaminated runoff often results in algal blooms and excessive plant growth. Bacterial decomposition of the excess plant material growing in enriched lakes often results in low oxygen concentrations which can lead to fish kills especially in the winter months. Since phosphorus is not very soluble in water, controlling contaminant runoff from feedlots and reducing erosion can effectively reduce the amount of phosphorus reaching streams and lakes.

Nitrogen

Nitrogen is present in manure in several forms, both inorganic and organic. The inorganic forms (ammonia, nitrite and nitrate) are important nutrients available for plant growth that cause excessive algae and vascular plant growth in lakes and rivers. Organic nitrogen is the predominant form of nitrogen in manure, and in the process of being converted to the inorganic forms consumes large amounts of oxygen. TKN is a combined measure of organic nitrogen and ammonia. Summing nitrate and nitrite concentration with TKN concentration yields a calculated value for total nitrogen.

Nitrate is the contaminate of concern for ground water and is most likely to limit groundwater use for drinking water. Manure typically contains little nitrate. The state standard for drinking water is 10 mg/l as N. Much lower concentrations in runoff will cause eutrophication of lakes and streams. Ammonia represents nitrogen in the reduced form. In the presence of oxygen it is often converted to nitrate. Ammonia is present in manure as an excretory product and is generated as an end product of bacterial decomposition of organic nitrogen. Ammonia is directly available for plant growth and is the most easily used form of nitrogen. It can support the rapid development of algal blooms if other nutrients are present. The state standard for ammonia (.04 mg/l) is based on un-ionized ammonia, which is toxic to

fish and other aquatic organisms. Un-ionized ammonia is calculated based on total ammonia concentrations, pH and temperature. It is most toxic during periods of hot weather in alkaline waters

Suspended Solids

Low suspended solids concentrations are desirable in lakes and streams to prevent the filling of lake basins, for aesthetic reasons and for maintenance of a healthy fishery. High suspended solids concentrations entering lakes result in reduced aesthetic value, limit recreational use and shorten the useful life of the lake. Many of the functional values of wetlands are also negatively affected by excessive loads of suspended solids. The state standard for maintaining a warm water permanent fishery is 90 mg/l suspended solids.

Fecal Coliform Bacteria

Fecal coliform bacteria are measured as an indicator of contamination of water by the feces of warm blooded animals. The number of bacteria per 100 ml of water is an indication of the degree of contamination from human or animal wastes. The presence of fecal coliform bacteria limits the use of water for both drinking and immersion recreation.

Monitoring Results

For the purposes of this discussion, water quality will be defined by concentrations of the contaminants listed above. The results for both feedlots are presented in tables listing concentrations of each contaminant in the order of sample collection. Differences in concentration between pairs of samples (below minus above) for each parameter is presented in a second table for the Gruby site. An "above" site was not available at the Kulesa feedlot. Construction of animal waste systems occurred at both sites in the Fall of 1994. This divides the water quality data into two sets. Data before 1994 represents the pre-treatment period. Data collected in 1995 and after represents the post-treatment period.

Gruby Feedlot

Nitrite concentrations at the Gruby feedlot ranged from .002 to .069 (Table 2-8). Nitrite concentrations were usually higher below the feedlot than above. Nitrate concentrations at the Gruby feedlot ranged from .01 to 2.66 mg/l (Table 2-8). No samples exceeded the drinking water standard of 10 mg/l of nitrate as N. Nitrate concentrations were consistently higher below the feedlot before treatment and exhibited no difference, or were lower below the feedlot on several dates following treatment (Table 2-9).

Ammonia concentrations at the Gruby feedlot ranged from .04 to 4.04 mg/l and were consistently higher below the feedlot than above it before and after treatment (Table 2-9). Concentrations of TKN at the Gruby feedlot ranged from .25 to 10.60 mg/l (Table 2-8) and were consistently higher below the feedlot than above before treatment. TKN concentrations continued to be higher below the feedlot on some sampling dates after treatment (Table 2-9).

Total Nitrogen concentrations at the Gruby feedlot ranged from .26 to 10.63 mg/l (Table 2-8). Samples collected below the feedlot consistently exhibited higher concentrations of total nitrogen than those collected above the feedlot before the system was installed (Table 2-9). A graph of the differences in concentrations of total nitrogen between pairs of samples collected above and below the Gruby site is presented in Figure 22. The animal waste management system at the Gruby feedlot appears to be reducing total nitrogen concentrations in the receiving stream during some runoff events.

Table 2-8 Concentrations of contaminants in mg/l at the Gruby feedlot.

Date	Fecal Coliform	Site	Susp. Solids	Nitrite	Nitrate	Ammonia	TKN	Total Phosphorus	Nitrogen
03/18/94	-	Above	1	0.016	0.23	0.06	0.43	0.05	0.67
03/18/94	-	Below	2	0.027	0.37	0.57	1.29	0.15	1.69
04/18/94	-	Above	1	0.002	0.04	-	0.47	0.01	0.51
04/18/94	-	Below	2	0.012	0.04	-	0.81	0.83	0.86
04/29/94	-	Above	3	0.004	0.01	0.04	0.34	0.01	0.35
04/29/94	-	Below	45	0.010	0.11	0.10	1.51	0.42	1.63
07/07/94	-	Above	1	0.012	0.05	-	1.05	0.27	1.11
07/07/94	-	Below	3	0.022	2.66	-	2.43	0.39	5.12
07/18/94	1800	Above	<1	0.002	0.01	-	0.64	0.15	0.66
07/18/94	40000	Below	9	0.042	0.14	-	3.38	0.44	3.56
08/10/94	890	Above	3	0.005	0.03	-	0.60	0.20	0.63
08/10/94	6100	Below	7	0.033	0.13	-	0.84	0.25	1.00
03/12/95	-	Above	6	0.016	0.99	0.47	1.13	0.25	2.14
03/12/95	-	Below	15	0.028	0.93	0.68	2.13	0.07	3.09
03/27/95	-	Above	3	0.009	0.15	-	0.48	0.07	0.64
03/27/95	-	Below	3	0.006	0.07	-	0.47	0.05	0.55
04/14/95	-	Above	1	0.002	0.01	-	0.25	0.62	0.26
04/14/95	-	Below	5	0.005	0.11	-	0.60	0.10	0.72
06/07/95	620	Above	3	0.002	0.01	-	0.65	0.14	0.66
06/07/95	21000	Below	16	0.024	0.01	-	1.70	0.23	1.73
03/12/96	-	Above	16	0.069	0.42	2.18	5.85	2.45	6.34
03/12/96	-	Below	30	0.023	0.01	4.04	10.60	2.89	10.63
03/13/96	-	Above	7	0.026	0.60	0.40	0.78	0.34	1.41
03/13/96	-	Below	7	0.041	0.68	1.19	2.67	0.93	3.39
05/19/96	-	Above	<1	0.001	0.01	-	0.49	-	0.50
05/19/96	-	Below	1	0.002	0.01	-	0.49	-	0.50
05/21/96	<10	Above	-	-	-	-	-	-	-
05/21/96	240	Below	-	-	-	-	-	-	-

Table 2-9 Below concentration minus above concentration in mg/l for contaminants at the Gruby feedlot.

Date	Fecal Coliform	Susp Solids	Nitrite	Nitrate	Ammonia	TKN	Total Phosphorus	Total Nitrogen
03/18/94	-	1	0.011	0.14	0.51	0.86	0.09	1.01
04/18/94	-	1	0.010	0.00	-	0.34	0.82	0.35
04/29/94	-	42	0.006	0.11	0.06	1.17	0.41	1.29
07/07/94	-	2	0.010	2.62	-	1.38	0.12	4.01
07/18/94	38200	9	0.040	0.13	-	2.74	0.30	2.91
08/10/94	5210	4	0.028	0.10	-	0.24	0.05	0.37
03/12/95	-	9	0.012	-0.06	0.21	1.00	-0.18	0.95
03/27/95	-	0	-0.003	-0.08	-	-0.01	-0.02	-0.09
04/14/95	-	4	0.003	0.10	-	0.35	-0.52	0.45
06/07/95	20380	13	0.022	0.00	-	1.05	0.09	1.07
03/12/96	-	14	-0.046	-0.41	1.86	4.75	0.44	4.29
03/13/96	-	0	0.015	0.08	0.79	1.89	0.59	1.99
05/19/96	-	1	0.001	0.00	-	0.00	-	0.00
05/21/96	240	-	-	-	-	-	-	-

At the Gruby feedlot, suspended solids concentrations ranged from <1 to 45 mg/l (Table 2-8) and were higher below the feedlot than above on all but two dates, both of which were following treatment (Table 2-9). A graph of the differences in concentrations of suspended solids, between pairs of samples collected above and below the Gruby site is presented in Figure 23. The animal waste management system at the Gruby feedlot appears to be having little effect on the suspended solids concentrations in the receiving stream during most runoff events (Figure 23).

Total Phosphorous concentrations at the Gruby feedlot ranged from .01 to 2.89 mg/l (Table 2-8). Total phosphorous concentrations were consistently higher below the feedlot than above the feedlot before treatment (Table 2-9). A graph of the differences in concentrations total phosphorus between pairs of samples collected above and below the Gruby site is presented in Figure 24. Following treatment, most samples taken in 1995 indicated less phosphorus below the feedlot than above. In 1996, however, samples taken below the feedlot again exhibited higher concentrations of total phosphorus. The animal waste management system at the Gruby feedlot appears to be reducing total phosphorous concentrations in the receiving stream water during some runoff events (Figure 24).

Notes taken by the sampler (Dennis Skadsen) indicated that runoff from a field where manure had been applied was entering Chekapa Creek between the above and below sampling sites in March of 1996. Runoff was also entering the stream from winter pasture outside of the diked area of the feedlot near the evaporation pond. Cattle were fed in this area so they could lay on drier ground. Runoff from both areas probably impacted water quality parameters on both dates in March 1996. Interference from these sources will make it difficult to evaluate the effectiveness of the animal waste management system at this site.

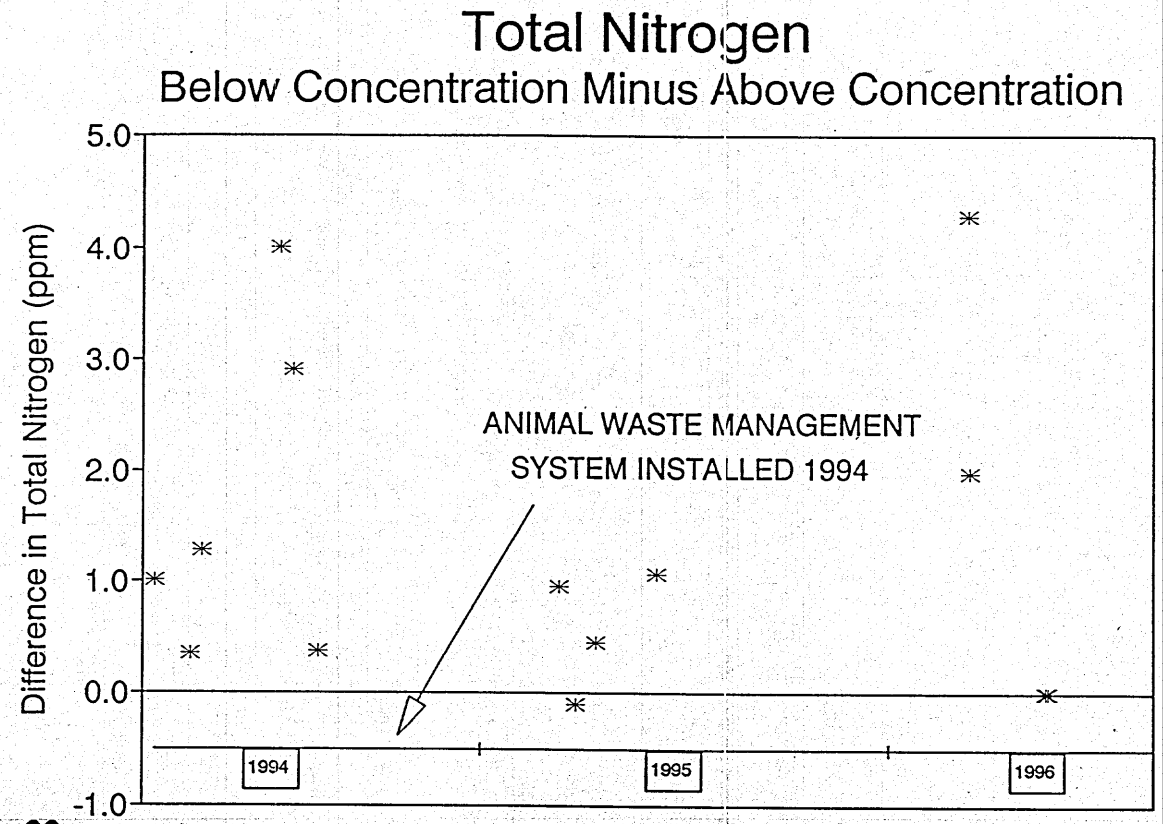


Figure 22. **Differences between above and below total nitrogen concentrations before and after construction of the animal waste management system at the Gruby feedlot.**

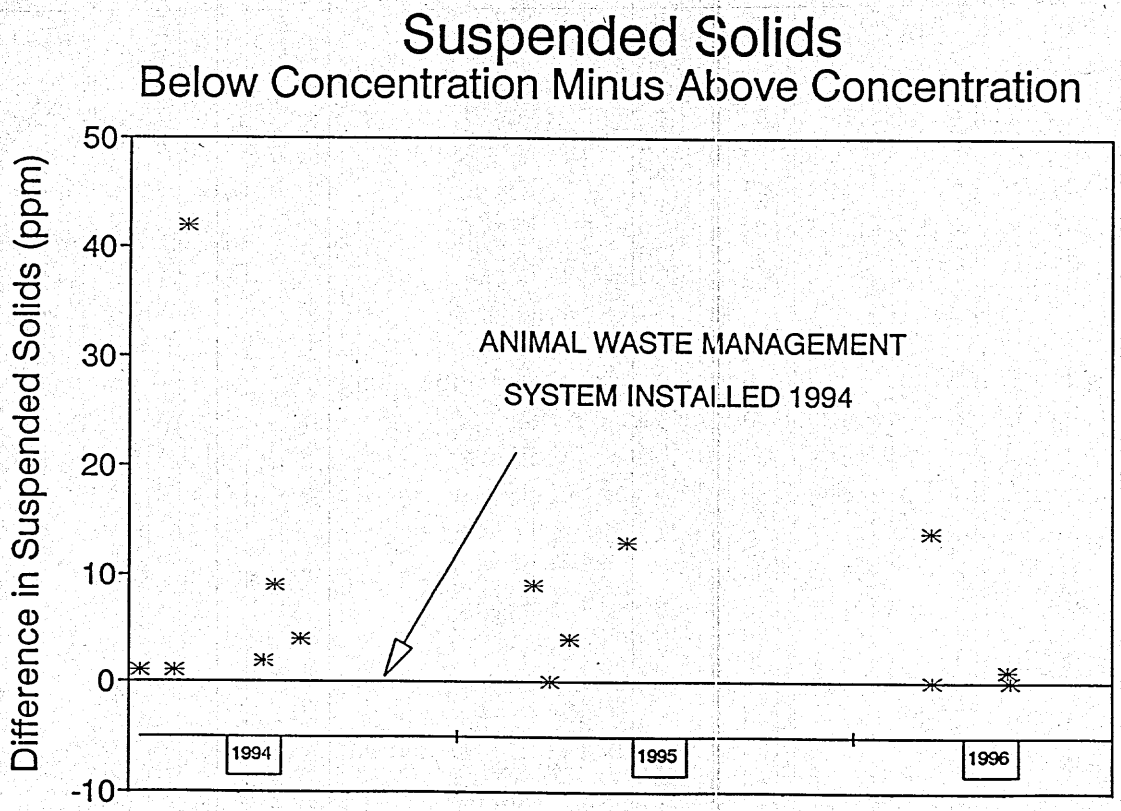


Figure 23. **Differences between above and below suspended solids concentrations before and after construction of the animal waste management system at the Gruby feedlot.**

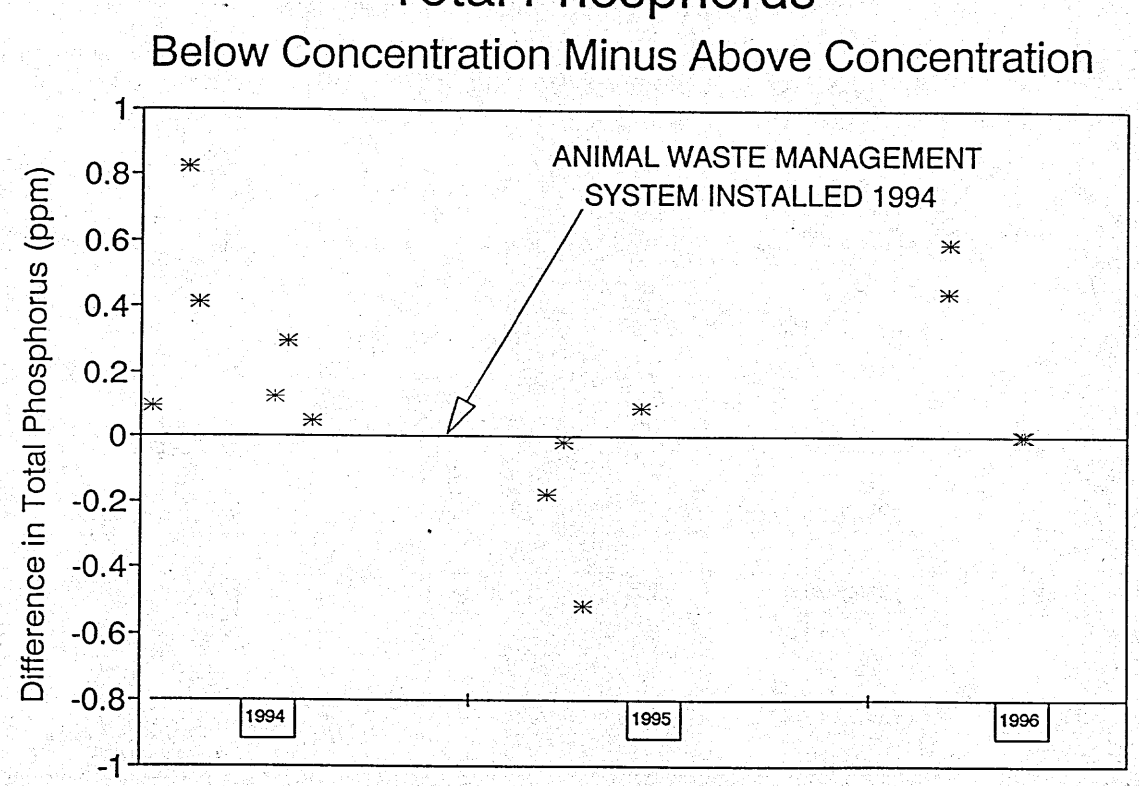


Figure 24. Differences between above and below total phosphorus concentrations before and after construction of the animal waste management system at the Gruby feedlot.

Kulesa feedlot

Nitrite concentrations at the Kulesa feedlot ranged from .002 to .221. Nitrate concentrations at the Kulesa feedlot ranged from .01 to .77 mg/l. No samples exceeded the drinking water standard of 10 mg/l of nitrate as N. Ammonia concentrations at the Kulesa feedlot ranged from .18 to 7.02 mg/l. Concentrations of TKN at the Kulesa feedlot ranged from .58 to 16.87 mg/l. Suspended solids concentrations ranged from 2 to 22 mg/l. Total Nitrogen concentrations at the Kulesa feedlot ranged from .62 to 16.9 mg/l. Total Phosphorous concentrations at the Kulesa feedlot ranged from .10 to 1.16 mg/l (Table 2-10).

Concentrations of all parameters seemed to follow the same pattern before and after construction. The animal waste management system at the Kulesa feedlot did not appear to reduce concentrations of any contaminants in the receiving stream water during most runoff events.

Notes taken by the sampler (Dennis Skadsen) indicated that runoff from a field east of the pond which had received an application of manure entered the receiving stream below the evaporation pond on March 11, 1996. Notes also indicate the inlet pipe from the solids basin to the evaporation pond was frozen, and that runoff from the feedlot was breaching the dike and discharging into the receiving stream. These two sources probably contributed to the contaminant load on both dates in March 1996.

Additional pre-treatment sampling would have been helpful at this site. A relatively large improvement in water quality will be required for successful documentation of water quality improvements in this area. Proper function of the animal waste management system and timing of manure applications to cropland so they do not contribute to runoff would also be useful.

Table 2-10. Concentrations of contaminants in mg/l at the Kulesa feedlot.

Date	Fecal Coliform	Site	Susp. Solids	Ortho PO4	Nitrite	Nitrate	Ammonia	TKN	Total PO4	Total Nitrogen
03/18/94	-	Below	8	-	0.048	0.48	0.76	1.80	1.16	2.33
04/21/94	-	Below	2	-	0.002	0.01	-	0.85	0.18	0.85
04/29/94	-	Below	9	-	0.008	0.08	0.18	1.05	0.10	1.13
07/07/94	-	Below	4	-	0.041	0.07	-	1.62	0.32	1.73
07/18/94	13000	Below	9	-	0.014	0.16	-	1.44	0.89	1.62
08/10/94	840	Below	6	-	0.004	0.03	-	0.58	0.23	0.62
03/13/95	-	Below	5	-	0.074	0.77	0.85	3.25	1.31	4.09
03/27/95	-	Below	3	-	0.033	0.22	-	1.09	0.35	1.34
04/14/95	-	Below	10	-	0.004	0.05	-	1.01	0.36	1.06
05/08/95	190	Below	3	-	0.002	0.01	-	0.89	0.24	0.90
06/10/95	-	Below	5	-	0.004	0.02	-	1.76	0.58	1.78
03/11/96	-	Below	22	-	0.221	0.39	2.19	7.30	3.19	7.91
03/13/96	-	Below	22	-	0.020	0.01	7.02	16.87	3.83	16.90
05/19/96	-	Below	1	-	0.006	0.05	-	1.54	-	1.59
05/21/96	<10	Below	-	-	-	-	-	-	-	-

Conclusions

Both feedlots studied exhibited evidence of negative impacts on water quality. Some sampling events indicated more negative impact than others. The parameters most consistently affected were total phosphorus, TKN (organic nitrogen and ammonia combined), and ammonia.

At the Kulesa Feedlot water quality appeared to be unchanged following construction of the animal waste management system. Highest concentrations of most contaminants were observed when the system was not operating properly, and runoff from a nearby field on which manure was applied entered the stream. The Gruby animal waste systems exhibited some evidence of improving water quality in the receiving stream. Runoff from uncontrolled areas adjacent to feedlot appeared to impact water quality during March of 1996. It appears that runoff can be controlled and water quality improved by building and

maintaining animal waste management systems. Good management of manure applications and proper function of the systems are important factors.

Additional post construction sampling will be needed before trend analysis is conducted to detect changes in water quality that can be linked to construction of the animal waste management system at both feedlots. Additional samples will be collected in 1996 and 1997.

Additional sampling should improve documentation at the Gruby site, especially if management of the uncontrolled areas improves. The Kulesa feedlot may also require more sampling over a period of time to determine if a positive trend in water quality will occur as past pollutant loadings are flushed out of the stock dam located below the feedlot.

Part III

Water Quality Monitoring

Section 1 - Tributary Runoff Monitoring

Introduction

Grab samples of runoff due to melting snow were collected at several locations around Pickerel Lake in 1993. The samples were collected to help identify sources of water quality degradation in the watershed. Results of analysis for nutrient and sediment parameters are presented in Table 3-1. Figure 25 shows the locations where samples were taken. Tributary monitoring was not part of the original 319 Work Plan.

Sampling Sites

Station 1 located at the south end of the lake (Figure 25), is below a gully that drains to the lake. Concentrations of inorganic nitrogen (nitrite and nitrate) and TKN (organic nitrogen + ammonia) were low to moderate. Elevated suspended solids and total phosphorus concentrations were observed. This may indicate soil erosion rather than contamination by human or animal wastes to be the source of degradation in this case. This site exhibited phosphorus concentrations 42 times higher than the average phosphorus concentration observed in the lake (.04 mg/l) during 1991 and 1992. Significant amounts of runoff from this area would be harmful to the lake. This area was enrolled in the US Fish & Wildlife Services "Partners In Wildlife" program. The landowner will be implementing a rotational grazing system. Cattle will be allowed to stay in this drainage's riparian area no more than 13 days per season. Bank erosion and the resulting sedimentation to Pickerel Lake will be reduced by the implementation of this practice. This should greatly reduce soil erosion, thus reducing the phosphorus load to the lake from this site.

Stations 2,3,4, and 9 are all located below feedlot areas identified during watershed mapping. All of these samples exhibited elevated concentrations of both nitrogen and phosphorus (Table 3-1). Phosphorus concentrations were up to 160 times higher than typical in lake concentrations (.04 mg/l). Significant amounts of runoff from these areas would be expected to degrade water quality in Pickerel Lake. Further samples were taken at Station 2 as part of the feedlot monitoring program described in Section 6A. An animal waste management system was built upstream of this site, in 1994. The feedlot above Station 9 continues to be a problem. Verbal complaints about this site were received during the Project. Further information on this site is found on pages 2-57 and 2-59 of Section 6.

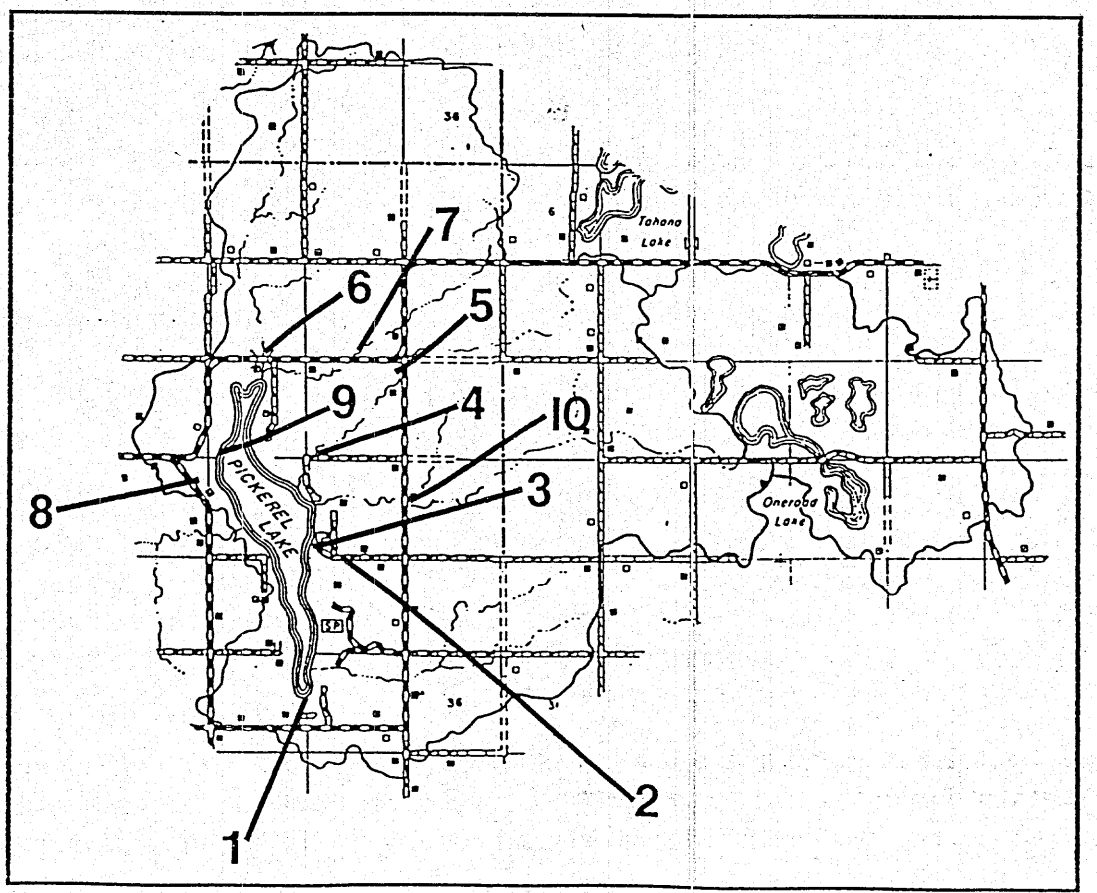
Station 5 is located above a dairy and beef operation where an animal waste management system was built in 1994. Station 4 is below the site. Suspended solids, nitrogen, and phosphorus were all higher below the site at station 4 when compared to station 5. The water quality at station 5 indicates however, that other sources of nutrients above the feedlot site are also degrading water quality. Further samples were taken at Station 5 as part of the feedlot monitoring program described in Section 6A. Further downstream samples were also taken, but at a site further upstream than Station 4.

Stations 6 and 10 were collected at points where major tributaries empty into the lake. Stations 7 and 8 were collected from smaller tributaries to the lake. Nutrient and sediment concentrations tended to be lower at these 4 sites than below identified problem areas but nutrient concentrations were high enough to be of concern.

Table 3-1 Concentrations of nutrient and sediment parameters observed in grab samples of runoff entering Pickerel Lake in 1993.

Station	Date	Time	Suspended Solids mg/l	Nitrite mg/l	Nitrate mg/l	TKN mg/l	Total Phosphorus mg/l
1	28-Mar-93	1340	12	0.008	0.209	0.383	1.67
2	28-Mar-93	1355	4	0.036	0.546	1.119	6.38
3	28-Mar-93	1303	7	0.029	0.771	1.289	4.89
4	28-Mar-93	1426	15	0.015	0.460	1.079	0.24
5	28-Mar-93	1620	3	0.012	0.413	0.752	0.16
6	29-Mar-93	1630	3	0.012	0.177	0.797	0.23
7	28-Mar-93	1635	2	0.014	0.383	1.220	0.22
8	28-Mar-93	1710	2	0.011	0.075	0.825	0.11
9	29-Mar-93	900	3	0.042	1.302	2.089	0.67
10	29-Mar-93	910	1	0.019	0.664	1.119	0.15

Figure 25 - 1993 Runoff Monitoring Sites



Section 2 - In-Lake Monitoring

Introduction

Water quality monitoring began in 1991 at Pickerel Lake as part of the Non-Point Source Task Force's lake protection strategy. A surface composite and a bottom composite was collected (formed from a surface sample and a bottom sample at three locations on the lake) in mid June, July and August each year from 1991 through 1995. Data collected over this five year period will be the subject of this report.

Trophic State

The word eutrophic comes from the Greek words eu (well) and trophe (nourishment) and literally means well nourished. Eutrophication is the over-nourishment or enrichment of lakes with nutrients. Trophic state is a way of describing how productive or enriched a lake is compared to other lakes. Lakes range from nutrient poor (oligotrophic), to moderately rich (mesotrophic), to highly enriched (eutrophic), to excessively enriched (hypereutrophic). As lakes age or become more eutrophic they tend to support more frequent algal blooms and weed growth which limits recreational use and enjoyment of the lake resource. While enriched lakes can support more fish production they can also become unstable. Hypereutrophic lakes for example lose oxygen at certain times of the year when excess algae and weeds die and decay causing fish kills. Frequently lakes become dominated by bullheads and other hardy species when oxygen concentrations fall below levels that support walleye and other game fish that require more oxygen. Several parameters are commonly used to describe trophic state. Several that indicate the current condition of Pickerel Lake are discussed below.

Dissolved Oxygen

Adequate dissolved oxygen is necessary to maintain aquatic organisms. Lake systems that exhibit adequate oxygen concentrations throughout the year are more likely to have a diverse population of aquatic organisms that is not dominated by one or two species. Low oxygen concentrations are detrimental to populations of many organisms and usually reduces diversity and stability in a lake ecosystem. Often large numbers of a few less desirable species will be found in these lakes.

Oxygen concentrations can affect other chemical parameters in lakes. For example, when anoxic conditions (oxygen levels near zero) form at the bottom of a lake, dissolved phosphorus, ammonia, and hydrogen sulfide and other undesirable substances are released from the lake sediments into the water column. These nutrients can contribute to algal growth when lakes turn over. Ammonia and hydrogen sulfide may also be toxic to aquatic organisms if they are present in sufficient concentrations.

Oxygen and temperature profiles for site 2 in 1991, 1992, 1993, 1994, and 1995 are presented in Figure 26, 27, 28, 29 and 30 respectively. Site 2 is located in the deepest portion of the lake. To maintain a permanent warm water fishery a standard of not less than 5.0 mg/l has been established. Oxygen concentrations below 5 mg/l were not observed in waters near the surface of Pickerel Lake during any of the sampling dates. Thermal stratification was observed on several dates The most pronounced

stratification was observed in August of 1991 and 1993 and July of 1995. Oxygen concentrations less than 5 mg/l were observed near the lake bottom on 10 of 15 sampling dates. Oxygen concentrations were near zero at the bottom in July and August of 1991, August of 1993, and July of 1994 and 1995.

Water Temperature

Water temperature measurements taken in the deepest area of a lake are used to determine if a lake is stratified. Temperature are recorded at several intervals from surface to bottom. Summer stratification is indicated by a rapid temperature decline in one segment of the water column. This region of rapid change in temperature with depth is called the thermocline. It separates a layer of a warm, less dense water above the thermocline from a colder, more dense layer of water below the thermocline. Temperature profiles for Site 2 are presented in Figures 26-30.

pH

The acidity of water is represented by pH. Each pH point represents a 10-fold increase or decrease in hydrogen ion concentration. The pH of lake water governs many chemical and biological processes. Biological activity can, in turn, affect pH. Carbon dioxide is used by algae during photosynthesis. Depletion of carbon dioxide causes an increase in pH. Large, actively growing blooms of algae can raise pH by one or two points.

Immersion recreation has the most restrictive criteria for pH (between 6.5 and 8.3 units). Observed pH in Pickerel Lake slightly exceeded the criteria on seven of the fifteen sampling dates. High pH on these dates is probably due to high algal productivity. The highest pH recorded for surface samples was observed on August 18, 1991. The greatest observed accumulated algal biomass as indicated by chlorophyll also occurred on August 18, 1991. An increase in biomass from July to August 1991 is consistent with high productivity.

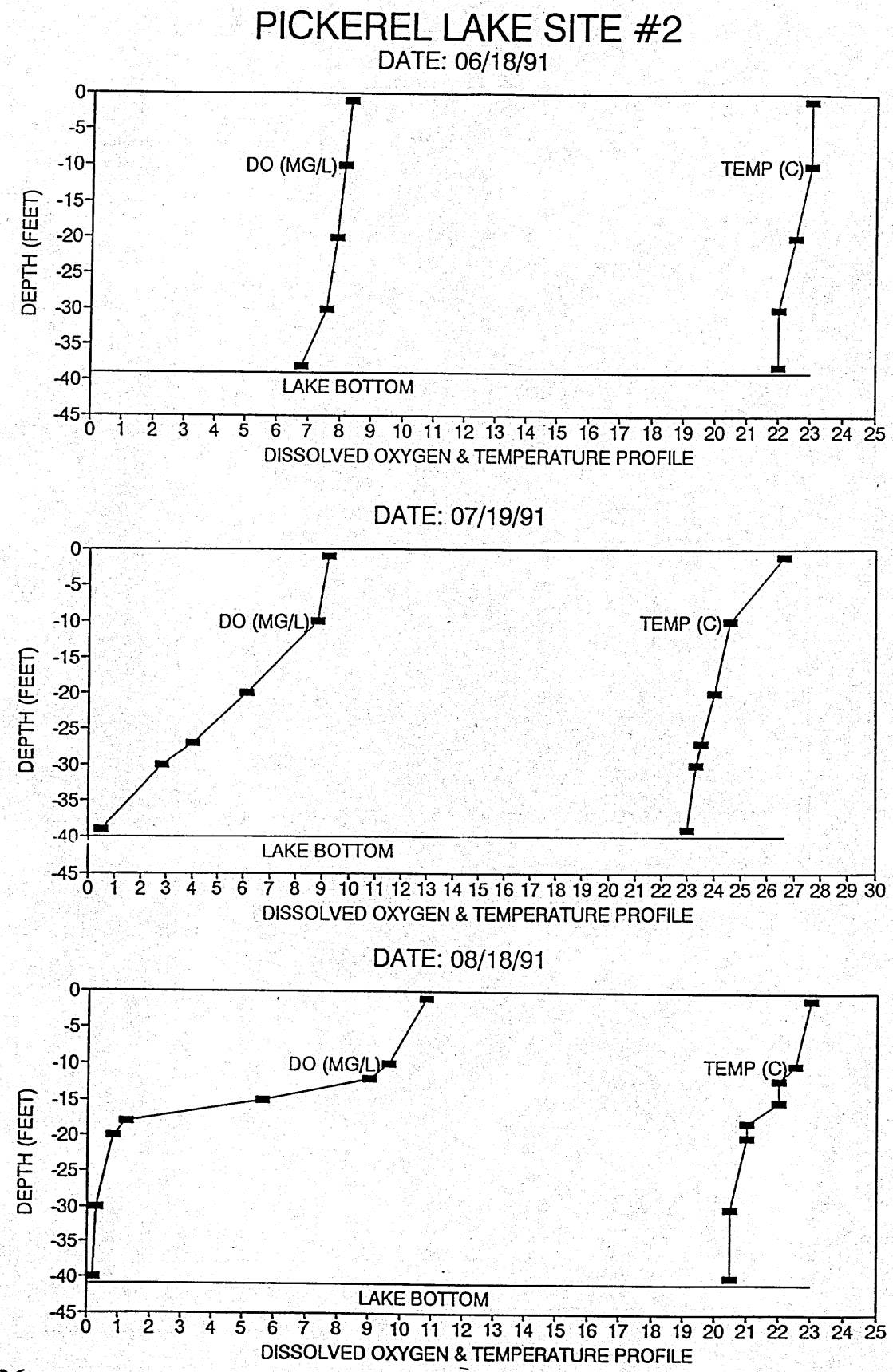


Figure 26. Dissolved oxygen and temperature profiles for site 2 at Pickerel Lake in 1991.

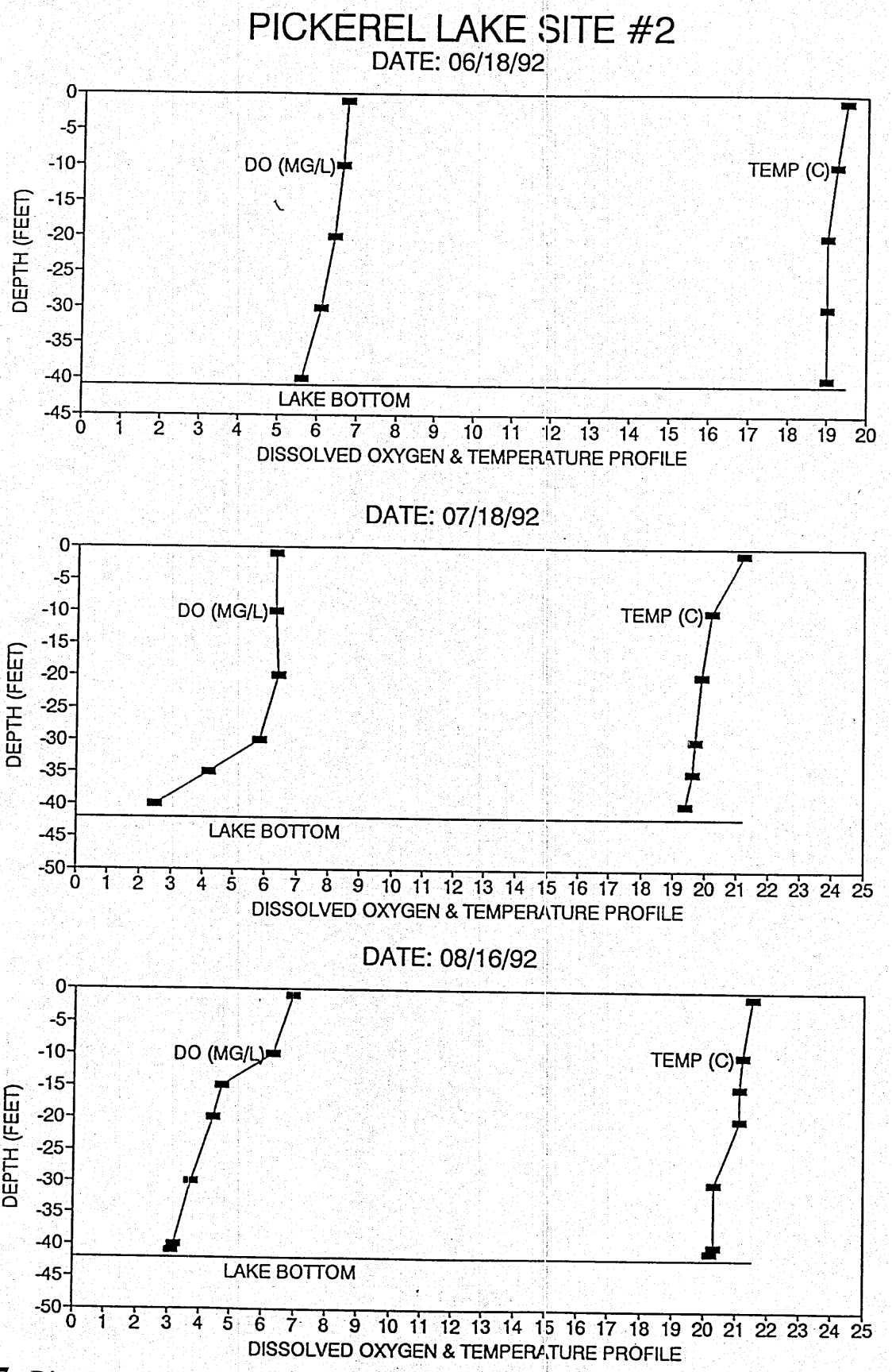


Figure 27. Dissolved oxygen and temperature profiles for site 2 at Pickerel Lake in 1992.

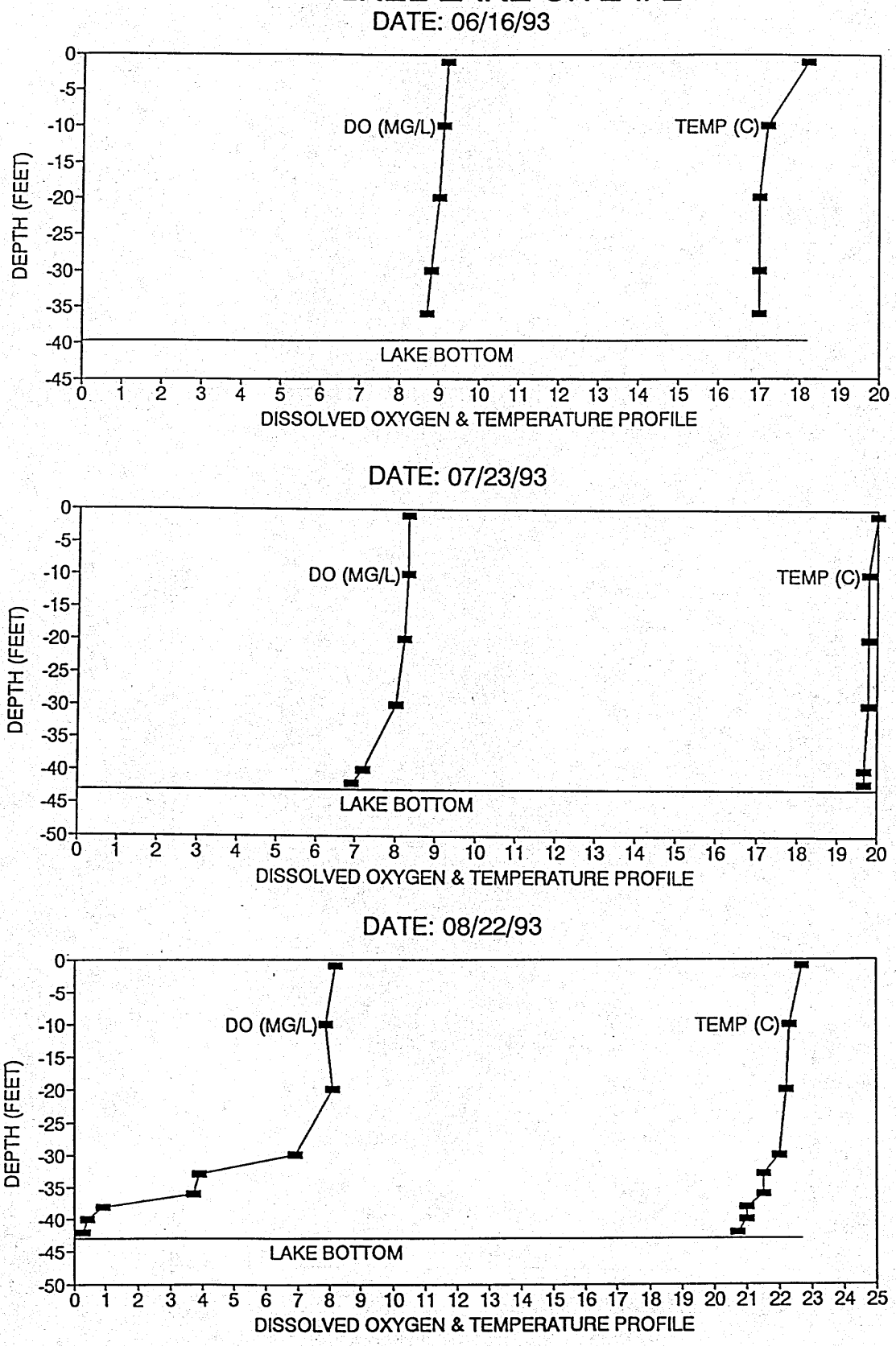


Figure 28. **Dissolved oxygen and temperature profiles for site 2 at Pickerel Lake in 1993.**

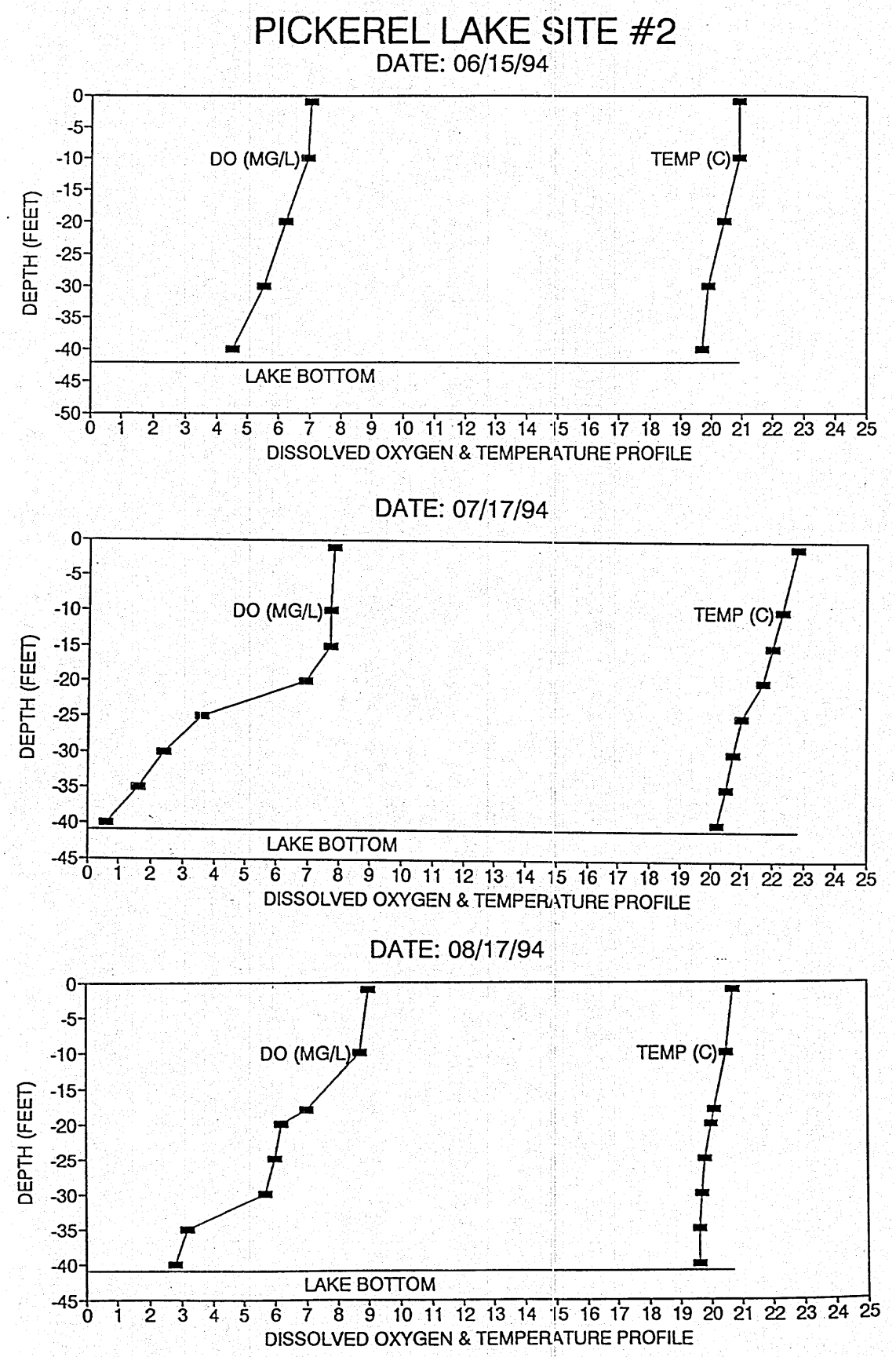


Figure 29. Dissolved oxygen and temperature profiles for site 2 at Pickerel Lake in 1994.

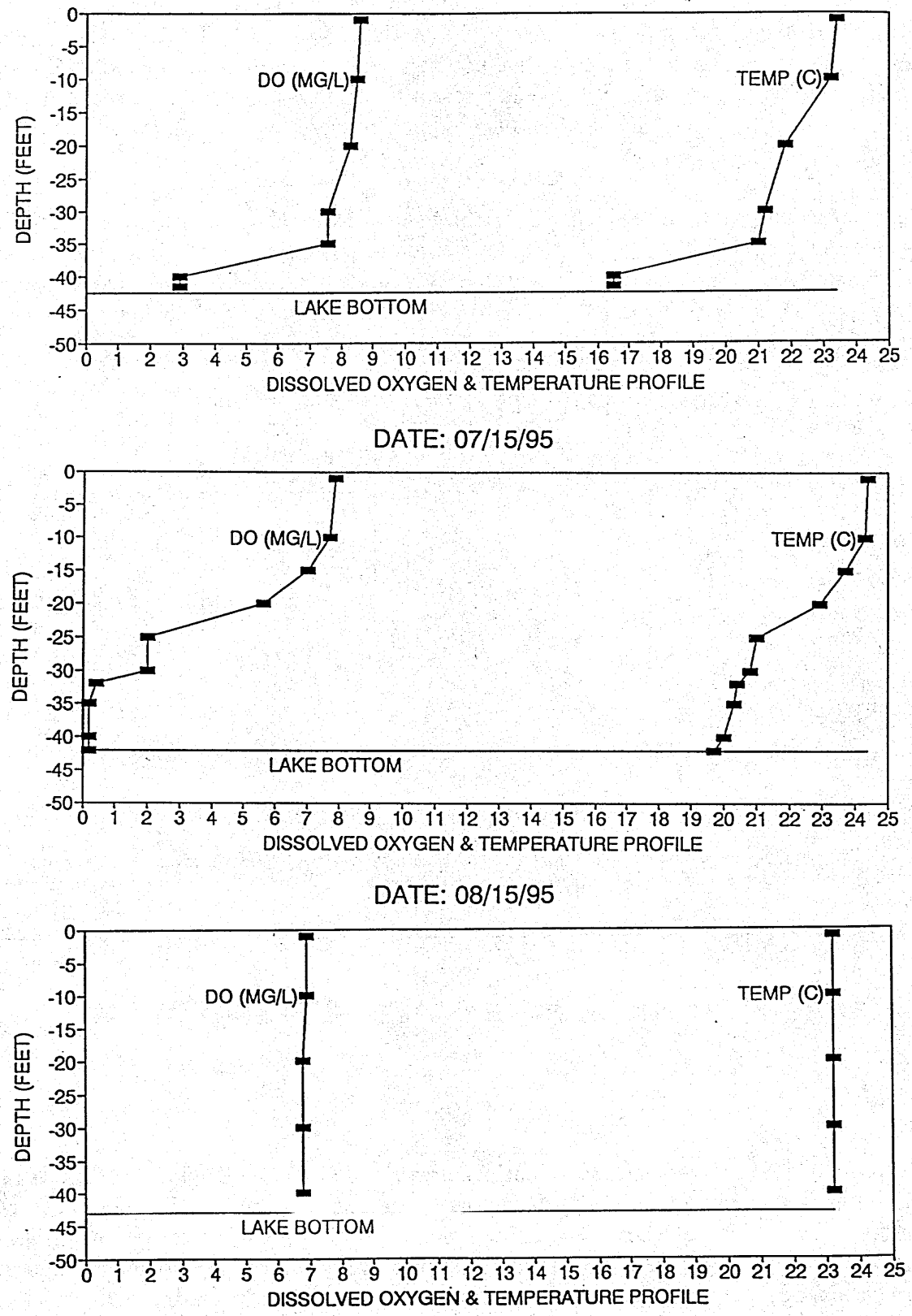


Figure 30. Dissolved oxygen and temperature profiles for site 2 at Pickerel Lake in 1995.

Transparency

The transparency of lake water is important to the aesthetic value of a lake. In most lakes, water transparency is determined by variations in algal populations. It is used as an indirect indicator of algal populations in lakes without significant suspended sediment. In reservoir systems, transparency may be a function of sediment load or turbidity. Most of the time transparency at Pickerel Lake is a function of algal populations.

Transparency of surface water in Pickerel Lake, as measured by secchi disk, are presented in Figure 31. The values plotted represent the mean of the three measurements taken at three different sites on the lake for each sampling date. Transparency was relatively stable over the five year period. The highest transparency was observed in June 1993. By August 1993 transparency had been reduced to more typical readings. Transparencies in this range are common in mesotrophic to eutrophic lakes.

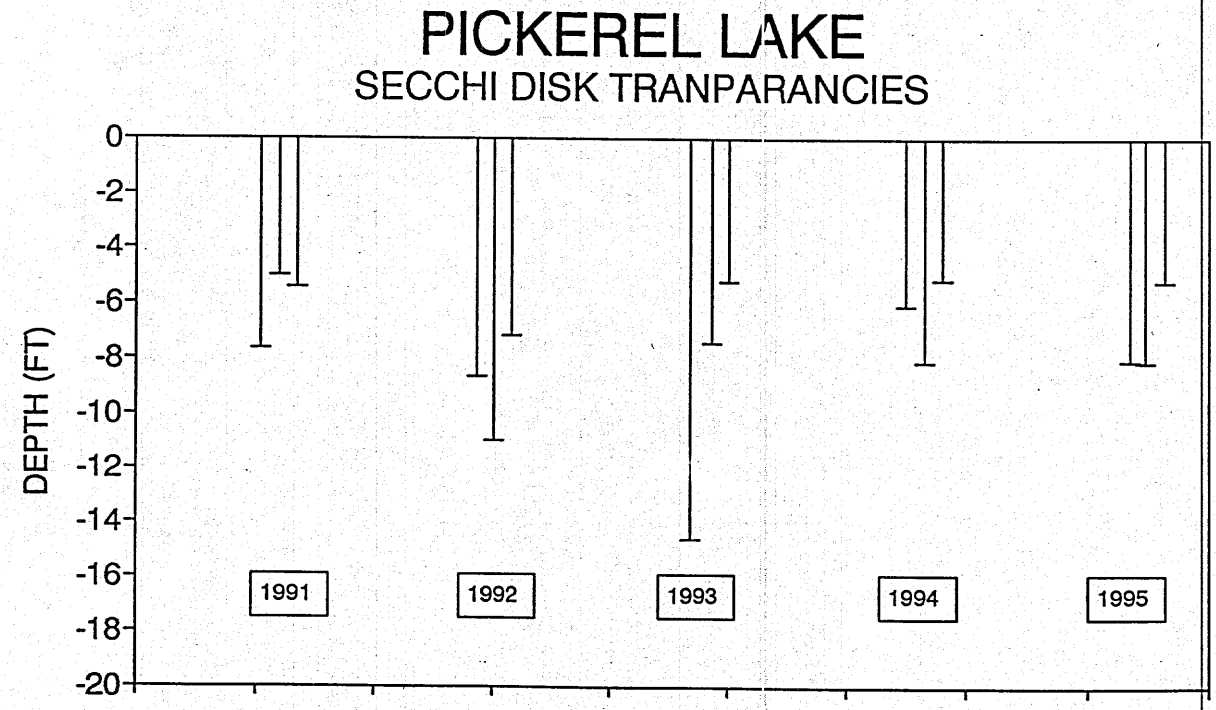


Figure 31. Secchi disc transparency for Pickerel lake in 1991 through 1995.

Nitrogen

Nitrogen is present in lakes in several forms, both inorganic and organic. The inorganic forms (ammonia, nitrite and nitrate) are important nutrients available for plant growth. If present in significant concentrations, they will cause excessive algae and weed growth. Organic nitrogen represents nitrogen incorporated into living (or once living) material. It is an indirect measure of how much algae (and other aquatic organisms) a lake may be able to support. Organic nitrogen can be used to define a lake's trophic state.

Organic Nitrogen

Organic nitrogen concentrations observed in Pickerel Lake surface samples are presented in Figure 32. Concentrations are typical of those found in mesotrophic to eutrophic lakes (Wetzel, 1983). Bottom samples exhibited higher concentration than surface samples except for July and August 1992. Concentrations tended to increase slightly from early to late summer in all years except 1994. Samples in 1991 exhibited the largest fluctuation in concentration from June to August. Pickerel Lake appeared to provide a relatively stable level of productivity as indicated by organic nitrogen during the five year study period.

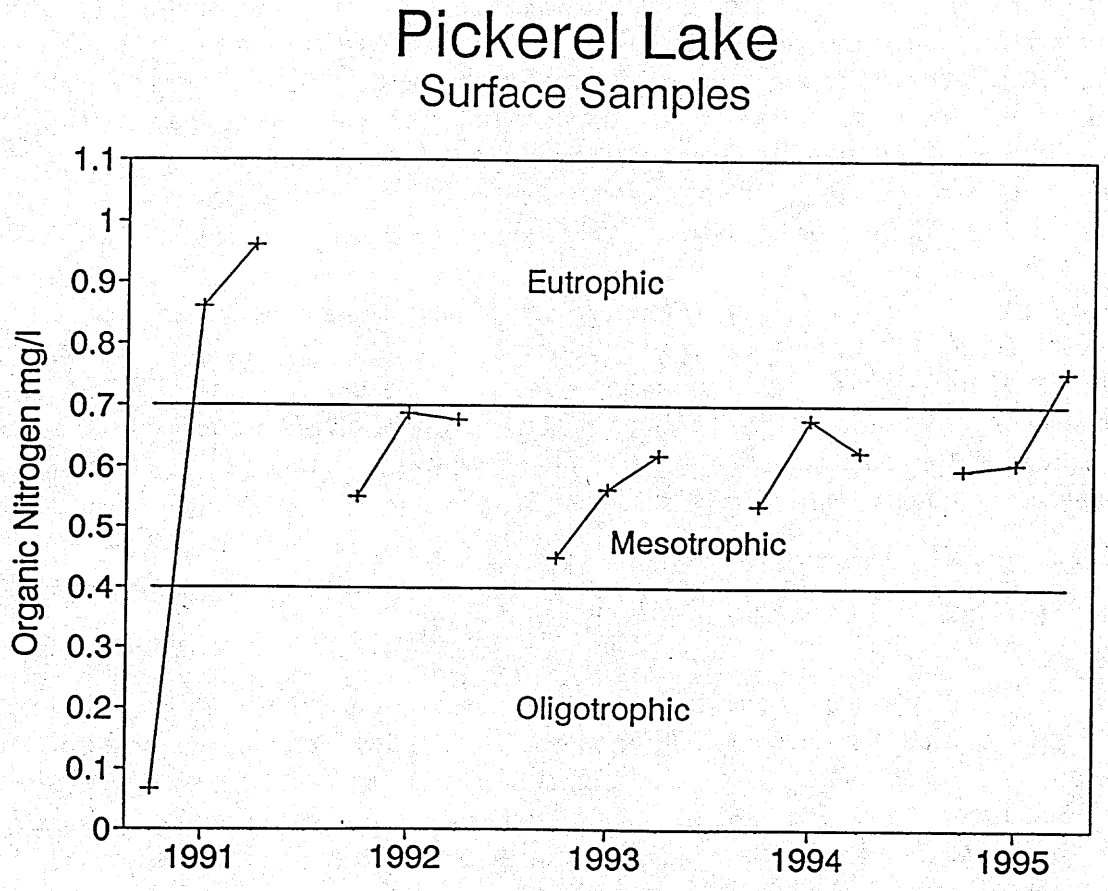


Figure 32. Organic nitrogen concentrations in Pickerel lake surface samples from 1991 to 1995.

Ammonia as Nitrogen

Ammonia is generated as an end product of bacterial decomposition. It is also a major exc
of aquatic animals, but this is a minor source compared to bacterial decomposition. Ammonia is directly available for plant growth and is the most easily used form of nitrogen. It can support the rapid development of algal blooms if other nutrients are present.

In the upper areas of lakes where light is available, ammonia is rapidly assimilated by algae and is usually low in lakes with low algal productivity. Ammonia concentrations in Pickerel lake surface samples were relatively low except for samples collected in June of 1992 and 1993 (Figure 33). Ammonia concentrations were usually higher in the bottom composite than in the surface composite. Ammonia is released from sediments under anoxic conditions and can accumulate in the deeper areas of the lake where algae cannot make use of it. This probably accounts for the higher concentrations of ammonia in bottom samples especially during extended periods of extreme oxygen stratification. The longest period of anoxia near the bottom occurred in July and August 1991 (Figure 26). This coincides with high concentrations of ammonia in bottom waters (Figure 33).

Ammonia concentrations in the surface composite were highest in the June sample and lowest in the August sample in four of the five years. This indicates that there is keen competition for nitrogen during the latter part of the summer at the surface and probably to the depth of light penetration. Ammonia accumulating in the deeper waters during the summer becomes available at the surface after colder weather and wind causes the lake to become fully mixed (turnover). This probably contributes to the Fall algal blooms that have been reported by local residents. A bloom of Microcystis was observed in October of 1993 after stratification had broken down and the lake was fully mixed.

The state standard for ammonia (.04 mg/l) is based on un-ionized ammonia, which is toxic to fish and other aquatic organisms. Un-ionized ammonia is calculated based on total ammonia concentrations, pH and temperature. This standard was not exceeded on any of the sampling dates. The highest observed surface ammonia occurred on 6/18/92 at .152 mg/l. This concentration did not exceed state standards at the temperature (19° C) and pH (8.28) observed that day. Warmer water or higher pH would have caused un-ionized ammonia to exceed the standard.

Nitrate plus Nitrite

Nitrate and Nitrite are also directly available for algal growth. Low concentrations were observed on most sampling dates in both surface and bottom waters (Figure 34). The highest concentrations were observed in July of 1992 at .045 mg/l. Concentrations of nitrate plus nitrite remained between .025 and .035 PPM during 1995. This pattern of higher concentrations throughout the summer was different than was observed in the other four years of study. There appears to be strong competition for nitrate and nitrite in Pickerel Lake most of the time.

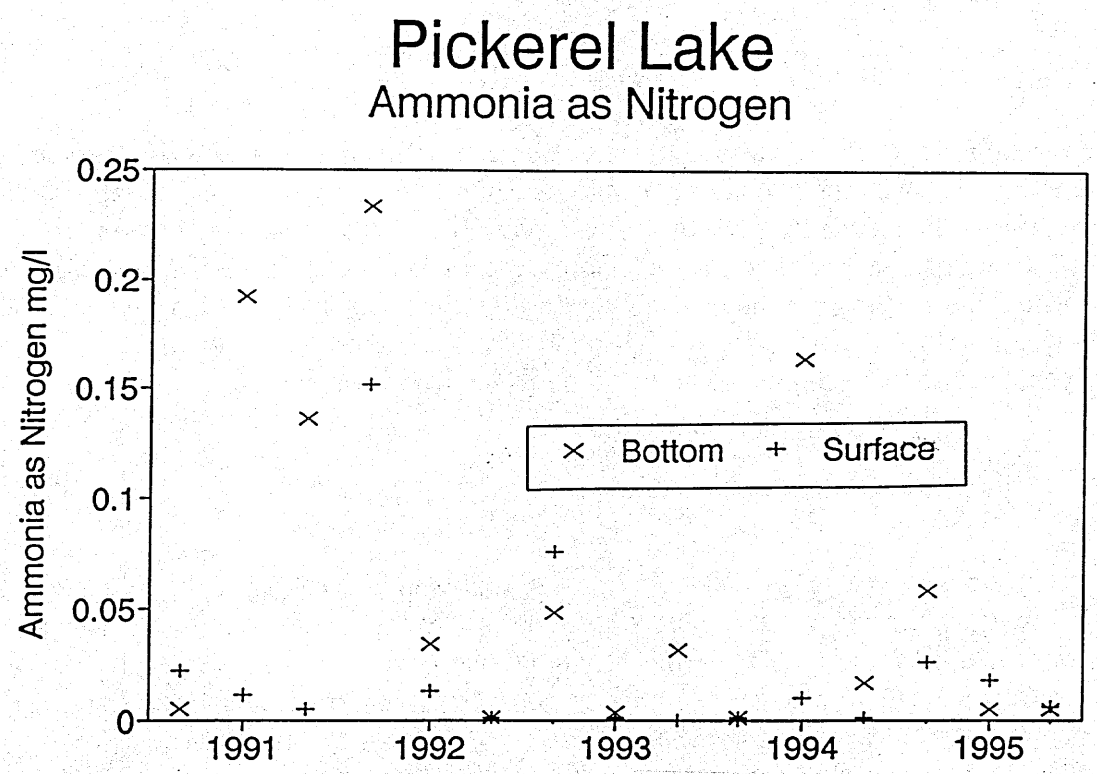


Figure 33. **Ammonia as nitrogen concentrations for Pickerel Lake surface and bottom samples from 1991 to 1995.**

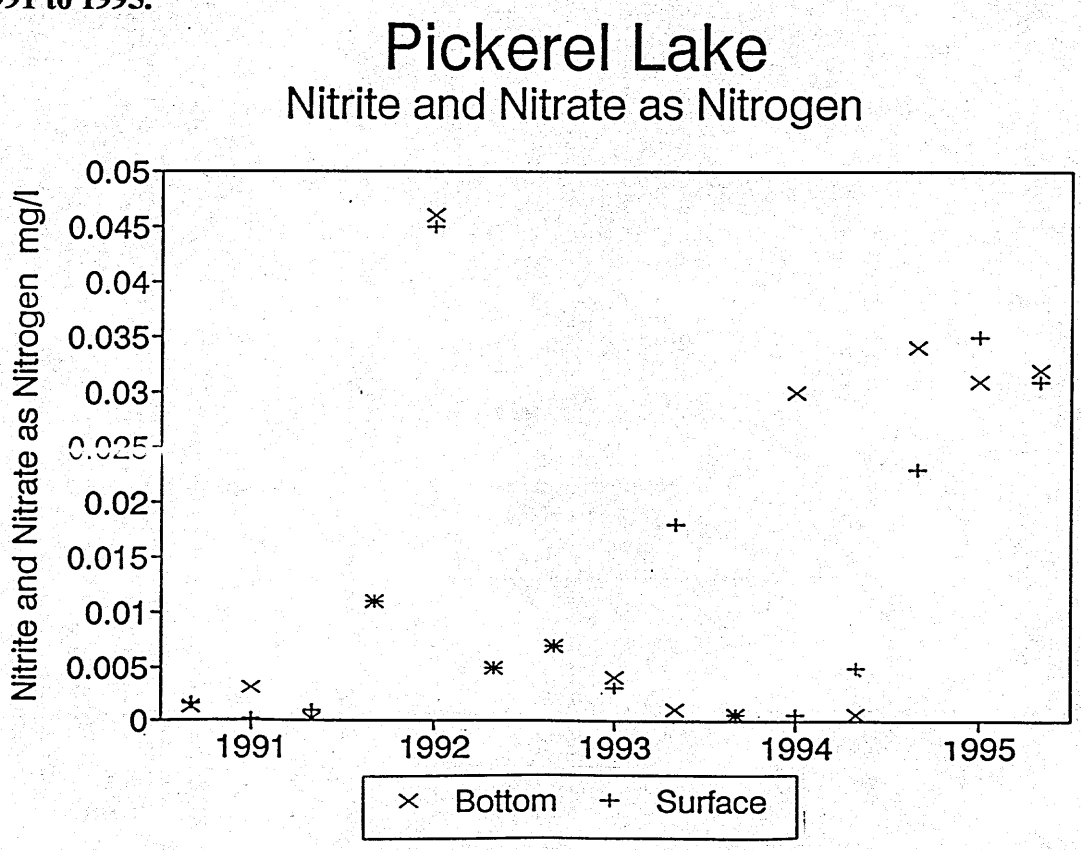


Figure 34. **Nitrate and Nitrite as nitrogen concentrations for Pickerel Lake surface and bottom samples from 1991 to 1995.**

Phosphorus

Phosphorus is required for the growth of all forms of algae, but relatively small quantities are needed. If other nutrients are available, one pound of phosphorus can produce 500 pounds of algae (Wetzel, 1983). It is often the nutrient that limits the growth of algal populations. Phosphorus is found in several forms in lakes. Total phosphorus and dissolved phosphorus are commonly measured in lake studies. Total dissolved phosphorus is the form immediately available for algal use. It is usually found in low concentrations during the summer in most lakes. Total phosphorus includes all forms, including phosphorus contained in living organisms, detritus, and attached to soil particles.

Total Phosphorus

Total phosphorus concentrations for Pickerel Lake surface samples 1991 through 1995 are presented in Figure 35. Using phosphorus as a trophic state index, a concentration of .03 to .1 mg/l would be classified as eutrophic (Wetzel, 1983). Concentrations observed in Pickerel Lake are typical of those found in mesotrophic to eutrophic lakes. This is consistent with trophic state indicated by organic nitrogen concentrations but more observations fell in the eutrophic range as indicated by total phosphorus (Figure 35). Total phosphorus concentrations tended to increase as summer progressed, except for a downturn in both August of 1991 and 1995. Samples in 1991 and 1992 exhibited the largest fluctuation in concentration between sampling dates.

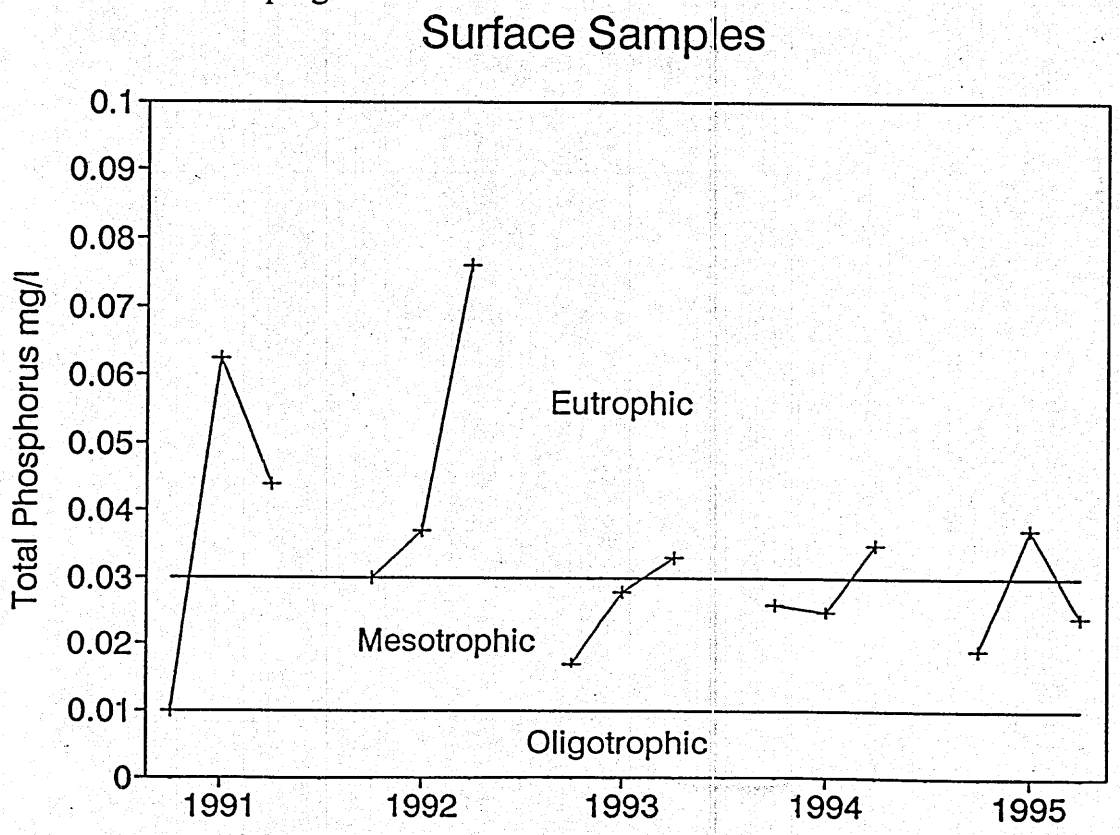


Figure 35. Total phosphorus concentrations in Pickerel Lake surface samples from 1991 through 1995.

Total Dissolved Phosphorus

Dissolved phosphorus concentrations can indicate the amount of phosphorus available for use by algae and other plants. Dissolved phosphorus is rapidly consumed by algae and seldom reaches high concentrations unless other factors are limiting algal growth. Phosphorus is released from sediments and becomes dissolved in the water under anoxic conditions. In can accumulate in the deeper waters of eutrophic stratified lakes where it is unavailable to the algae.

High concentrations of dissolved phosphorus in bottom waters were observed in July and August 1991 (Figure 36). The dissolved phosphorus accumulating in Pickerel Lake's bottom waters in the summer would become available at the surface after Fall turnover and would, along with the nitrogen available, encourage the fall algal blooms that are observed in the lake. In July and August 1991, and August 1993 when the most pronounced oxygen stratification was observed (Figure 26 and Figure 27), the largest differences between surface and bottom concentrations of phosphorus was also observed. Release of phosphorus from the sediments probably accounts for elevated concentrations in bottom composites.

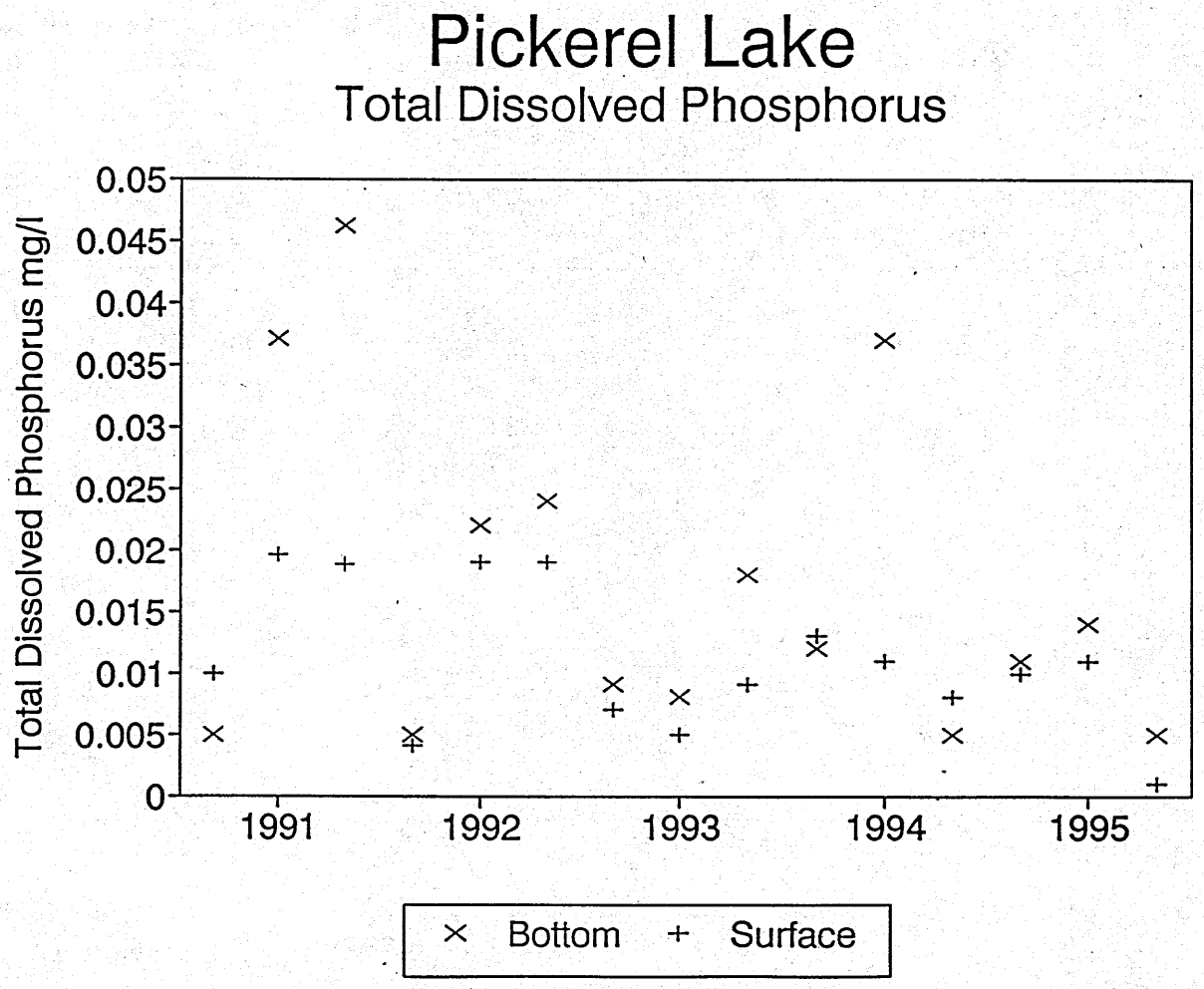


Figure 36. Total dissolved phosphorus concentrations in Pickerel Lake bottom and surface samples from 1991 through 1995.

Chlorophyll a

Chlorophyll a is the green pigment in plants (including algae) that allows them to capture sunlight and produce food with nutrients in the water. Other pigments are also used by different types of algae, but chlorophyll a is the most abundant. Measuring chlorophyll concentrations in a lake provides a means to assess algal abundance, since almost all chlorophyll that occurs in open water is due to phytoplankton growing within the lake. It does have limitations, however, since chlorophyll content of phytoplankton cells can vary seasonally (Nicholls and Dillon 1978). It is best used as an indicator rather than a direct measure of algal biomass.

Chlorophyll a concentrations observed in Pickerel Lake from 1991 to 1995 are presented in Figure 37. Concentrations of Chlorophyll a increased from June through August in all five years of study. Concentrations of Chlorophyll a observed in Pickerel Lake are typical of mesotrophic to eutrophic lakes (Wetzel 1983). This finding is consistent with total phosphorus and organic nitrogen values. Chlorophyll a concentrations observed over a five year study period are also stable within a range of approximately 2 to 14 mg/m3. This is a much smaller variation than was observed with other eastern South Dakota lakes (Figure 38). Of the eastern lakes, only Enemy Swim Lake had a lower median chlorophyll concentration, represented by the white horizontal line, and varied over a narrower range.

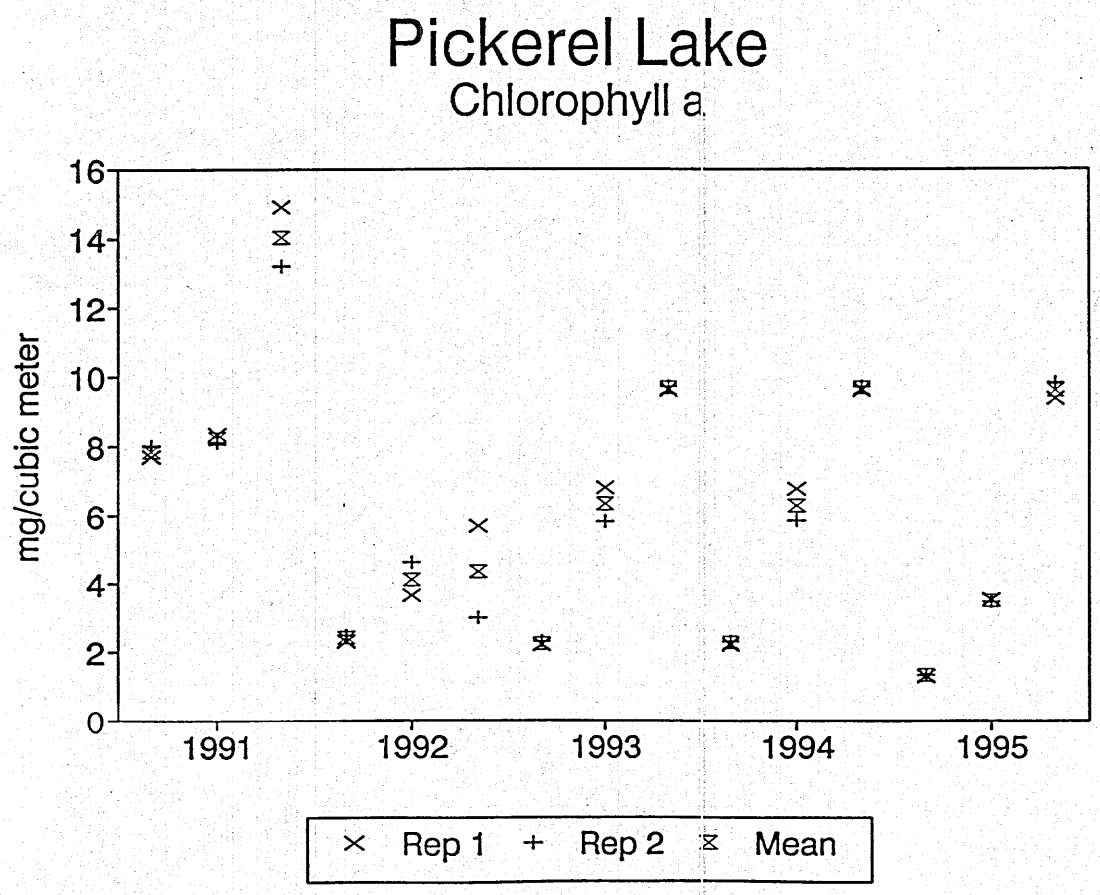


Figure 37. Chlorophyll a concentrations in Pickerel lake surface samples from 1991 through 1995.

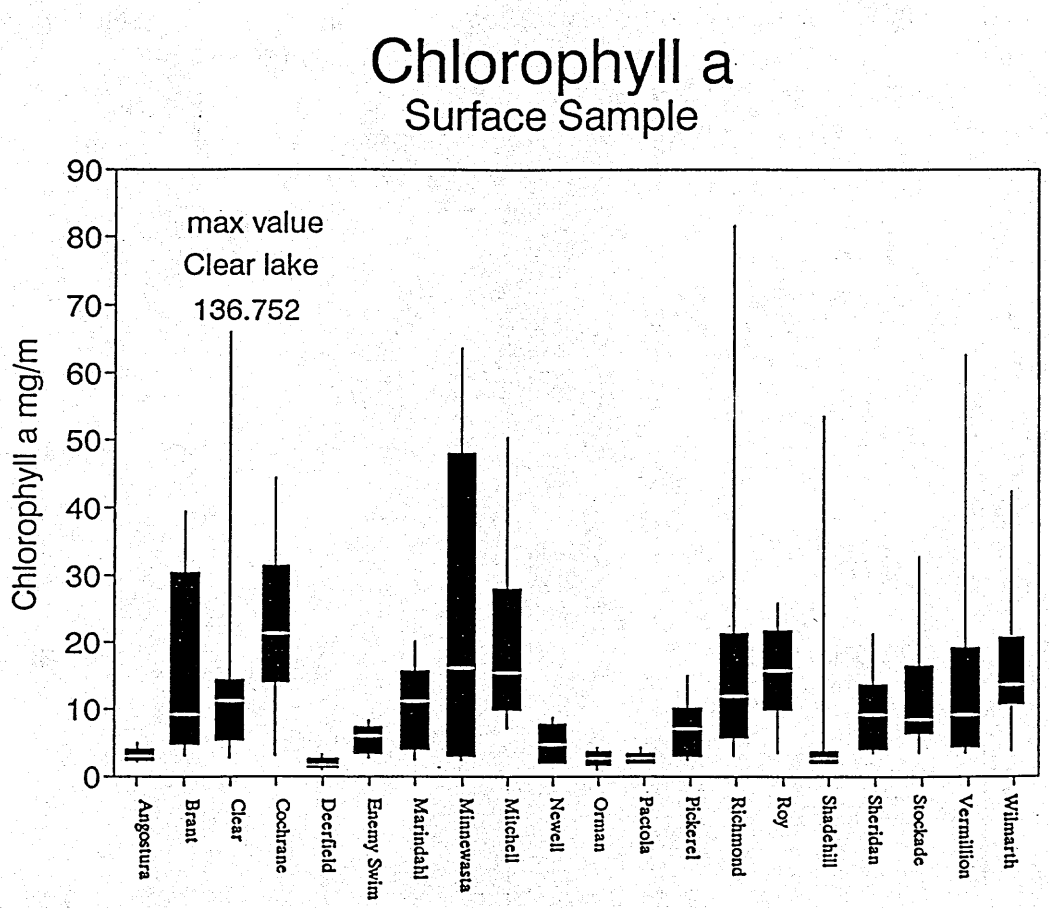


Figure 38. Box and whisker plots of Chlorophyll a concentrations observed in 20 deep lakes in South Dakota from 1991 through 1995. The white line represents median value, the ends of the black lines represent minimum and maximum extent of the data, and the ends of the black bar represent the 25th and 75th percentile for the data.

Suspended Solids

Low suspended solids concentrations are desirable in lakes for aesthetic reasons and for maintenance of a healthy fishery. Fish populations can be affected by high suspended solids in several ways. fish can be killed directly or their growth, resistance to disease and reproduction success may be reduced. Migrations can also be affected (EPA, 1976). High suspended solids concentrations result in reduced aesthetic value of a lake which can limit recreational use.

The state standard for maintaining a warm water permanent fishery is 90 mg/l. This standard was not exceeded on any of the sampling dates reported (Figure 39). Suspended solids concentrations were below 12 mg/l on all of the sampling dates. Concentrations were lower in 1992, 1993 and early 1995 than on other sampling dates (Figure 39).

In Pickerel Lake, suspended solids is primarily a reflection of the small plants and animals that live in the open water (plankton) rather than the suspended sediment that is often present in shallower lakes. Pickerel Lake's depth prevents the wind from stirring bottom sediment to any large degree. Recreational use of the lake and ability to support a healthy fishery are apparently not limited by high suspended solids in Pickerel Lake at this time.

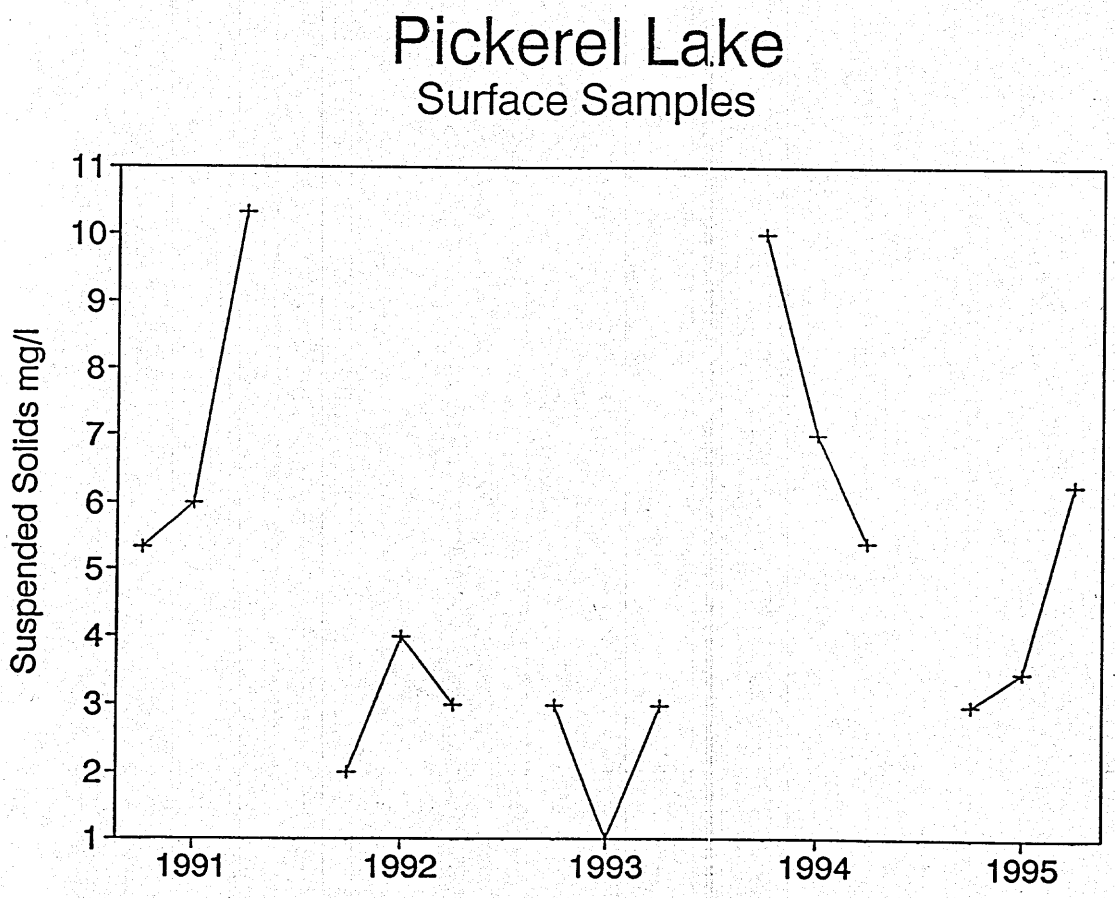


Figure 39. Suspended solids concentrations in Pickerel lake surface samples from 1991 through 1995.

Part IV

Project Disbursements

Project Disbursements

Introduction

Major funding for the Pickerel Lake Protection Project was provided by a 319 Clean Lakes Program Grant from the U.S. Environmental Protection Agency; two state grants - a Consolidated Water Facilities Construction Program grant, and a Coordinated Soil & Water Conservation Fund grant. The following pages will provide information on the projects budget, and detail how grant funds were utilized. Information on In-kind and Local Match will also be provided in this section. Please note - all project funds may not have been dispersed at the time of this report. A complete audit of the Pickerel Lake Protection Project will be published separate of this report detailing all project expenses.

Project Budget Review

Table 4-2, page 4-3 shows the original project budget with the amounts each grant contributed per budget item, plus expected local match and in-kind contributions. Further information on Federal & State Grants obtained for the Project and other funds utilized are found on pages 1-24 to 1-25 in Part I of this report. The following pages will denote how project funds were spent per budget item, and in-kind and local match generated for each activity. Table 4-10, shows the final project cost including local match and in-kind contributions.

Disbursements

Project Coordinator Wages & Benefits

Funding Source: **EPA 319 Clean Lakes Program Grant**
South Dakota Coordinated Soil & Water Conservation Grant

Budget Amount: $50,700.00
EPA 319 - $28,609.00
Conservation Grant - $22,091.00
Local Match or In-Kind - None

Dispersal's:

1993 - Wages: $11,736.38	Benefits: $ 897.91	Total: $12,634.29
1994 - Wages: $15,187.56	Benefits: $1,161.82	Total: $16,349.38
1995 - Wages: $15,098.59	Benefits: $1,164.77	Total: $16,263.36
1996 - Wages: $ 6,450.21	Benefits: $ 493.46	Total: $ 6,943.67
Total - Wages: $48,472.74	Benefits: $3,717.96	**Total: $52,190.70**

Project Coordinator Wages & Benefits cont.

Total dispersal's - $52,190.70
EPA 319 - $30,099.70
Conservation Grant - $22,091.00

Table 4-1 Disbursements - Project Coordinator Wages & Benefits

EPA 319		SD Coordinated		Project Total	
Budget	**Spent**	**Budget**	**Spent**	**Budget**	**Spent**
$28,609.00	$30,099.70*	$22,091.00	$22,091.00	$50,700.00	**$52,190.70**

*Cost overrun of $1,490.70 obtained from Shoreline Stabilization budget.

Table 4-2 Pickerel Lake Protection Project Budget

Budget Item	EPA 319	SD Coordinated Soil & Water	SD Consolidated Water Facilities	WQIP	NRCS	Water Resources Institute	Local*	TOTAL
Project Coordinator	$28,609.00	$22,091.00						$50,700.00
Information & Education	$4,944.00							$4,944.00
Shoreline Stabilization	$11,000.00						$30,120.00	$41,120.00
Mapping	$12,187.00					$8,138.00		$20,325.00
Best Mgt. Practices		$30,500.00		$30,150.00			$25,000.00	$85,650.00
Animal Waste Mgt. Systems	$35,000.00		$40,000.00	$31,500.00			$11,668.00	$118,168.00
Travel	$4,000.00						$809.00	$4,809.00
Technical Assistance		$25,000.00			$25,000.00			$50,000.00
Office Support Staff							$12,000.00	$12,000.00
Planning Committee							$1,800.00	$1,800.00
Total:	$95,740.00	$77,591.00	$40,000.00	$61,650.00	$25,000.00	$8,138.00	$81,397.00	**$389,516.00**

***Local Match & In-Kind Services**

Information & Education

Funding Source: **EPA 319 Clean Lakes Program Grant**

Budget Amount: $4,944.00
EPA 319 - $4,944.00
Local Match or In-Kind - None budgeted (See page 4-9)

Dispersal's of Information & Education dollars have been broken down into the following categories with short explanations of each category.

Local Meetings - $884.55

Costs incurred for the following; meeting space rental and meals for the Northeast Water Quality Conferences, booth rental at the Webster Farm & Home Shows, meeting space rental and refreshments for Lake Awareness Seminars, meal at the 1995 Watershed Tour & Picnic ($556.26); displays for local meetings ($141.06); and flyers and advertising for Lake Awareness Seminars ($187.23). Information on these meetings is found in Part II - Section 2 of this report.

Other Meetings, Workshops & Training Seminars - $143.00

Costs incurred; registration fees for the South Dakota Association of Conservation Districts 1993 Annual Meeting, 1994 EPA Region 6 - Clean Lakes Conference, South Dakota Water Congress - 1995 Fall Legislative Forum, 1995 Coordinated Resource Management Community Training, and 1995 Watershed Management Workshop. Specific dates and locations of these meetings are found on pages 2-4 to 2-5, Part 2 - Section 1 of this report.

Newsletters - $541.85

Expenses incurred for having a professional printer print the 1993, 1994 & 1995 project newsletters. The NRCS Office in Webster obtained a new copier in 1995 capable of producing professional quality copies. The 1996 newsletter was produced using this copier. The only expense for the 1996 newsletter was the purchase of copier paper, an expense included with Administrative Costs. Further information on project newsletters is found on page 2-11, Part II - Section 2 of this report.

Photographic Documentation - $305.65

Expenses include the cost of purchasing both print & slide film ($46.77), developing film ($238.90), slide storage pages ($5.09), and duplicating slides for presentations ($14.89). The majority of print & slide film was provided by the NRCS as an in-kind contribution to the project. Information on photographic documentation is given on page 2-11, Part II - Section 2 of this report.

Project Signs - $654.00

The project workplan called for signs to be constructed and placed at strategic areas around Pickerel Lake. Four - 4 ft. X 8 ft. plywood signs were constructed with a painting of Pickerel Lake and a list of participating local, state, and federal agencies. Two magnetic signs were purchased to attach to the Project Coordinators vehicle when conducting project business. Further information on project signs is found on page 2-13, Part II - Section 2 of this report.

Fact Sheets/Brochures - $277.73

Expenses incurred for having a professional printer print the following fact sheets; 500 copies - A Brief Geological History of Pickerel Lake, 500 copies - Pickerel Lake Water Levels 1928-1993, 400 copies - A Pictorial Guide To Pickerel Lake Fish, 400 copies - Pickerel Lake Fisheries, and 500 copies - Lake Protection Tips ($249.73). The four other fact sheets were printed on the NRCS Office copier, expenses for the purchase of copier paper for these are found under Administrative Costs. 150 copies of the brochure "A Field Guide to Aquatic Exotic Plants & Animals", and 50 copies each of the "Eurasian Water Milfoil Identification Card" and "Zebra Mussel Identification Card" were purchased from the Minnesota Dept. of Natural Resources ($28.00). Information on project fact sheets is found on pages 2-13 to 2-14, Part II - Section 2 of this report.

Quarterly Reports - $102.50

Expenses incurred for adding two color maps to the 1994 2nd/3rd Quarterly Report to show the types of GIS maps developed for the project.

Lake Property Owners Survey - $60.51

Expense incurred for having a professional printer print and fold 400 copies of the Lake Property Owners Survey. Further information on the lake property owners survey is found on pages 2-15, Part II - Section 2 of this report.

Dues/Subscriptions - $195.00

Expense for 1993, 1994 & 1995 North American Lake Management Society membership dues.

Address Database/Lake Atlas - $163.15

Expenses incurred for obtaining copies of the Pickerel Lake tax list to develop a lake property owner database, and obtaining drawings of platted lots to locate property. A lake atlas was developed and used for identifying owners of shoreline property in need of stabilization. A version of this lake atlas was provided to lake property owners for a minimum $6.00 donation to the project. These donations provided $729.00 in local match and were used for Information & Education activities.

CRP Mailing - $80.25

Expense incurred for copying a GIS color map of Pickerel Lake's watershed to include in a letter notifying landowners of the 13th Conservation Reserve Program sign-up. Pickerel's watershed was given priority during this sign-up. The map delineated watershed boundaries, and current land use to help landowners determine their eligibility for this sign-up.

Water Quality Monitoring - $359.50

Expenses incurred for grab samples taken at various tributary sites in Pickerel Lake 's watershed ($343.50), and two well water samples taken at animal waste management system sites ($16.00).

Expendable Goods - $159.97

These expenses include disposable material purchased for use in programs to the general public & local schools. Materials included aquarium filters, plant food, food coloring, 112 - water quality buttons, and 13 - T-shirts used as door prizes during the 1994 & 1995 Farm & Home Show in Webster, SD.

Final Report - $482.50

Expenses for copying 315 color GIS maps reprinted in this report, and paper for cover sheets. Remaining 319 Information & Education funds will be used to pay for binding this report, see page 4-9.

Capital Assets - $352.78

Expenses incurred for reference materials - books/brochures, slides, videos, posters, computer software, and equipment used for lake ecology presentations. A complete list of these items and their cost are found beginning on page 4-7.

Total Dispersal's - $4,762.94

Table 4-3
Materials & Equipment Purchased with 319 Grant Funds

Reference Material	Cost
(Books & Brochures)	
Compendium Of Educational Material On Water	$12.45
A Primer On Limnology	$3.00
Controlling Nonpoint Source Pollution, A Handbook	$9.50
Organizing Lake Users	$12.00
Field Manual For Water Quality Monitoring	$9.95
Living In Water	$10.00
Interlakes Lake Ecology: Workbook, Teachers Guide	$15.00
Carp In North America	$10.00
The Monitor's Handbook	$4.95
LakeSmart's Handbook	$18.95
Handle With Care: Your Guide To Preventing Water Pollution	$9.95
Clean Water In Your Watershed: A Citizens Guide	$23.95
Financing Mechanisms For BMPs	$2.50
Delineating Watersheds - A First Step Toward Effective Mgt.	$2.50
Rural Roads: Pollution Prevention & Control Measures	$2.50
Lake Conservation Handbook	$4.50
Landscape Design & Maintenance	$4.50
Protecting Water Quality In Urban Areas - BMPs for MN	$35.00
A Citizens Guide To Lake Protection	$6.55
Communicating Water Quality Risk Issues To The Public	$2.00
Agricultural Best Management Practices	$2.00
Understanding Your Shoreline	$0.50
Understanding Your Septic System	$0.50
CTIC - Wetland Fact Sheets (4)	$1.00
CTIC - Tillage Fact Sheets (6)	$1.50
Guides to Watershed Partnerships	
Getting To Know Your Local Watershed	$2.00
Building Local Partnerships	$2.00
Leading & Communicating	$2.00
Managing Conflict	$2.00
Crop Residue Mgt. to Reduce Erosion & Improve Soil Quality	$10.25
Understanding, Living With, And Controlling Shoreline Erosion	$2.62
(Videos)	
Exotic Aquatic Plants & Animals	$10.00
Clean Water, Clear Choices	$11.83

(Slides)	
EROS - Aerial Photo of Pickerel Lake	$9.00
Brook Stickleback	$2.00
Logperch	$2.00
Johnny Darter	$2.00
Fathead Minnow	$2.00
Orangespotted Sunfish	$2.00
(Posters)	
Nonpoint Source Posters	$7.50
Eurasian Watermilfoil Poster	$0.50
Zebra Mussel Poster	$0.50
Purple Loosestrife Poster	$0.50
(Computer Programs)	
Water Quality Digitized Clip Art Collection	$25.00
(Equipment)	
Equipment for Lake Game	$22.06
5 gallon Aquarium w/pump	$23.10
Dripial Pursuit/Puddle Pictures Game Cards	$6.67
TOTAL:	**$352.78**

Information & Education cont.

Local Match & In-Kind Contributions:

Lake property owner donations for lake atlas - **$746.50***

Project Coordinator - Computer hardware & software used to generate project newsletters, fact sheets, reports, and database storage - **$2,203.00***

SD Dept. of Game, Fish & Parks - Parks Division
Placement/mounting of four project signs - **$517.62**

Use of Pickerel Lake Lodge for public meeting - **$25.00***

Use of Pickerel Lake Lutheran Bible Camp for public meeting - **$20.00***

Total local match & in-kind contributions - $3,512.12

Federal Grant Match - $3,512.12
***State Grant Match - $2,994.50**

Table 4-4 Disbursements - Information & Education

EPA 319		Local		Total	
Budget	**Spent**	**Budget**	**Spent**	**Budget**	**Spent**
$4,944.00	$4,762.94*	$0.00	$3,512.12	$4,944.00	$8,274.51

* The remaining $181.06 will be used to pay for binding this report

---

Shoreline Stabilization

Funding Source: **EPA 319 Clean Lakes Program Grant**

Budget Amount: $41,120.00
EPA 319 - $11,000.00
Local Match or In-kind - $30,120.00

Dispersal's:

Shoreline Stabilization Demonstration Project - **$4,804.63**

See pages 2-34 to 2-35, Section 3 - Part II, for a complete breakdown of construction costs for this activity.

Total dispersal's - $4,804.63

Use of the remaining balance of shoreline stabilization funds is shown in Table 4-5.

Local Match & In-kind Contributions:

SD Dept. of Game, Fish & Parks - Wildlife Division
Construction of new spillway & outlet weir (See page 2-32, Section 3-Part II) - **$8,180.24**

SD Dept. of Game, Fish & Parks - Parks Division
Shoreline Erosion Control Project (See page 2-31, Section 3-Part II) - **$3,261.79**
Use of tractor & truck at demonstration site - **$600.00**
Wages & Benefits of park personnel at demonstration site - **$61.00**
Cabin/Campsite rental for AmeriCorp Volunteers - **$68.00**

AmeriCorp Volunteers
Labor for shoreline demonstration site - **$1,099.00***

Lakeshore Property Owners
Local match from 5 lakeshore property owners for stabilizing 413 feet of shoreline - **$14,073.05***

Total local match & in-kind contributions - $27,343.08

Federal Grant Match - $27,343.08
***State Grant Match - $15,172.05**

Table 4-5 Disbursements - Shoreline Stabilization

EPA 319		Local		Total	
Budget	**Spent**	**Budget**	**Spent**	**Budget**	**Spent**
$11,000.00	$4,804.63*	$30,120.00	$27,343.08	$41,120.00	**$32,147.71**

Remaining $6,195.37 used in the following budgets, and to pay for the final project audit.

Animal Waste Mgt. Systems	$1,932.50
Coordinator Wages & Benefits	$1,490.70
Travel	$451.18
Final Project Audit	$2,320.99
Total:	$6,195.37

Mapping

Funding Source: **EPA 319 Clean Lake Program Grant**

Budget Amount: $20,325.00
EPA 319 - $12,187.00
Local Match or In-Kind - $8,138.00

Dispersal's:

Water Resources Institute - **$12,186.10**
See Section 4 - Part II, for information on this project activity.

Local Match & In-Kind Contributions:

Water Resources Institute
Match for WRI personnel salaries & fringe benefits, travel expenses, supplies, and indirect costs - **$8,138.00**

Total local match & in-kind contributions - $8,138.00

Federal Grant Match - $8,138.00

Best Management Practices

Funding Source: **SD Coordinated Soil & Water Conservation Fund Grant**
Farm Services Agency - Water Quality Incentive Program (WQIP)

Budget Amount: $85,650.00
Conservation Grant - $30,500.00
WQIP - $30,150.00
Local Match or In-Kind - $25,000.00

Dispersal's:

SD Coordinated Soil & Water Conservation Fund Grant - Incentive payments to five land owner/operators for implementation of Best Management Practices.

1994: 1,093.2 acres @ $10,166.46
1995: 1,093.2 acres @ $10,166.46
1996: 1,093.2 acres @ $10,166.46 (1996 payments not made at time of report)

Total: $30,499.38

Water Quality Incentive Program - Incentive payments to five land owner/operators for implementation of Best Management Practices.

1994: 439.5 acres @ $7,298.00
1995: 457.1 acres @ $7,597.00
1996: 457.1 acres @ $7,597.00
1997: 17.6 acres @ $ 299.00

Total: $22,791.00

Local Match & In-kind Contributions:

Rental of No-Till Drills - **$965.63**

Landowner/operator cost-share for implementing BMP's with Coordinated Soil & Water Conservation Fund incentive payments. - **$25,252.92**

Landowner cost for preparation and seeding of 83.6 acres of cropland to alfalfa - **$2,008.60**

Total local match & in-kind contributions - $28,227.15
Federal Grant Match - $28,227.15
State Grant Match - $28,227.15

Table 4-6 Disbursements - Best Management Practices

SD Coordinated		WQIP		Local	
Budget	**Spent**	**Budget**	**Spent**	**Budget**	**Spent**
$30,500.00	$30,499.38	$30,150.00	$22,791.00	$25,000.00	$28,227.15

Total	
Budget	**Spent**
$85,000.00	**$81,517.53**

Table 4-7 Disbursements - Animal Waste Management

EPA 319		SD Consolidated		WQIP	
Budget	**Spent**	**Budget**	**Spent**	**Budget**	**Spent**
$35,000.00	$36,932.50	$40,000.00	$40,000.00	$31,500.00	$24,405.00

Local		Total	
Budget	**Spent**	**Budget**	**Spent**
$11,668.00	$43,640.26	$118,168.00	**$144,977.76**

Animal Waste Management Systems/Waste Utilization

Funding Source: **EPA 319 Clean Lakes Program Grant**
SD Consolidated Water Facilities Construction Program
Farm Services Agency - Water Quality Incentive Program (WQIP)

Budget Amount: $118,168.00
Construction Funds
EPA 319 - $35,000.00
Consolidated - $40,000.00
Local Match or In-Kind - $11,668.00 (Operators cost-share for EPA 319 Funds)
Incentive Payments
WQIP - $31,500.00

Dispersal's:

Gruby Animal Waste Management System

Construction Costs:	EPA 319 Funds:	**$19,904.55**
	Consolidated Funds:	**$22,754.89**
	Operators Cost Share:	**$21,437.24**
	Total:	**$64,096.68**

WQIP Waste Management Incentive Payments - **$4,380.00**
(A payment of $1,460.00 was made each year from 1994 - 1996)

WQIP Waste Utilization Incentive Payments - **$6,120**
(A payment of $2,040.00 was made each year from 1994 - 1996)

Kulesa Animal Waste Management System

Construction Costs:	EPA 319 Funds:	**$9,132.31**
	Consolidated Funds:	**$10,432.79**
	Operators Cost-share:	**$12,121.75**
	Total:	**$31,686.85**

WQIP Waste Management Incentive Payments - **$3,000.00**
(A payment of $1,000.00 was made each year from 1994 - 1996)

WQIP Waste Utilization Incentive Payments - **$3,000.00**
(A payment of $1,000.00 was made each year from 1994 - 1996)

Kulesa cont.
Operator installed new drinker and pipeline, and fencing for new calving yard prior to construction of system which reduced by change order, a portion of the original bid for this system by $1,650.00. Operators expenses of **$3,122.48** counted as local match towards the construction of this system.

Gronke Animal Waste Management System

Construction Costs:		
	EPA 319 Funds:	**$7,895.64**
	Consolidated Funds:	**$6,812.32**
	Operators Cost-share:	**$6,958.79**
	Total:	**$21,666.75***

*Additional work will be needed to correct problems with this system, increasing the final cost.

WQIP Waste Management Incentive Payments - **$2,640.00**
(A payment of $880.00 was made in 1995 & 1996 with one final payment in 1997 due to delay in constructing the system.)

WQIP Waste Utilization Incentive Payments - **$5,265.00**
(A payment of $1,755.00 was made in 1995 & 1996 with one final payment due to delay in constructing the system being made in 1997)

Total Construction Funds Dispersed:
EPA 319 Clean Lakes Program Funds - **$36,932.50**
South Dakota Consolidated Water Facilities Construction Funds - **$40,000.00**

Total WQIP Incentive Payments - $24,405.00
Waste Management - $10,020.00
Waste Utilization - $14,385.00

Local Match & In-kind Contributions:

David Gruby
Cost-share for construction of AWMS - **$21,437.24**

Terry Kulesa
Cost-share for preconstruction feedlot improvements and construction of AWMS - **$15,244.23**

Jacob Gronke, Jr.
Cost-share for construction of AWMS - **$6,958.79**

Total local match & in-kind contributions - $43,640.26
Federal Grant Match - $43,640.26
State Grant Match - $43,640.26

Travel

Funding Source: **EPA 319 Clean Lakes Program Grant**

Budget Amount: $4,809.00
EPA 319 - $4,000.00
Local Match - $809.00

Dispersal's:

Mileage - $4,023.20 (16,763.30 miles @ .24 cents per mile)
Lodging - $308.55
Meals - $119.43

Total dispersal's - $4,451.18

Local Match & In-kind Contributions:

Mileage (Mileage incurred by Planning Committee) - **$ 447.37**

Total Local Match & In-Kind Contributions - $ 447.37

Federal Grant Match - $ 447.37
State Grant Match - $ 447.37

Table 4-8 Disbursements - Travel

EPA 319		Local		Total	
Budget	**Spent**	**Budget**	**Spent**	**Budget**	**Spent**
$4,000.00	$4,451.18*	$809.00	$447.37	$4,809.00	$4,898.55

* Cost overrun of $451.18 obtained from Shoreline Stabilization Budget.

Technical Assistance

Funding Source: **SD Coordinated Soil & Water Conservation Fund Grant**
Natural Resources Conservation Service

Budget Amount: $50,000.00
Conservation Grant - $25,000.00
Natural Resources Conservation Service - $25,000.00
Local Match or In-Kind - None budgeted

Dispersal's

SD Coordinated Soil & Water Conservation Fund - **$22,250.00***

Funds payed to NRCS for technical assistance, and planning & design of ag waste systems and best management practices. Final payment of $2,750.00 to NRCS maybe withheld to complete construction of the Gronke Animal Waste Management System.

Information on time worked by NRCS personnel not available.

Office Support Staff

Funding Source: **Local Match or In-Kind Contributions**

Budget Amount: $12,000.00
Local or In-Kind Contributions - $12,000.00

Local Match & In-Kind Contributions:

Day Conservation District In-Kind contribution for time spent on project by District Business Manager - $3,044.18 (through 10 April 1996)

Day County Commission cash contribution - **$5,000.00***

Day Conservation District Cash Contribution - **$1,000.00***

Total Local Match & In-Kind Contributions: $9,044.18

Federal Grant Match - $9,044.18
State Grant Match - $9,044.18

Office Support Staff cont.

Administrative Cost Dispersal's
Postage - $1,692.60
Office Supplies - $1,016.46
Telephone - $2,109.74
Advertisements - $290.55
Audits/Bank Charges - $140.52
Total Dispersal's - $5,249.87*

Administrative costs covered by the $6,000.00 cash contributions from the Day Conservation District and Day County Commission.

Planning Committee

Funding Source: **Local Match or In-Kind Contributions**

Budget Amount: $1,800.00
Local or In-Kind Contributions - $1,800.00

Local Match or In-Kind Contributions:

Day Conservation District Board of Supervisors - $3,675.00

District Conservationist - $795.00

Total Local Match or In-Kind Contributions - $4,470.00

Local Match

Federal and State grants require that local government agencies, special interest groups, and the public - share a percentage of the total cost of the project being funded. In the case of the Pickerel Lake Protection Project, 24% of the projected total project cost ($338,866.00) was required to be local match. The Contract written between the SD Dept. of Environment & Natural Resources and the Day Conservation District required that $79,915.00 in local matching funds and in-kind services be raised for the federal EPA 319 grant. The Contract/Letter of Agreement written between the SD State Conservation Commission and the Day Conservation District called for local match of at least $81,397.00 be provided for the SD Coordinated Soil & Water Conservation Grant. Local match and in-kind services contributed by other State Agencies could not be counted as match towards the SD Coordinated Soil & Water Conservation Grant, however these funds and contributions could be counted as match towards the EPA 319 grant. Table 4-9, provides data on all local match & in-kind contributions generated during the three years of the Protection Project. Documentation of local match & in-kind contributions is on file at the offices of the Day Conservation District.

Table 4-9 Local Match & In-Kind Contributions

Contributor & Year	Total Amount	Towards State	Towards Federal
1992			
South Dakota Game, Fish & Parks			
Shoreline erosion control	$3,261.79		$3,261.79
Pickerel Lake Lodge (meeting space)	$25.00	$25.00	$25.00
1993			
South Dakota Game, Fish & Parks:			
Cleanup of outlet channel	$430.24		$430.24
Reconstruction of outlet weir/channel	$7,750.00		$7,750.00
Mounting of Project Signs	$517.62		$517.62
Water Resources Institute - Watershed Mapping	$6,123.98		$6,123.98
D. Skadsen - Use of computer/software	$2,203.00	$2,203.00	$2,203.00
T. Kulesa - Feedlot Improvements	$3,122.48	$3,122.48	$3,122.48
P. Riley - 63 feet: Shoreline Erosion Control	$4,350.00	$4,350.00	$4,350.00
Day Conservation District			
Office Support Staff/Planning Committee -			
1 April 1992 through 25 June 1993	$2,169.72	$2,169.72	$2,169.72
1994			
Day Conservation District			
Office Support Staff/Planning Committee -			
9 July 1993 through 23 February 1994	$1,282.69	$1,282.69	$1,282.69
3 March 1994 through 30 August 1994	$1,123.39	$1,123.39	$1,123.39
Cash contribution for administration of project	$1,000.00	$1,000.00	$1,000.00
S. Julius - Planting of 83.6 acres of grasses/legumes	$2,008.60	$2,008.60	$2,008.60
R. Kulesa - Rental of no-till drill	$502.13	$502.13	$502.13
T. Kulesa - Cost-share for Animal Waste Mgt. System	$12,121.75	$12,121.75	$12,121.75
D. Gruby - Cost-share for Animal Waste Mgt. System	$21,437.24	$21,437.24	$21,437.24
J. Schroeder - Shoreline erosion control	$6,346.85	$6,346.85	$6,346.85
K. Griffin - 50 feet shoreline erosion control	$1,305.00	$1,305.00	$1,305.00
G. Handegard - 100 feet shoreline erosion control	$1,711.20	$1,711.20	$1,711.20

Contributor & Year	Total Amount	Towards State	Towards Federal
1994 cont.			
R. Nelson - 50 feet shoreline erosion control	$360.00	$360.00	$360.00
Cost-share of 5 operators for implementing BMP's	$16,835.28	$16,835.28	$16,835.28
1995			
Day Conservation District			
Office Support Staff/Planning Committee -			
2 September 1994 through 24 February 1995	$795.53	$795.53	$795.53
1 March 1995 through 27 October 1995	$968.65	$968.65	$968.65
South Dakota Dept. Game, Fish & Parks			
Equipment use for Shoreline Demonstration Site	$600.00		$600.00
Wages & Benefits for GF&P personnel helping w/above	$61.00		$61.00
Cabin/Campsite Rental for AmeriCorp volunteers	$68.00		$68.00
AmeriCorp volunteer labor Shoreline Demonstration Project	$1,099.00	$1,099.00	$1,099.00
Day County Commission - Cash contribution for project	$5,000.00	$5,000.00	$5,000.00
R. Kulesa - Rental for no-till drill	$463.50	$463.50	$463.50
Pickerel Lake Lutheran Bible Camp - meeting space	$20.00	$20.00	$20.00
Lake property owners cash contributions to project	$721.50	$721.50	$721.50
Lake property owners cash contribution to project	$25.00	$25.00	$25.00
1996			
Day Conservation District			
Office Support Staff/Planning Committee -			
7 November 1995 through 10 April 1996	$826.67	$826.67	$826.67
District Conservationist - 9 March 1992 through 8 April 199	$795.00	$795.00	$795.00
J. Gronke, Jr. - Cost-share for Animal Waste Mgt. System	$6,958.79	$6,958.79	$6,958.79
Cost-share of 5 Operators for implementing BMP's	$8,417.64	$8,417.64	$8,417.64
Total:	$122,808.24	**$103,995.61**	**$122,808.24**

Table 4-10 Total Project Cost

Budget Item	EPA 319	SD Coordinated	SD Consolidated	WQIP	NRCS	Local Match	Total
Project Coordinator	$30,099.70	$22,091.00					$52,190.70
Information & Education	$4,762.94					$3,512.12	$8,275.06
Shoreline Stabilization	$4,804.63					$27,343.08	$32,147.71
Mapping	$12,186.10					$8,138.00	$20,324.10
Best Mgt. Practices		$30,499.38		$22,791.00		$28,227.15	$81,517.53
Animal Waste Mgt.	$36,932.50		$40,000.00	$24,405.00		$43,640.26	$144,977.76
Travel	$4,451.18					$447.37	$4,898.55
Technical Assistance		$25,000.00			$22,250.00		$47,250.00
Office Support Staff						$9,044.18	$9,044.18
Planning Committee						$4,470.00	$4,470.00
Total:	$93,237.05	$77,590.38	$40,000.00	$47,196.00	$22,250.00	$124,822.16	**$405,095.59**

Appendix A - References

References

Anonymous. 1985. Pickerel lake Water Quality Study Area Report. SD Department of Environment & Natural Resources.

Environmental Protection Agency, 1976. Quality Criteria for Water.

Hanson, Douglas R. 1973. Watershed Inventory of Waubay Lakes Basin (Pickerel Lake) South Dakota, 1971-72. SD Dept. Game, Fish & Parks.

Hanson, Douglas R. 1976. Eutrophication of South Dakota Lakes - Generalized Model of Nutrient and Sediment Sources to Pickerel Lake. SD Department of Game, Fish & Parks.

Hayden, J. and J. Siegel. 1977. A Plan for the Classification, Preservation, and Restoration of Lakes in Northeastern South Dakota. SD State Lakes Preservation Committee.

Hayworth, Elizabeth Y. 1972. Diatom Succession in a Core from Pickerel Lake, Northeastern South Dakota. Geological Society of America Bulletin. 83:157-172.

Helms & Associates. 1995. Draft Report - Pickerel Lake Sanitary District, Blighted Area Designation. Helms & Associates Consulting Engineers, Aberdeen.

Leap, Darrel I. 1988. Geology and Hydrology of Day County, South Dakota. Bulletin 24. SD Department of Environment & Natural Resources, Division of Geological Survey.

Nicholls, K.H., and P.J. Dillon 1978. An Evaluation of Phosphorus-Chlorophyll-Phytoplankton Relationships for Lakes. Int. Rev. Hydrobiol. 63(2):141-54.

Rothrock, E.P. 1935. Geology and Water Resources of Day County, South Dakota. Report No. 25. SD State Geological Survey.

Steffen, Jerry E. 1982. Ordinary High Water Mark Investigation for Pickerel Lake. SD Department of Environment & Natural Resources.

Stewart, W.C. and E. Stueven. 1994. 1993 South Dakota Lakes Assessment Final Report. SD Department of Environment & Natural Resources.

Vollenweider, R.A. 1968. The Scientific Basis of Lake and Stream Eutrophication, with Particular Reference to Phosphorus and Nitrogen as Eutrophication Factors. OECD Tech. Report, Paris.

Watts, W.A. & R.C. Bright. 1968. Pollen, Seed, and Mollusk Analysis of a Sediment Core from Pickerel Lake, Northeastern South Dakota. Geological Society of American Bulletin 79: 855-876.

Wetzel, R. G. 1983. Limnology 2nd. Ed. Saunders College Publishing. 753 pp.

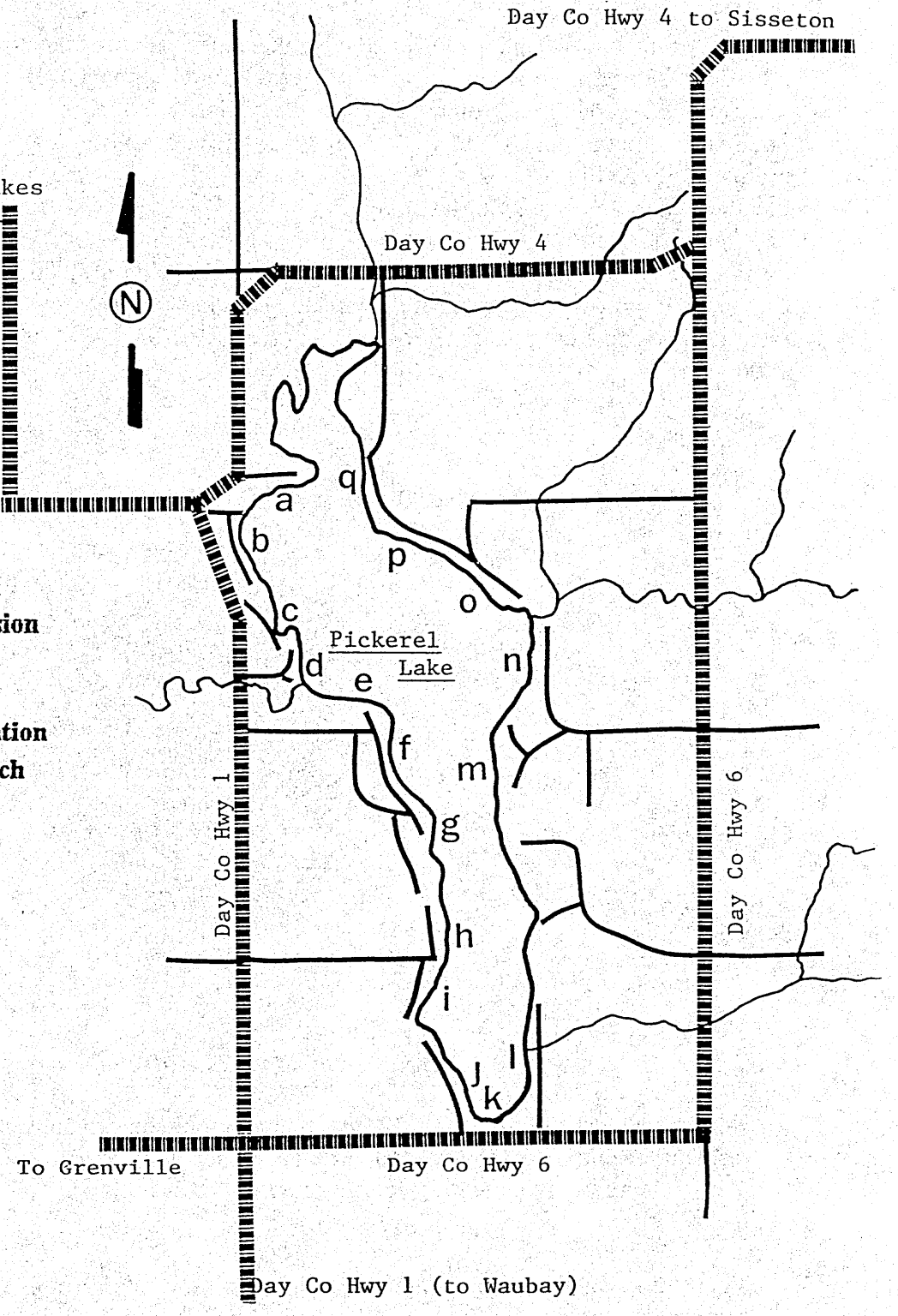
Appendix B - Lakeshore Development

- **Lakeshore Development Map**

- **Description of Lakeshore Developments**

  Introduction
  Figure 1 - Lake Home & Cabin Use
  Lake Developments
  Lake Property Owners Demographics
  Figure 2 - Pickerel Lake Property Owners By County
  Figure 3 - Pickerel Lake Property Owners By State
  Lakeshore Maps

Location Map - Lakeshore Developments



Area Directory

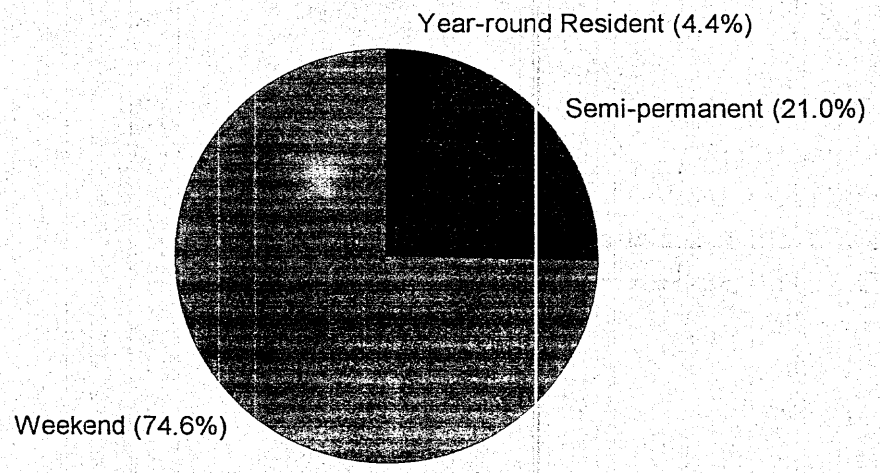
A. North Pickerel Lake Subdivision
B. Turtle Bay Association
C. Bullhead Bay Association
D. Pickerel Lake Outlet Association
E. Tahahe Point & Tipi-ota Beach
F. Duncan's 1st Addition
G. Jewett's Addition
H. Ramona Beach Subdivision
I. Ralph Johnson's Subdivision
J. Lot 2 of Section 34
K. Webster-Pickerel Lake Park Subdivision
L. Subdivision of Lot 2
M. Hyde Park Subdivision
N. Du-Lynn Coteau Beach
O. Chekapa Bay Subdivision
P. Von Wald's Addition
Q. Bass Beach

Description of Lakeshore Developments

Introduction

Cabins or lake homes on Pickerel Lake can be placed into three categories: Year-round lake homes - occupied twelve months out of the year; Semi-permanent lake homes -typically occupied from May through September, winterized, and the majority owned by retired persons who winter in the Southern United States; Cabins - occupied only on weekends and typically not winterized. Cabins are used an average of 15 weekends per year. Figure 1 shows current usage of lake homes and cabins on Pickerel Lake. In a survey of lake property owners - of the 35% who returned the survey, 16% said they had future plans to live year-round in their lake homes, and 37% of those answering the survey planned to improve their lake property. The trend noted during the Protection Project was to upgrade existing cabins - enlarging and winterizing. Figures 2 and 3 located on page 4 show that the majority of Pickerel Lake property owners are from South Dakota, and Brown Co. Descriptions and data as of winter of 1996.

Figure 1 - Lake Home & Cabin Use



Lake Developments

- **North Pickerel Subdivision** - 22 lake homes/cabins on privately owned lots. One year-round lake resident, twenty-one semi-permanent lake homes and cabins. YMCA Camp Wisagoma occupies point. Camp used only during summer months. Swimming lessons offered at this camp to area and lake residents.

- **Turtle Bay** - 9 lake homes/cabins. Lots leased from the Sisseton-Wahpeton Sioux Tribe. All semi-permanent lake homes and cabins. These dwellings are either mobile homes or small cabins that can be easily moved.

- **Bullhead Bay** - 8 lake homes/cabins. Lots leased from the Sisseton-Wahpeton Sioux Tribe. All semi-permanent lake homes and cabins. These dwellings are either mobile homes or small cabins that can be easily moved

- **Pickerel Lake Outlet Association** - 28 lake homes/cabins. Lots leased from the Sisseton-Wahpeton Sioux Tribe. All semi-permanent lake homes and cabins. These dwellings are either mobile homes or small cabins that can be easily moved.

- **Tahahe Point & Tipi-ota Beach** - 10 lake homes/cabins on private lots. All semi-permanent lake homes and cabins.

- **Duncan's 1st Addition** - 13 lake homes/cabins on private lots. One year-round lake resident, twelve semi-permanent and cabins.

- **Jewett's Addition** - 9 lake homes/cabins on private lots. All semi-permanent lake homes and cabins. Several lots in this addition are available for future development.

- **Ramona Beach** - 18 lake homes/cabins on private lots. One year-round resident, seventeen semi-permanent lake homes and cabins.

- **Ralph Johnson's Subdivision** - 6 lake homes/cabins on private lots. Three year-round residents, and three semi-permanent lake homes and cabins.

- **Webster-Pickerel Lake Park Subdivision** - 58 lake homes/cabins, one resort/restaurant on private lots. One resort with four rental cabins, and restaurant. One year-round resident, 58 semi-permanent lake homes and cabins.

- **Subdivision of Lot 2** - 9 lake homes/cabins on private lots. All semi-permanent lake homes and cabins.

- **Hyde Park** - 32 lake homes/cabins, one church camp, one baitshop/store on private lots. One year-round resident, thirty-one semi-permanent lake homes and cabins. One bait shop and store with shoreline gas pump for boats. Pickerel Lake Lutheran Bible Camp used only during the summer months.

- **Du-Lynn Couteau Beach** - 13 lake homes/cabins on private lots. One year-round resident, twelve semi-permanent lake homes and cabins.

- **Chekapa Bay** - 21 lake homes/cabins on private lots. Three year-round residents, 19 semi-permanent lake homes and cabins.

- **VonWald's Addition & Bass Beach** - Formerly leased land now private lots under the name of Beal's Subdivision. Currently 57 semi-permanent lake homes and cabins. The majority of dwellings located on the north end of this developments are small cabins or trailer houses typical of leased sites. Several lots are now available for development on the area known as the clay banks. Cabin owners were given an opportunity to buy the lots they once leased.

Maps showing the locations of cabins and lake homes are given on pages 5 - 15. These are the same maps used for the Lake Directory published by the Project Coordinator.

Lake Property Owner Demographics

Fig. 2 - Pickerel Lake Property Owners

By County of Home Address

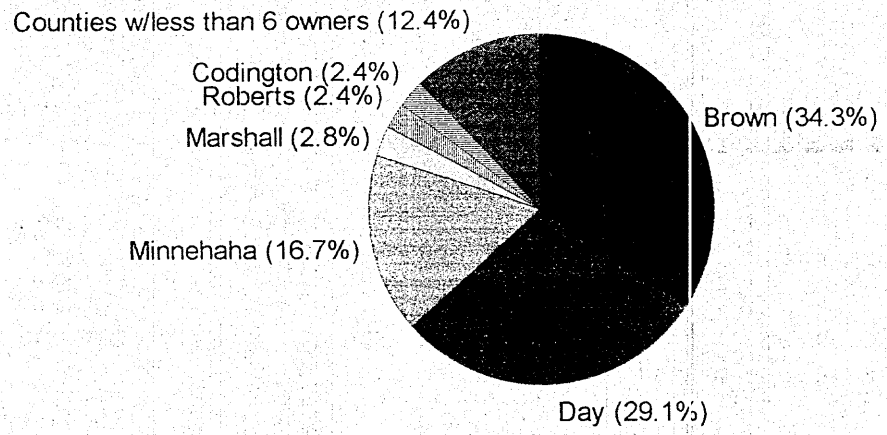
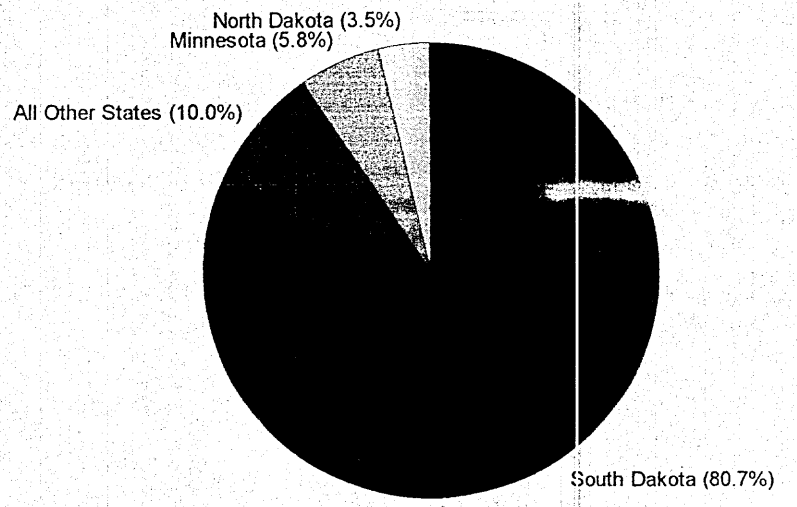
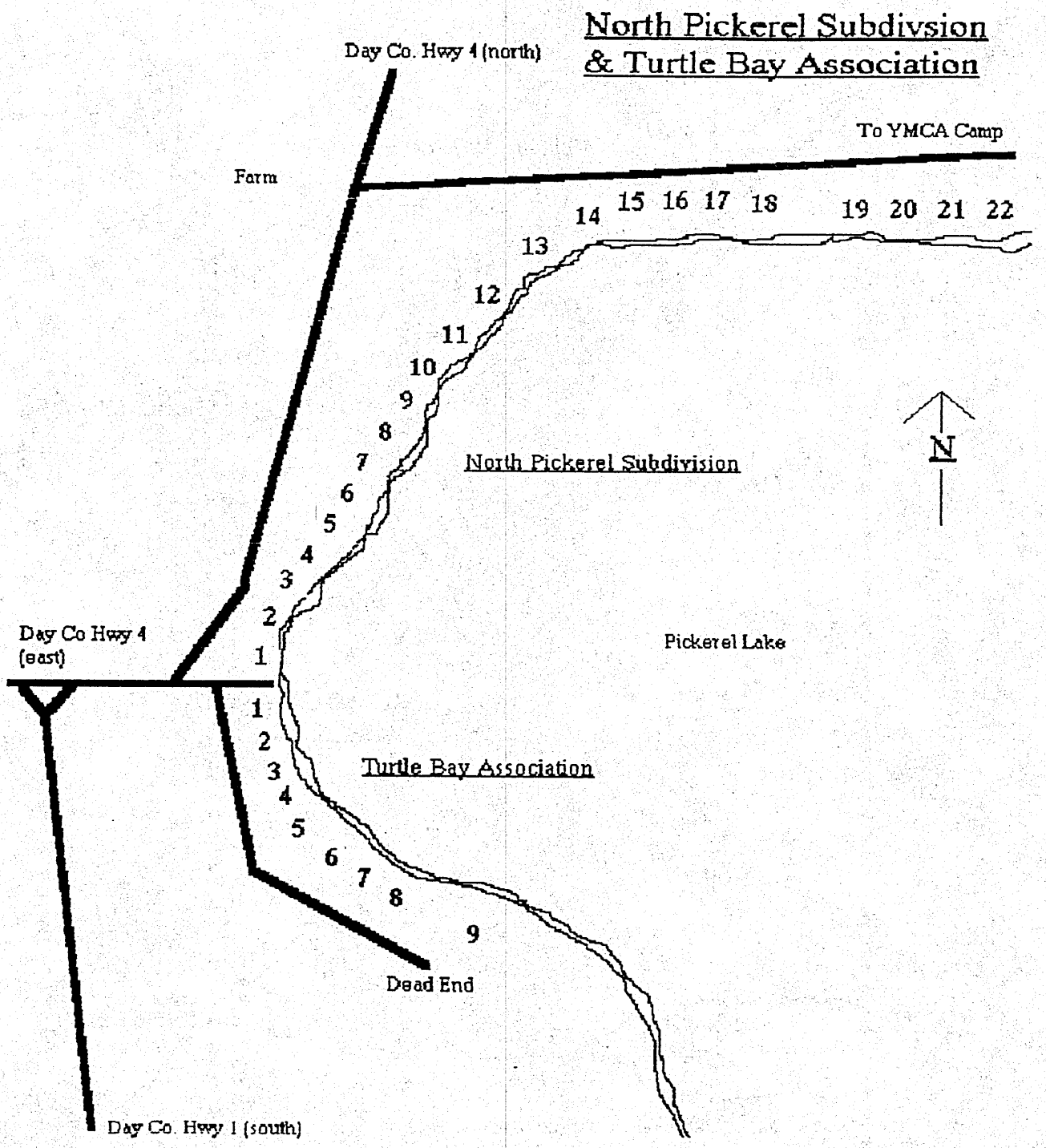
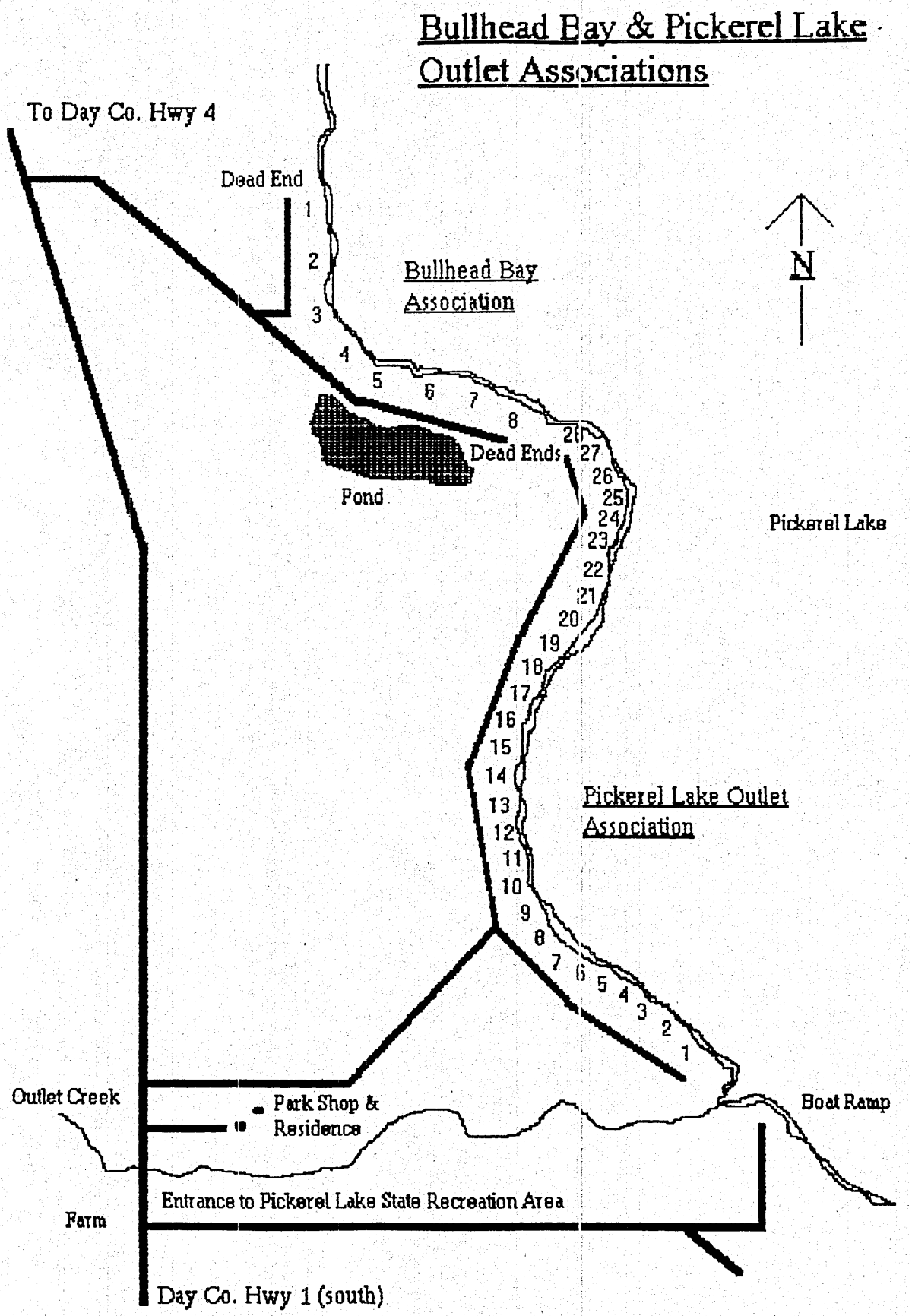


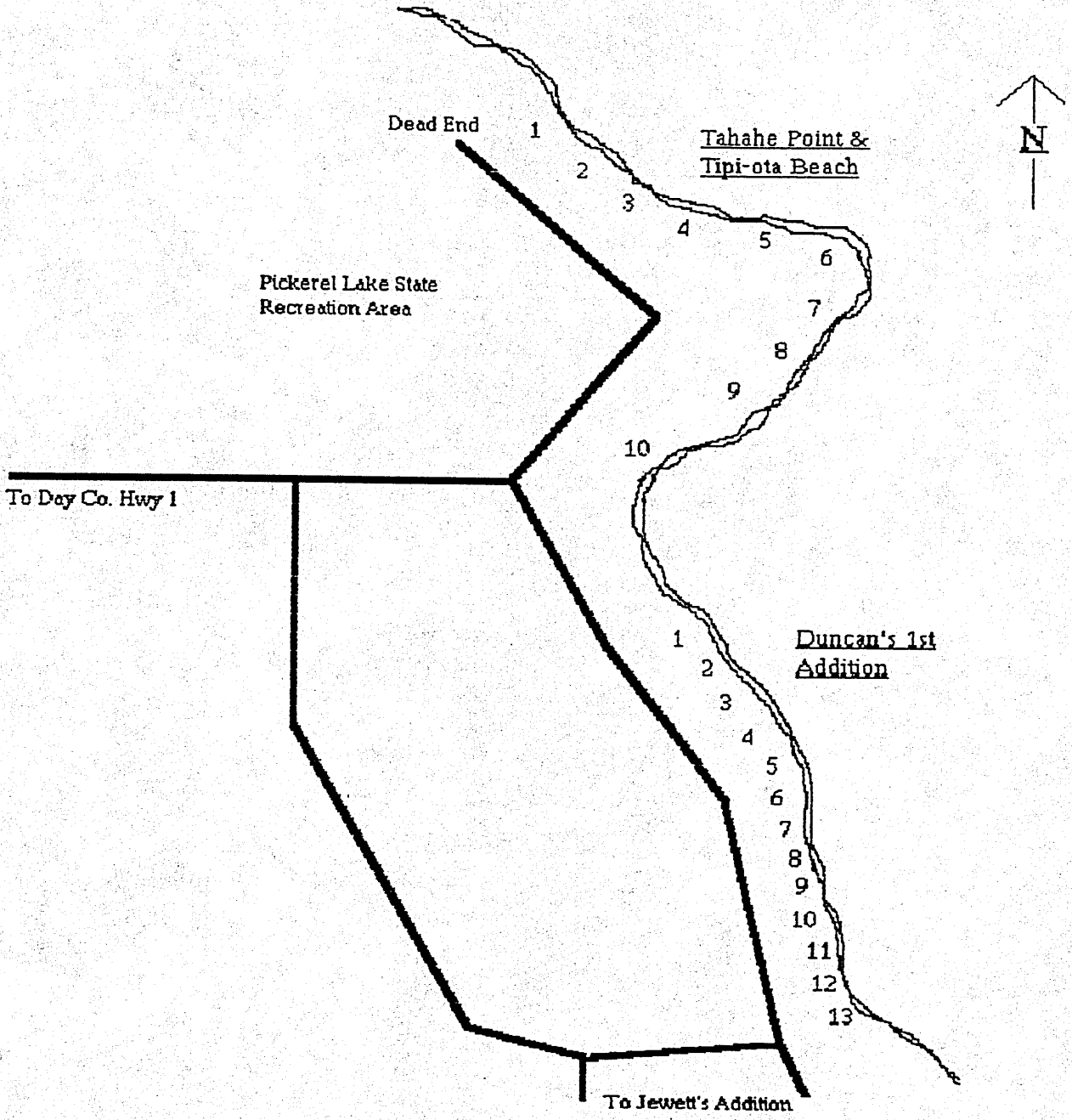
Fig. 3 - Lake Property Owners By State

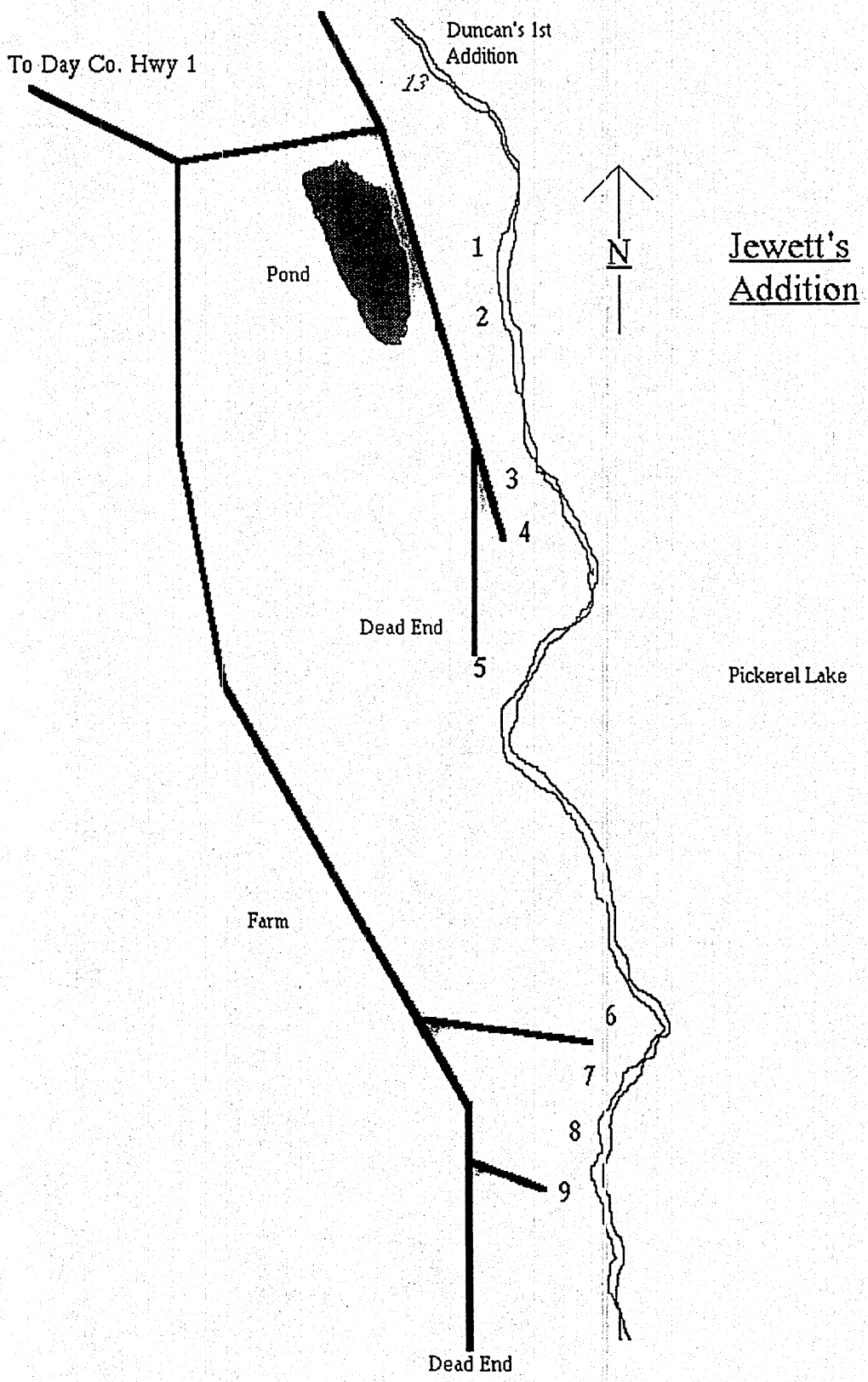


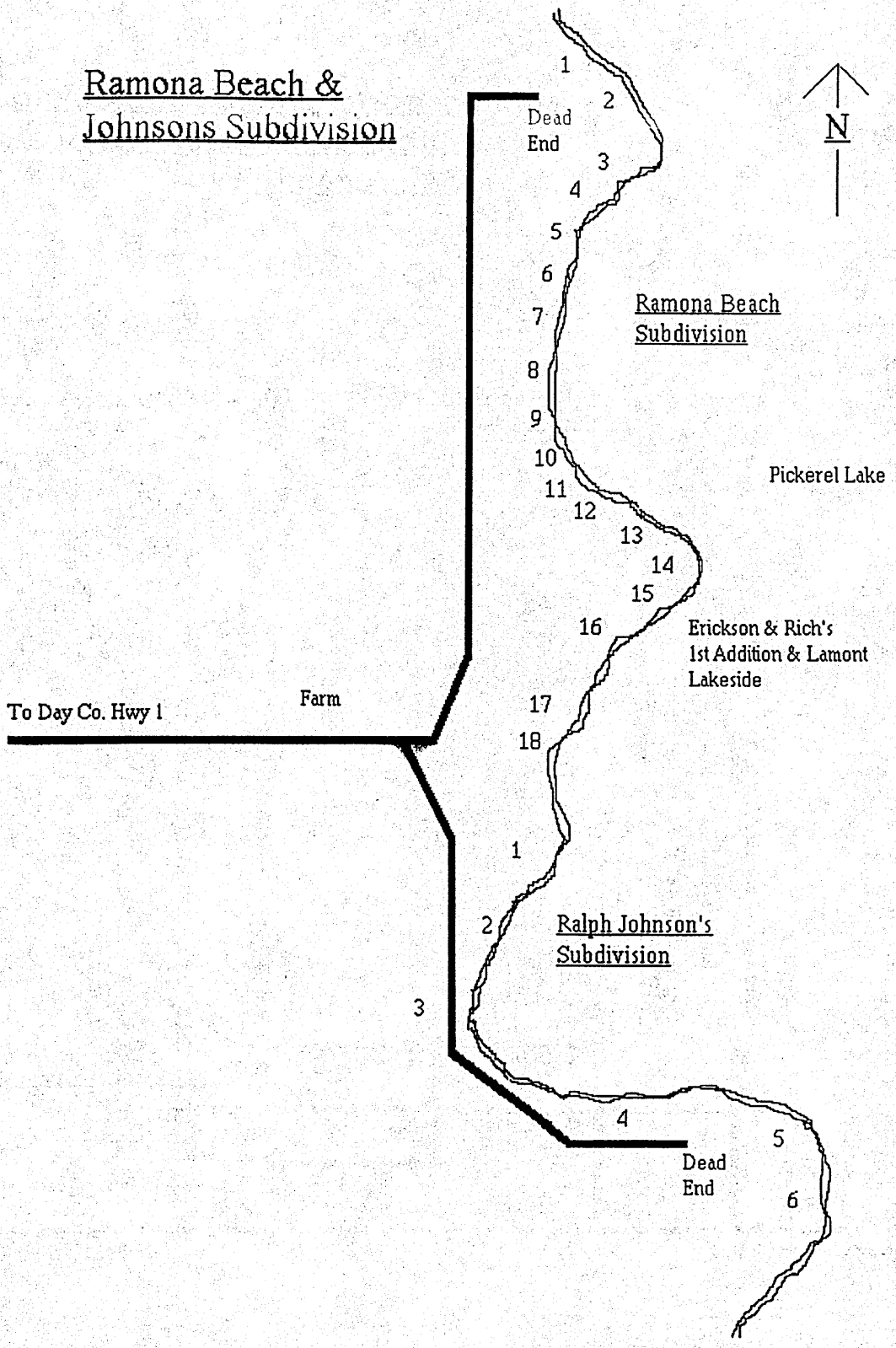

North Pickerel Subdivsion
& Turtle Bay Association
Day Co. Hwy 4 (north)
To YMCA Camp
Farm
14 15 16 17 18 19 20 21 22
13
12
11
10
9
8
7
6
5
4
3
2
1
North Pickerel Subdivision
N
Day Co Hwy 4
(east)
Pickerel Lake
1
2
3
4
5
6
7
8
9
Turtle Bay Association
Dead End
Day Co. Hwy 1 (south)

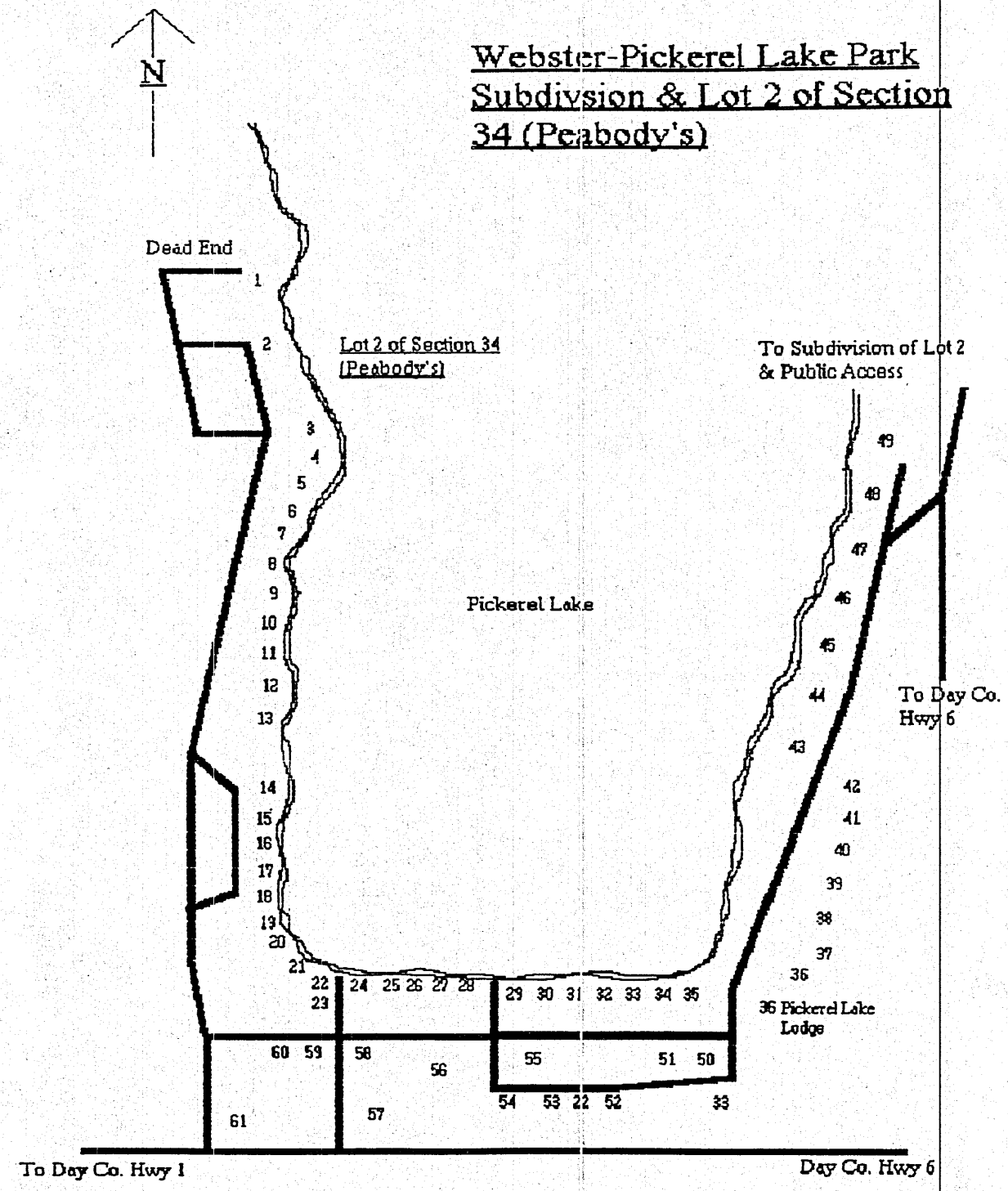

Bullhead Bay & Pickerel Lake Outlet Associations
To Day Co. Hwy 4
Dead End
Bullhead Bay Association
N
Dead Ends
Pond
Pickerel Lake
Pickerel Lake Outlet Association
Outlet Creek
Park Shop & Residence
Boat Ramp
Entrance to Pickerel Lake State Recreation Area
Farm
Day Co. Hwy 1 (south)

Tahahe Point & Tipi-ota Beach and Duncan's 1st Addition

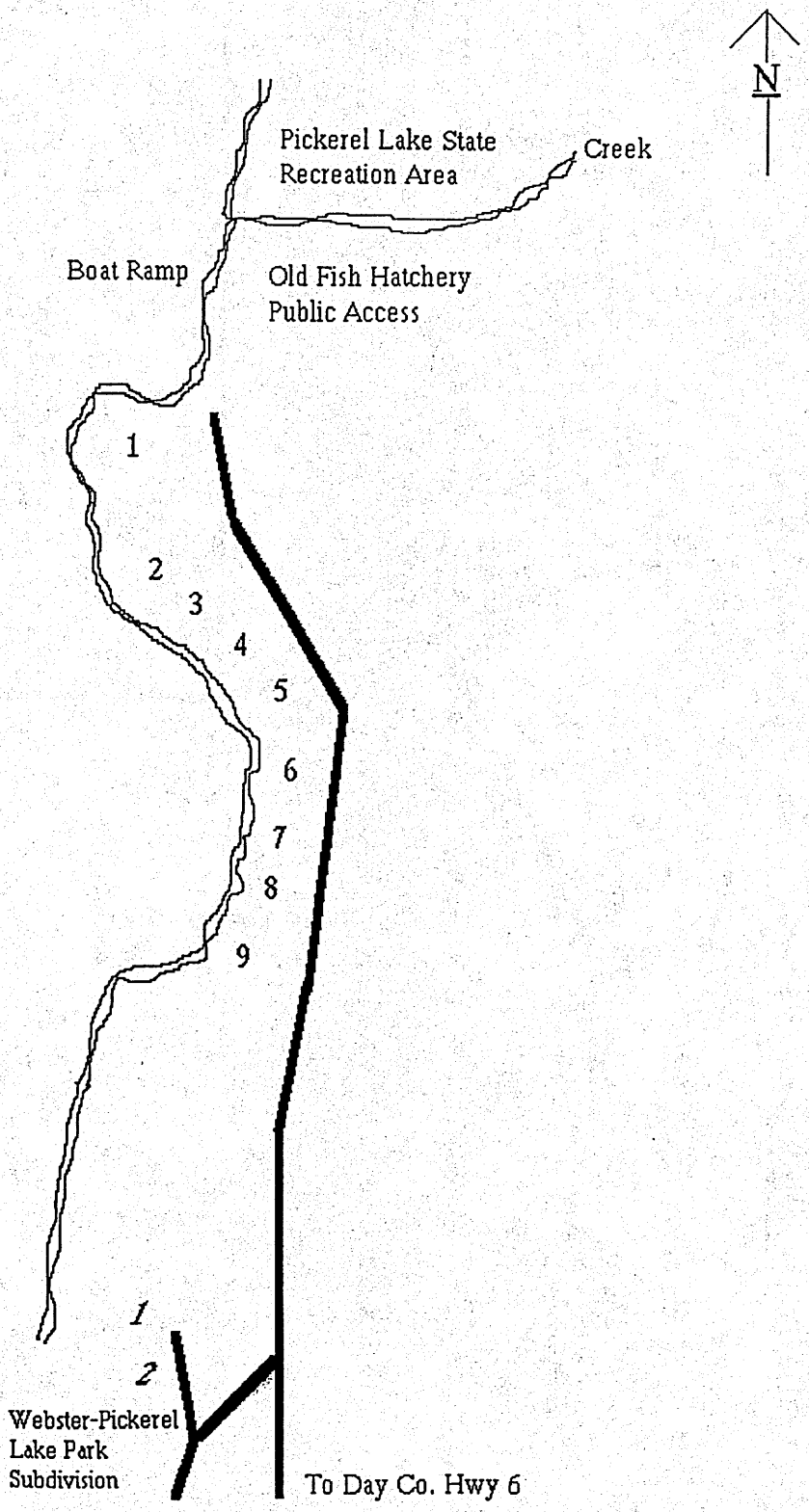


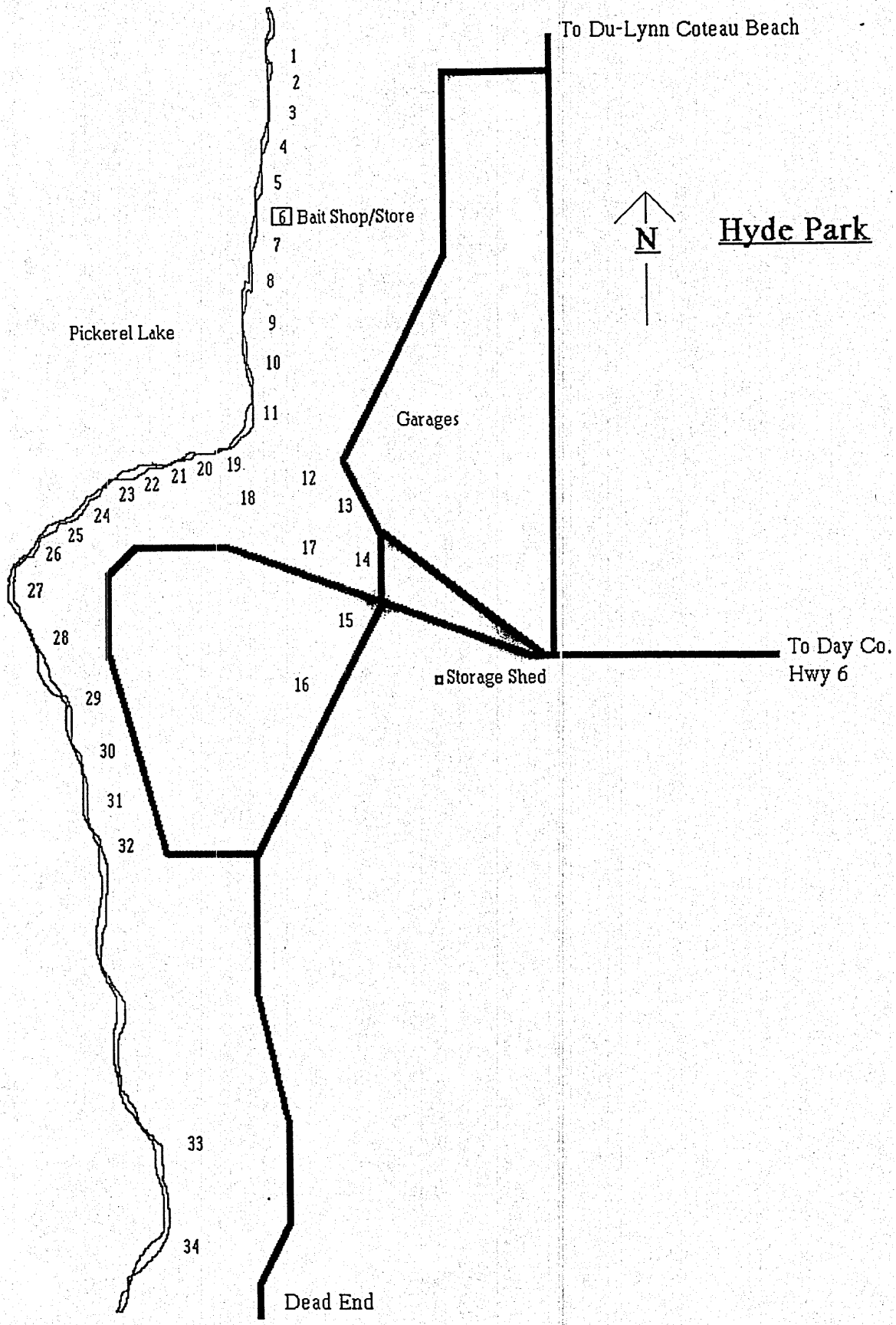

To Day Co. Hwy 1
Duncan's 1st Addition
13
Pond
1
2
3
4
5
Dead End
N
Jewett's Addition
Pickerel Lake
Farm
6
7
8
9
Dead End


Ramona Beach &
Johnsons Subdivision
N
Dead
End
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
Ramona Beach
Subdivision
Pickerel Lake
Erickson & Rich's
1st Addition & Lamont
Lakeside
To Day Co. Hwy 1
Farm
1
2
3
4
5
6
Ralph Johnson's
Subdivision
Dead
End

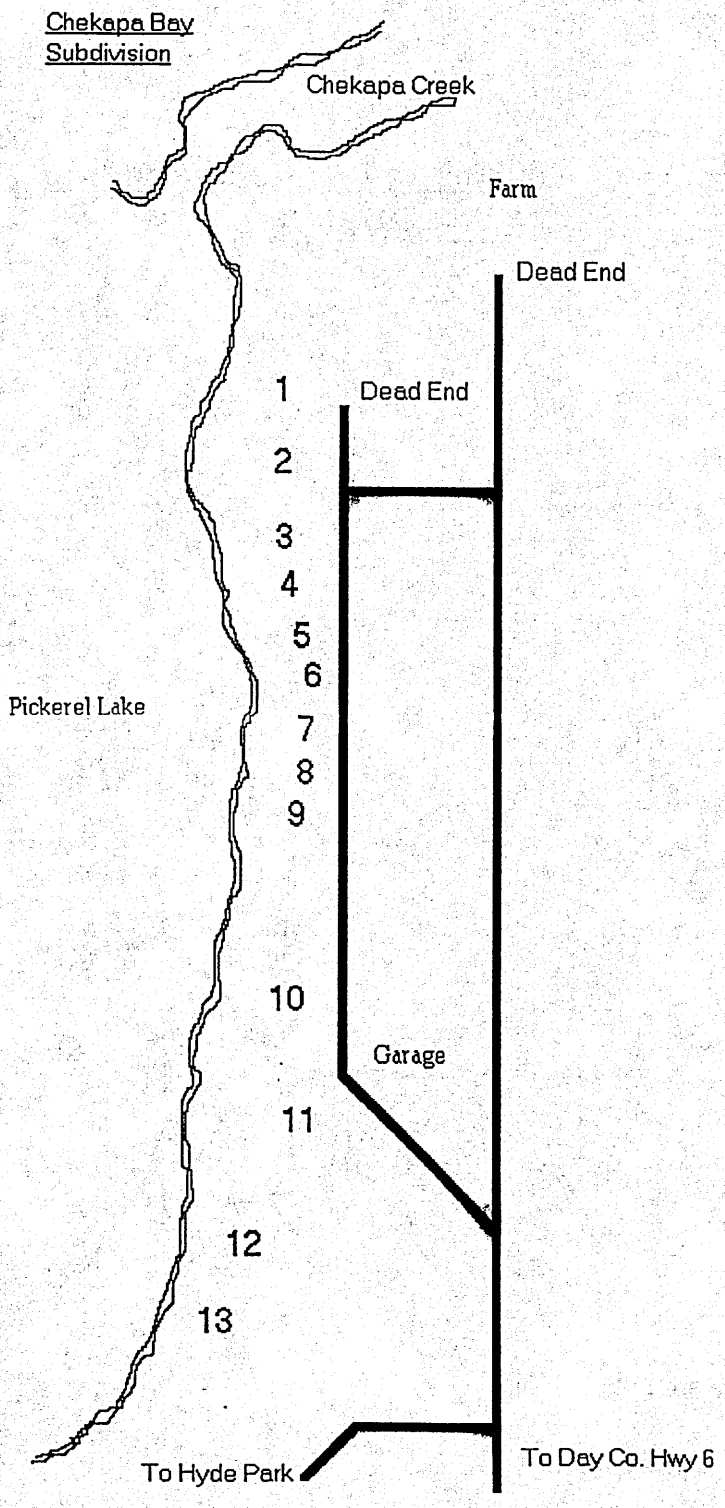

N
Webster-Pickerel Lake Park Subdivision & Lot 2 of Section 34 (Peabody's)
Dead End
Lot 2 of Section 34 (Peabody's)
To Subdivision of Lot 2 & Public Access
Pickerel Lake
To Day Co. Hwy 6
36 Pickerel Lake Lodge
To Day Co. Hwy 1
Day Co. Hwy 6

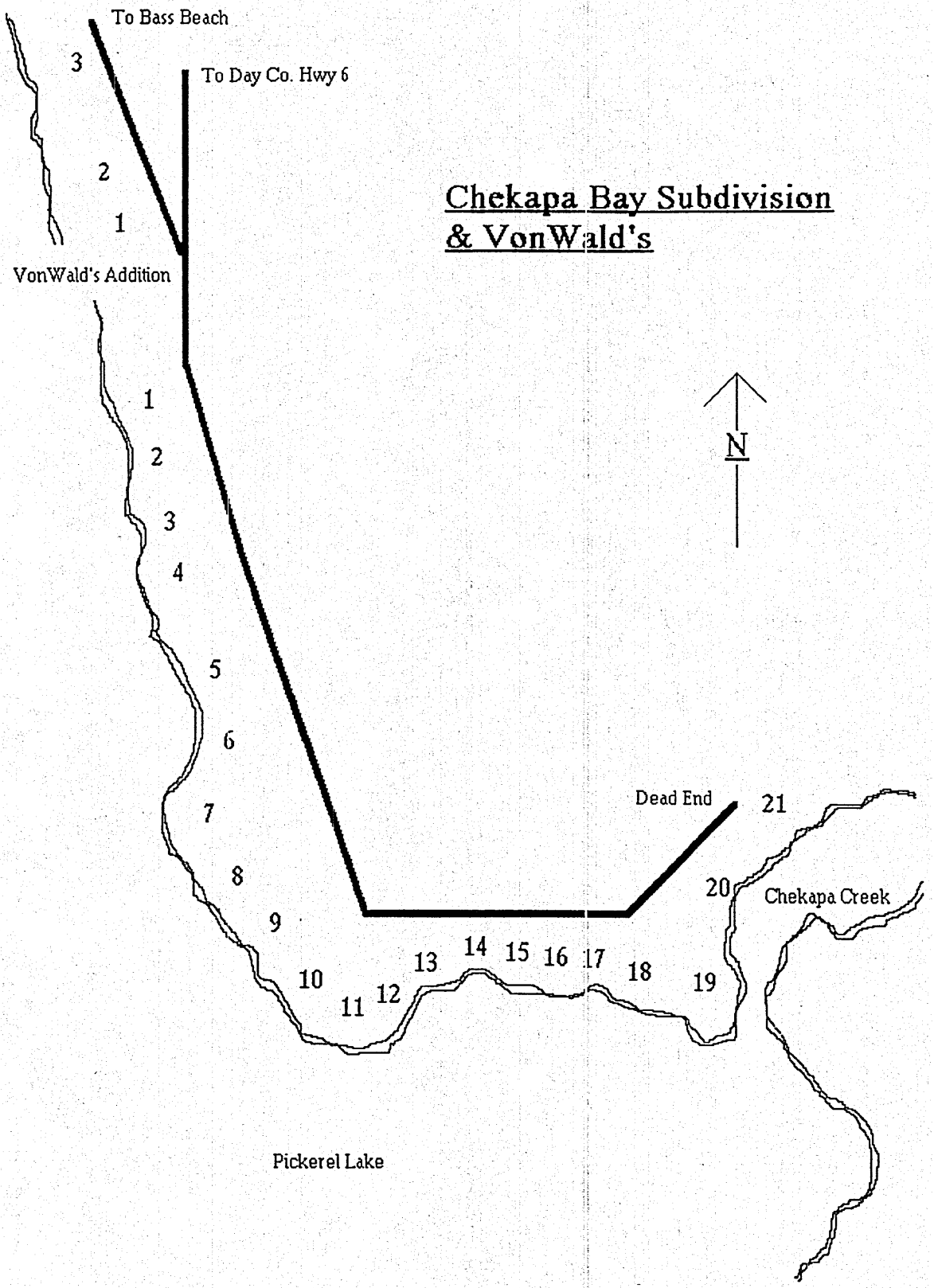
Subdivision of Lot 2

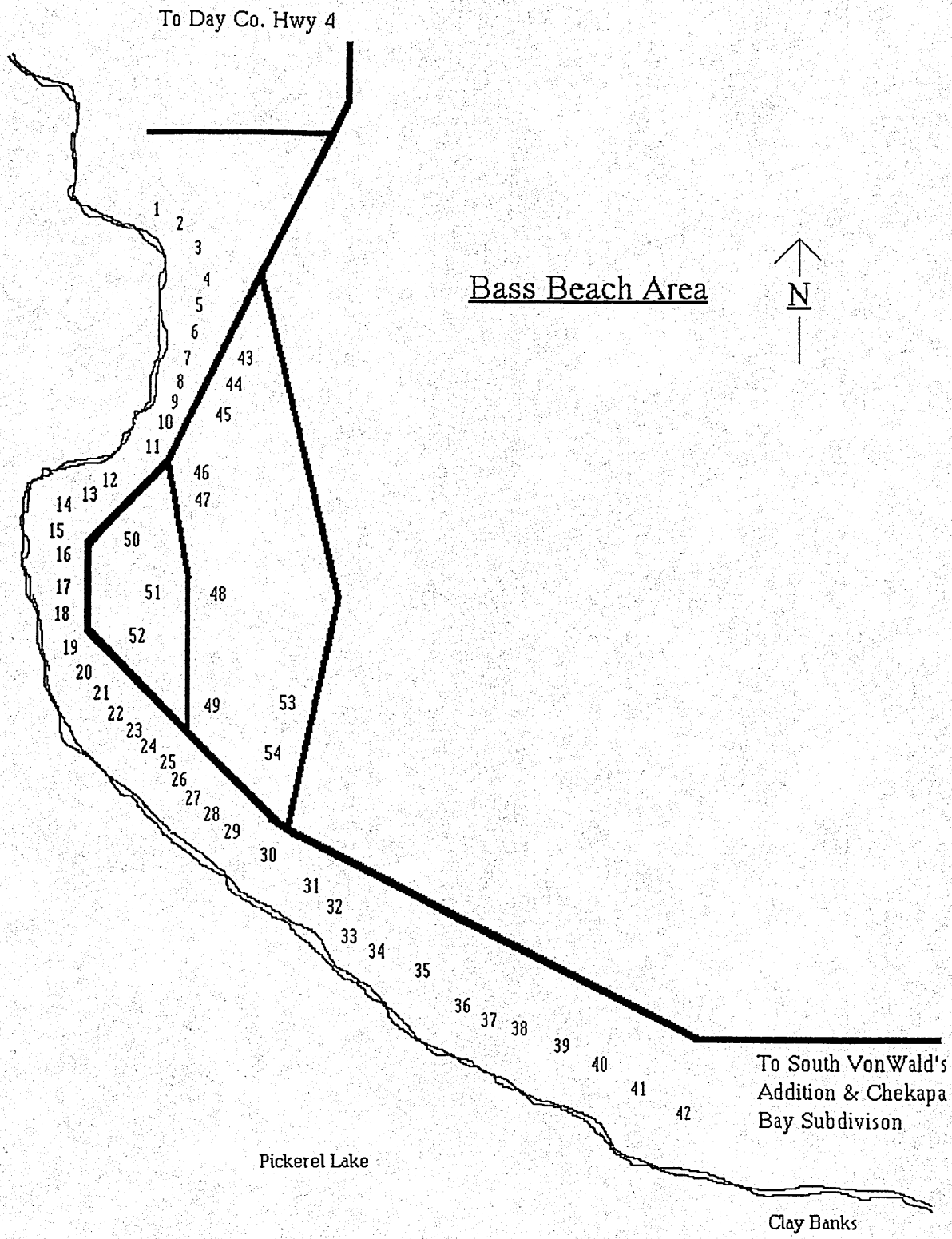



To Du-Lynn Coteau Beach
1
2
3
4
5
6 Bait Shop/Store
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
N
Hyde Park
Pickerel Lake
Garages
Storage Shed
To Day Co.
Hwy 6
Dead End

Du-Lynn Coteau Beach




To Bass Beach
To Day Co. Hwy 6
Chekapa Bay Subdivision
& VonWald's
VonWald's Addition
N
Dead End
Chekapa Creek
Pickerel Lake
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21


To Day Co. Hwy 4
Bass Beach Area
N
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
To South VonWald's
Addition & Chekapa
Bay Subdivison
Pickerel Lake
Clay Banks

Appendix C
Northeast Lake Hydrologic Unit Plan

HYDROLOGIC UNIT PLAN

for the

NORTHEAST LAKES HYDROLOGIC UNIT
(HU UNIT #7)

DAY COUNTY CONSERVATION DISTRICT

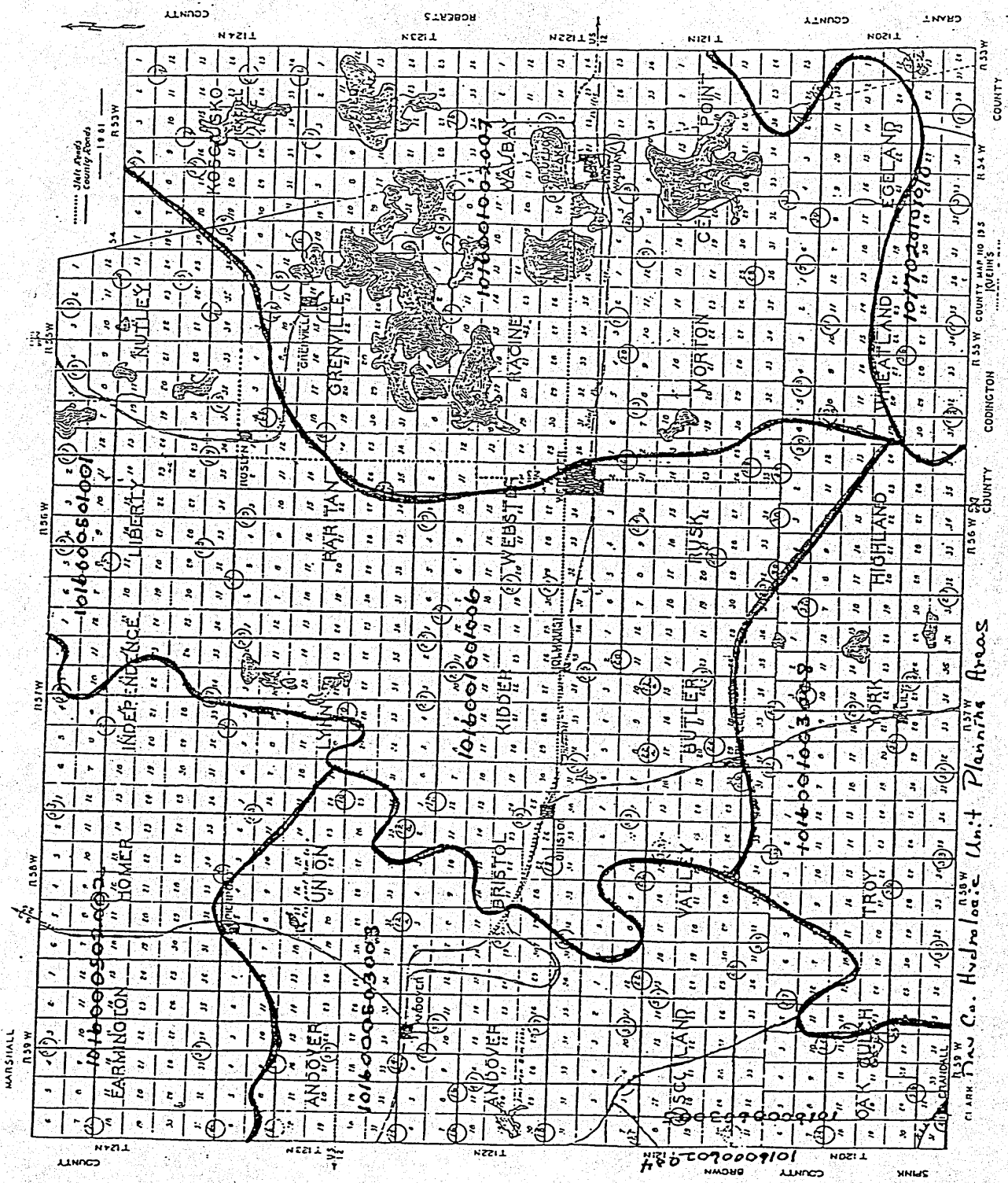
Webster, So. Dak.

Assisted By
U.S. Department of Agriculture
Soil Conservation Service
South Dakota Cooperative Extension Service
S.D. Association of Conservation District

August 13, 1992

INTRODUCTION

The Northeast Lakes Hydrologic Unit was selected by tne Day County Conservation District for public input into the development of a Hydrologic Unit Plan. The area is a concern of the District because of it's impact on Pickerel, Enemy Swim and the NE Waubay Lakes. These major lakes act as important sources and sinks for ground water flow. Interchange of water from one lake to another takes piace through surface streams, surficial outwash and probably through underlying deeper till. These lakes are the primary fisheries, sosurces of wildlife habitat and recreation in northeastern Day County. This area is also important for the large number of acres of wetlands, which serve as a primary watershed for the area and provide a valuable nesting and habitat cover for the large number of upland game birds, waterfowl and whitetail deer that are present in northeast Day County.


Roscoe
Grenville
Walbay
Morton
Egeland
Liberty
Independence
Lynn
Webster
Rush
Highland
Homer
Earmington
Union
Bristol
Kidder
Butler
York
Valley
Troy
Andover
Rockham
Oak Ridge
Pond Creek
Ramsey Co. Hydrologic Unit Planning Areas

BRIEF DESCRIPTION OF THE HYDROLOGIC UNIT AREA

The Northeast Lakes Hydrologic Unit Area is located in the northeast corner of Day County, encompassing 168 square miles and a little more than 100,000 acres. It extends 14 miles east-west and 13 miles north-south. This Hydrologic Unit area borders Marshall and Roberts County. The town of Roslyn, population 261, borders the west edge of the Hydrologic Unit Area, the town of Grenville, population 119, is located in the south one-half of the Hydrologic Unit Area, close to the Waubay Lakes Area and a Native American Village borders Enemy Swim Lake.

The major water bodies involved in the Hydrologic Unit Area include the following: Pickerel Lake, a deep natural lake, situated in the Coteau de Prairie, a hilly plateau of glacial moraine. The lake covers approximately 955 acres, an average depth of 22 ft. to a maximum depth of 43 ft. Pickerel Lake has only one discharge stream, running west and drains into sloughs and swampy areas. The southern extremity of Enemy Swim Lake, called Campbell's Slough, possesses the highest water level of all the major lakes in the area, 1,854 ft. above sea level. This body drains northward into the main body of Enemy Swim Lake. The main body of Enemy Swim Lake drains west into Spring Lake, of which discharges into NE Waubay Lake through swampy area. NE Waubay Lakes is the ultimate surface and ground water sink for all the major lakes in the area.

The major soils of the area are complexes made up of the following: Forman-Buse-Aastad; Buse-Barnes; Sioux-Renshaw; Renshaw-Sioux. These are deep, loamy, some clayey soils. A large portion of the Northeast Hydrologic Unit is made up of hilly upland and highly erodible soil.

The land use patterns in the Hydrologic Unit Area are as follows: 50% cropland, 30% grassland and 20% is in lakes and wetlands. The main crops grown are small grains, corn, soybeans, buckwheat and alfalfa.

BRIEF DESCRIPTION OF PUBLIC INVOLVEMENT

Letters were sent to producers in the northeast part of Day County, introducing the process called "Hydrologic Unit Planning", and encouraging them to attend a public meeting in order to identify concerns they may have regarding soil erosion, water quality, weed control, lake preservation or any other resource concerns. A news article (see attachment I) was included in the ASCS Newsletter, reaching all producers in the County. Twelve interested parties attended (see attachment II), discussing the problems in the northeast area and how to address these problems and preserve our natural resources. Several other news articles about the northeast lakes area are included in this Plan.

HYDROLOGIC UNIT SESSION

The Day County Conservation District along with the Agricultural Stabilization and Conservation Service, Cooperative Extension Service, and Soil Conservation Service are sponsoring public meeting Feb. 6th at 7:00 p.m. at the Town-Hall-Nutrition Center, Roslyn, S.D., to form a Hydrologic Unit in the northeast part of Day County. The purpose of the meeting is to gain local input in identifying resource concerns on topics such as soil erosion, water quality, weed control, lake preservation or any other concerns. All interested persons are welcome to attend.

Clifford Peterson	Webster S.D Rt 2 Box 72
David Breitbach	Webster S.D. Rt 1 Box 128
Marvin Berry	Webster, S.D. 512 W. 5TH AVE.
Bob Pecock	Webster, SD
Tom Dunlap	Webster, S.D. 215 W. 7½ Ave.
Gary E. Strand	Roslyn RR 1 Box 23
Sylvester Wika	R2 Webster
Bob Rohl	East Shore – Pickerel Lake
Harvey C. Jewett	East Shore – Pickerel Lake
Neil Anderson	Webster, S.D. RR 2 Box 110B
Charlene Hanson	415 W 8th Ave – Webster
Allen Hanson	Rt 1 Box 214 Granville SD

NORTHEAST LAKES HYDROLOGIC UNIT

COMMUNITY CONCERNS RANKED BY PRIORITY;

A. Water Quality
   - Ag & Human Waste Management around lakes area
   - Well head protection
   - Pesticide and fertilizer management

B. Wind and Water Erosion
   - Reduce wind and water erosion on crop land
   - Tree plantings

C. Weed Control On Cropland and Grassland
   - Control of Noxious Weeds
   - Control of grasshopper and pocket gophers
   - Weed control on state and federal land
   - Fire protection for grassland (including Conservation Reserve & Waterbank land)

D. Grazing Management
   - Control noxious weeds in pasture, Conservation Reserve program acres, and Water Bank lands
   - Control overgrazing of pastures

E. Wildlife Management
   - Depredation and predator control
   - Tree plantings and food plots
   - Pocket gopher control

Objective 1: Improve Water Quality in Northeast Lakes Hydrologic Unit.

Goal A: Improve water quality around area lakes.

Concerns:

Ag and human waste management around lakes area,
Well head protection
Pesticide and fertilizer management

Strategies	Date	Assisting
1.) Identify degree to which area lakes are affected by feedlot and septic tanks.		
a) Work with landowners that have feedlots close to lake area that may affect water quality.	1992-94	Cons.Dist. SCS DWNR
b) News releases - addressing runnoff in lakes - feedlots and septic tanks.	1992-94	Cons.Dist. SCS Extension ASCS
2.) Work with ASCS County Committee to increase cost-share for Ag-Waste systems in Co. ACP docket.	1993	Cons.Dist. ASCS Co.Ext.Agent
3.) Identify abandoned wells in area	1993-94	Cons.Dist.
a) Educate public on dangers of abandoned wells.		SCS Co.Ext.Agent
b) Work with landowners on plugging abandoned wells.		ASCS
4.) Approach ASCS County Committee to place sealing of abondoned wells on ACP docket.	1992	Cons.Dist: ASCS SCS
5.) Improve public awareness of pesticide and fertilizer mgt. by news articles.	1992-94	Cons. Dist. ASCS Co.Ext.Agent

Objective 2: Wind and Water Erosion in the Northeast Lakes Hydrologic Unit.

Goal A: Reduce wind and water erosion.

Concerns:

Reduce wind and water erosion on crop land.
Tree plantings.

Strategies	Date	Assisting
1.) Encourage over-winter cover crops or leaving more crop residue on fields through news articles and conservation	1992-94	Cons.Dist. SCS ASCS Co.Ext.Agent
2.) Encourage establishment of field shelterbelts.	1992-2002	Cons.Dist.
3.) Encourage renovation of old shelterbelts.	1992-2002	Cons.Dist. SCS

Objective 3: Weed Control on Cropland and Grassland

Goal A: Improve weed control in the Northeast Lakes area of Day County.

Concerns:

Control of noxious weeds
Control grasshoppers & pocket gophers
Weed control on state & federal land
Fire protection for grass land (including Conservation Reserve and Waterbank land)

Strategies	Date	Assisting
1.) Enforce noxious weed control	1992-2002	Co.Weed Bd.
2.) Improve involvement of public agencies who control land in addressing weed control on public lands.		
a) Coordinate an annual inter-agency meeting to discuss weed control problems and coordinate activities.	1992-2002	H.U.Comm. Cons.Dist. Co.Weed Bd. SCS
3.) Develop Noxious weed infestation map.	1992	Cons.Dist. Co.Weed Bd.
4.) Improve education on weed control, grasshoppers and pocket gophers.	1992-93	SCS Cons.Dist. ASCS
a) Write periodic newsletter articles.	1992-93	Cons.Dist. SCS ASCS
5.) Inform landowners of methods of fire protection for grasslands	1992-93	Cons.Dist. SCS ASCS
a) Write periodic newsletters articles.		

Objective 4: Grazing Management in the Northeast Lakes Hydrologic Unit.

Goal A: Improve grazing management and weed control.

Concerns:

Control noxious weeds in pasture, CRP and Waterbank lands.
Control overgrazing of pastures.

Strategies	Date	Assisting
1.) Provide public information on controlling noxious and semi-noxious weed problems with news releases and informational meetings.	1992-93	Cons.Dist. ASCS Co.Weed Bd. H.U.Comm. SCS
2.) Develop conservation plans with attention on planned grazing systems to protect against overgrazing of pastures and rangeland.	1992-2002	Cons.Dist. SCS

Objective 5: Wildlife Management in the Northeast Lakes Hydrologic Unit.

Goal A: Improve Wildlife Management.

Concerns:

Depredation and predator control
Tree plantings and food plots
Pocket gopher control

Strategies	Date	Assisting
1.) Hold public informational meetings to identify problem areas and how to correct the situations.	1992-94	Co.Comm. Co.Ext.Agent H.U. Comm.
2. Encourage tree plantings and food plots for wildlife management.	1992-2002	Cons.Dist. SCS

DESCRIPTION OF HOW THE DISTRICT WILL REVIEW AND EVALUATE THE HYDROLOGIC UNIT PLAN AND RESULTING ACTIONS

As a follow-up procedure the Day Conservation District and the Hydrologic Unit planning committee will review and update this plan yearly. A follow-up survey may be necessary for public input to determine if concerns are being taken care of. Two members of the Conservation District Board will be involved in each Hydrologic Unit area.

Appendix D - Wildlife

- **Reptiles & Amphibians Occurring In The Waubay Basin Watershed**
- **Birds Occurring In The Waubay Basin Watershed**
- **Mammals Occurring In The Waubay Basin Watershed**
- **Natural Heritage Database: Pickerel Lake Watershed**
- **Key To Codes Used In Natural Heritage Database Reports**

Reptiles and Amphibians Occurring In The Waubay Basin Watershed

Amphibians

Tiger salamander (Ambystoma tigrinum)

Great Plains toad (Bufo cognatus)

Canadian toad (Bufo hemiophrys)

Striped chorus frog (Pseudacris tiseriata)

Mudpuppy (Necturus maculosus)
(Historical)

Northern leopard frog (Rana pipiens)

Reptiles

Snapping turtle (Chelydra serpentina)

Painted turtle (Chrysemys picta)

Prairie skink (Eumeces septentrionalis)

Smooth green snake (Opheodrys vernalis)

Gopher (Bull) snake (Pituophis melanoleucus)
(Accidental)

Red-bellied snake (Storeria occipitomaculata)

Plains garter snake (Thamnophis radix)

Common garter snake (Thamnophis sirtalis)

Birds Occurring In The Waubay Basin Watershed

Loons
Common Loon

Grebes
Pied-billed Grebe*
Horned Grebe
Red-necked Grebe*
Eared Grebe*
Western Grebe*

Totipalmate Swimmers
American White Pelican*
Double-crested Cormorant*

Herons
American Bittern*
Least Bittern*
Great Blue Heron*
Great Egret
Snowy Egret*
Little Blue Heron
Tricolored Heron
Cattle Egret*
Green-backed Heron*
Black-crowned Night-Heron*
Yellow-crowned Night-Heron
White-faced Ibis*

Waterfowl
Tundra Swan
Greater White-fronted Goose
Snow Goose
Ross' Goose
Canada Goose*
Wood Duck*
Green-winged Teal*
American Black Duck (*Historical)
Mallard*
Northern Pintail
Blue-winged Teal*
Northern Shoveler*
Gadwall*
American Wigeon*
Canvasback*
Redhead*
Ring-necked Duck
Greater Scaup
Lesser Scaup*
Oldsquaw
White-winged Scoter
Common Goldeneye (*Historical)
Bufflehead
Hooded Merganser
Common Merganser
Red-breasted Merganser
Ruddy Duck*

Diurnal Birds of Prey
Turkey Vulture
Osprey
Bald Eagle
Northern Harrier*
Sharp-shinned Hawk
Cooper's Hawk*
Northern Goshawk
Broad-winged Hawk
Swainson's Hawk*
Red-tailed Hawk*
Ferruginous Hawk*
Rough-legged Hawk
Golden Eagle
American Kestrel*
Merlin
Peregrine Falcon
Gyrfalcon
Prairie Falcon

Gallinaceous Birds
Gray Partridge
Ring-necked Pheasant*
Greater Prairie-Chicken (*Historical)
Sharp-tailed Grouse
Wild Turkey*

Rails, Cranes & Allies
Virginia Rail
Sora*
American Coot*
Sandhill Crane

Whooping Crane

Shorebirds & Gulls

Black-bellied Plover
Lesser Golden-Plover
Semipalmated Plover
Piping Plover*
Killdeer*
American Avocet*
Greater Yellowlegs
Lesser Yellowlegs
Willet*
Spotted Sandpiper*
Upland Sandpiper*
Hudsonian Godwit
Marbled Godwit*
Ruddy Turnstone
Sanderling
Semipalmated Sandpiper
Least Sandpiper
White-rumped Sandpiper
Baird's Sandpiper
Pectoral Sandpiper
Dunlin
Stilt Sandpiper
Short-billed Dowitcher
Long-billed Dowitcher
Common Snipe*
American Woodcock*
Wilson's Phalarope

Franklin's Gull*
Bonaparte's Gull
Ring-billed Gull*
California Gull*
Herring Gull
Caspian Tern
Common Tern*
Forster's Tern*
Least Tern
Black Tern*

Pigeons & Allies

Rock Dove*
Mourning Dove*

Cuckoos

Black-billed Cuckoo*
Yellow-billed Cuckoo

Owls

Eastern Screech-Owl
Great Horned Owl*
Snowy Owl
Barred Owl
Long-eared Owl
Short-eared Owl

Goatsuckers

Common Nighthawk*

Swifts & Hummingbirds

Chimney Swift*
Ruby-throated Hummingbird*

Kingfishers

Belted Kingfisher

Woodpeckers

Red-headed Woodpecker
Red-bellied Woodpecker
Yellow-bellied Sapsucker
Downy Woodpecker*
Hairy Woodpecker
Northern Flicker*

Perching Birds

Olive-sided Flycatcher
Eastern Wood-Pewee*
Yellow-bellied Flycatcher
Willow Flycatcher*
Least Flycatcher*
Eastern Phoebe*
Say's Phoebe
Vermillion Flycatcher
Great Crested Flycatcher*
Western Kingbird*
Eastern Kingbird*
Horned Lark*
Purple Martin*
Tree Swallow*
Northern Rough-winged Swallow*

Bank Swallow*
Cliff Swallow*
Barn Swallow*
Gray Jay
Blue Jay*
Black-billed Magpie
American Crow*
Black-capped Chickadee*
Red-breasted Nuthatch
White-breasted Nuthatch*
Brown Creeper
House Wren*
Winter Wren
Sedge Wren
Marsh Wren*
Golden-crowned Kinglet
Ruby-crowned Kinglet
Eastern Bluebird*
Mountian Bluebird
Townsend's Solitaire
Veery
Gray-cheeked Thrush
Swainson's Thrush
Hermit Thrush
Wood Thrush
American Robin*
Varied Thrush
Gray Catbird*
Northern Mockingbird*
Brown Thrasher*
Bohemian Waxwing
Cedar Waxwing*
Northern Shrike
Loggerhead Shrike
European Starling*
Solitary Vireo
Yellow-throated Vireo
Warbling Vireo*
Philadelphia Vireo
Red-eyed Vireo*
Golden-winged Warbler
Tennessee Warbler
Orange-crowned Warbler
Nashville Warbler
Northern Parula
Yellow Warbler*
Chestnut-sided Warbler
Magnolia Warbler
Cape May Warbler
Black-throated Blue Warbler
Blackburnian Warbler
Palm Warbler
Bay-breasted Warbler
Blackpoll Warbler
Black-and-white Warbler
American Redstart
Worm-eating Warbler
Ovenbird
Northern Waterthrush
Mourning Warbler
Common Yellowthroat*
Wilson's Warbler
Canada Warbler
Summer Tanager
Scarlet Tanager
Northern Cardinal
Rose-breasted Grosbeak*
Indigo Bunting
Dickcissel
Rufous-sided Towhee
American Tree Sparrow
Chipping Sparrow*
Clay-colored Sparrow*
Field Sparrow
Vesper Sparrow*
Savannah Sparrow*
Grasshopper Sparrow
Le Conte's Sparrow*
Fox Sparrow
Song Sparrow*
Lincoln's Sparrow
Swamp Sparrow
White-throated Sparrow
White-crowned Sparrow
Harris' Sparrow
Dark-eyed Junco
Lapland Longspur
Chestnut-collared Longspur*
Snow Bunting
Bobolink
Red-winged Blackbird*
Western Meadowlark*
Yellow-headed Blackbird*
Rusty Blackbird
Brewer's Blackbird
Common Grackle*

Brown-headed Cowbird*
Orchard Oriole*
Northern Oriole*
Pine Grosbeak
Purple Finch
House Finch
Red Crossbill*
White-winged Crossbill
Common Redpoll
Hoary Redpoll
Pine Siskin
American Goldfinch*
Evening Grosbeak
House Sparrow*

* Denotes breeding species.

Mammals Occurring In The Waubay Lake Basin

Virginia opposum (Didelphis virginiana) (Accidental)

Masked shrew (Sorex cinereus)
Hayden's shrew (Sorex hadeni)

Northern short-tailed shrew (Blarina brevicauda)

Silver-haired bat (Lasionycteris noctivagans)

Eastern cottontail (Sylvilagus floridanus)

White-tailed jackrabbit (Lepus townsendii)

Eastern chipmunk (Tamias striatus)

Woodchuck (Marmota monax)

Franklin's ground squirrel (Spermophilus franklinii)

Richardson's ground squirrel (Spermophilus richardsonii)

Thirteen-lined ground squirrel (Spermophilus tridecemlineatus)

Gray squirrel (Sciurus carolinensis)

Fox squirrel (Sciurus niger)

Plains pocket gopher (Geomys bursarius)

Beaver (Castor canadensis)

Western harvest mouse (Reithrodontomys megalotis)

White-footed mouse (Peromyscus leucopus)

Deer mouse (Peromyscus maniculatus)

Northern grasshopper mouse (Onychomys leucogaster)

Prairie vole (Microtus ochrogaster)

Meadow vole (Microtus pennsylvanicus)

Muskrat (Ondatra zibethicus)

House mouse (Mus musculus)

Norway rat (Rattus novegicus)

Meadow jumping mouse (Zapus hudsonius)

Coyote (Canis latrans)

Red fox (Vulpes vulpes)

Gray fox (Urocyon cinereoargenteus)

Raccoon (Procyon lotor)

Ermine (Short-tailed weasel) (Mustela erminea)

Long-tailed weasel (Mustela frenata)

Least weasel (Mustela nivalis)

Mink (Mustela vison)

Badger (Taxidea taxus)

Eastern spotted skunk (Spilogale putorius)

Striped skunk (Mephitis mephitis)

Mule deer (Odocoileus hemionus)

White-tailed deer (Odocoileus virginianus)

Moose (Alces alces)
(Accidental)

Pronghorn antelope (Antilocapra americana)

Natural Heritage Database

State & Federal Endangered, Threatened and Species of Special Concern - Occuring in the Pickerel Lake Watershed

Name	County	Location	Federal Status	State Status	State Rank	Global Rank
Brook Stickleback Culaea inconstans	Day	124NO53W Section 10 & 35			S4	G5
Cooper's Hawk Accipiter cooperii	Day	124NO53W Section 26			S3B,SZN	G4
Clustered Sedge Carex aggregata	Day	124NO53W Section 35			SU	G5
Eastern Chipmunk Tamias striatus	Day	124NO53W Section 35 & 26			S3	G5
Green-backed Heron Butorides virescens	Day	124NO53W Section 22			S3B,SZN	G5
Large-flowered Bellwort Uvularia grandiflora	Day	124NO53W Section 35			S3	G5
Large-leaf Pondweed Potamogeton amplifoloius	Day	124NO53W			S3	G5
Logperch Percina caprodes	Day	124NO53W Section 22			S2	G5
Nodding Trillium Trillium cernuum	Day	124NO53W Section 35			S3	G5

Name	County	Location	Federal Status	State Status	State Rank	Global Rank
Northern Redbelly Snake Storeria occipitomaculata	Day	124NO53W Section 22		ST	S3	G5T5
Regal Fritillary Speyeria idalia	Day	124NO53W Section 22	C2		S1	G3
Ruby-throated Hummningbird Archilochus colubris	Day	124NO53W Section 22			SUB,SZN	G5
Smooth Green Snake Opheodrys vernalis	Day	124NO53W Section 12,22			S4	G5
Swainson's Hawk Buteo swainsoni	Day	124NO53W Section 26	3C		S4B,SZN	G4
Sweetflag Acourus americanus	Day	124NO53W Section 22,26			S4	G5
Tall Cottongrass Eriophorum polystachion	Day	124NO53W Section 36			S3	G5
Tawny Sedge Carex alopecoidea	Day	124NO53W Section 26			S2	G5
Wild Rice Zizania aquatica	Day	124NO53W Section 23			S4	G5

KEY TO CODES USED IN NATURAL HERITAGE DATABASE REPORTS

FEDERAL STATUS	LE = Listed endangered
	LT = Listed threatened
	LELT = Listed endangered in part of range, threatened in part of range
	C1 = Candidate for federal listing, information indicates that listing is justified.
	C2 = Candidate for federal listing, information to justify listing is not available.
	3A = Former candidate, rejected because presumed extinct or habitat destroyed
	3B = Former candidate, rejected because not recognized as a distinct taxon
	3C = Previous candidate for federal listing, rejected because more common, widespread or protected than previously known
STATE STATUS	SE = State Endangered
	ST = State Threatened

An endangered species is a species in danger of extinction throughout all or a significant portion of its range. (applied rangewide for federal status and statewide for state status)

A threatened species is a species likely to become endangered in the foreseeable future.

Global Rank	State Rank	Definition (applied rangewide for global rank and statewide for state rank)
G1	S1	Critically imperiled because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
G2	S2	Imperiled because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
G3	S3	Either very rare and local throughout its range, or found locally (even abundantly at some of its locations)in a restricted range, or vulnerable to extinction throughout its range because of other factors; in the range of 21 of 100 occurrences.
G4	S4	Apparently secure, though it may be quite rare in parts of its range, especially at the periphery. Cause for long term concern.
G5	S5	Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery.
GU	SU	Possibly in peril, but status uncertain, more information needed.
GH	SH	Historically known, may be rediscovered.
GX	SX	Believed extinct, historical records only.
G?	S?	Not yet ranked
_?	_?	Inexact rank
_T		Rank of subspecies or variety
_Q		Taxonomic status is questionable, rank may change with taxonomy
	SZ	No definable occurrences for conservation purposes, usually assigned to migrants
	SP	Potential exists for occurrence in the state, but no occurrences
	SR	Element reported for the state but no persuasive documentation
	SA	Accidental or casual

Bird species may have two state ranks, one for breeding (S#B) and one for nonbreeding seasons (S#N). Example: Ferruginous Hawk (S3B,SZN) indicates an S3 rank in breeding season and SZ in nonbreeding season.

Appendix E - 1991 Summer Fish Kill

- **Pollution Is A Factor In Pickerel Fish Kill**
- **Lake Problems Explained Here**
- **Making Waves At Pickerel Lake**

Pollution is a factor in Pickerel fish kill

by Dorinda Daniel

The dying of fish at Pickerel Lake last week indicates that the lake's water quality is declining, according to the Game, Fish and Parks Department's chief of fisheries.

GF&P personnel observed that approximately 200 fish died at the south end of the lake last week.

"I think this is an indicator that things are getting poorer," in regard to the water quality at Pickerel Lake, said Bob Hanten, chief of fisheries GF&P.

Until now, Pickerel Lake has been regarded as one of the best lakes in the state in terms of water quality.

"This serves as a good warning that bad things can happen if we don't get going on controlling pollutants coming into the lake," said Hanten.

This was not a complete kill of the fish in the lake, he emphasized. GF&P will be conducting a survey in September to determine the fish population at Pickerel Lake.

He explained what happened that caused the fish kill.

Over the years, a large amount of runoff and a large amount of organic material have been seeping into the Pickerel Lake watershed. Because of this, there are more nutrients in the lake. The nutrients are detrimental to the lake because they encourage heavy plant growth.

During the warm weather last week, the lake stratified (formed a colder bottom layer and a warmer surface layer). In the bottom layer, the oxygen was depleted because of the decomposition of organic matter.

A combination of windy weather and rain broke the stratification in the lake so the bottom layer mixed with the top layer. In the mixing process, gases that were toxic to fish mixed with the upper layer.

Might affect fishing

Because they were most susceptible to toxic gases, most of the fish that died were small.

"This may have an affect on the future (fish) population at Pickerel Lake, depending upon how extensive the kill was," said Hanten.

What happened at Pickerel Lake could occur at any lake with similar pollutants coming into the water, he stated.

A combination of factors over the years has contributed to pollution factors at the lake, Hanten said. These include

See POLLUTION Page 2

Webster R+F 8/26/91

CONTINUED FROM PAGE 1

seepage from septic tanks, manure runoff and soil erosion.

One of the solutions is for people who live around the lake to organize a sanitary sewer district, said Hanten.

All groups living around Pickerel Lake will need to work together to solve the problem, he said.

A Pickerel Lake Protection Project will start this fall. The purpose of the four-year project is to identify soil erosion and pollution within the Pickerel Lake watershed and to voluntarily treat these pollution sources and problems.

Participating agencies are the Day County Soil Conservation District, Soil Conservation Service, Cooperative Extension Service, South Dakota State University/Water Resources Institute, Agriculture Stabilization and Conservation Service and the S.D. Department of Environment and Natural Resources.

9/23/91

Lake problems explained here

Lakes are one of the greatest resources people have, and people need to realize that their actions are affecting lakes, according to Dave German of the Water Research Unit at South Dakota State University, Brookings.

People expect to pay for sewer and water services in town. Yet, when they go to lakes they want things as cheaply as possible, he said.

According to German, this is part of the westward movement, when people moved west to an area and polluted it, moved further west to another area and polluted it, then moved on to another area.

"There's no place west of here to go. We've got to quit doing that," German said.

During an Izaak Walton League meeting in Webster Thursday night, German listed what he believed caused a fish kill at Pickerel Lake in August.

"What is significant to me (about the fish kill) was that this is the first time we know about that happening," he said.

The Game, Fish and Parks Department netted at Pickerel Lake last week to determine the severity of the fish kill. Dave Lucchesi, fisheries research biologist at the Webster GF&P office, said they netted a lot of adult perch, some adult walleyes and smallmouth bass.

"It appears that there was a partial kill, but it appears that the fishery is still in pretty good condition," he said.

Monitoring 20 lakes

German is monitoring 20 lakes in South Dakota where the quality of water is still good to see what changes are occurring in the lakes. His efforts are directed to try to preserve or improve the quality of these lakes. Tests were conducted at the lakes in mid-June, mid-July and mid-August.

Pickerel Lake is one of the lakes in the study.

According to tests, Pickerel Lake had good concentrations of oxygen at all levels in mid-June and there was not too much difference in water temperature at all depths of the lake.

In mid-July, tests showed a stronger difference in temperatures, mainly in the top 10 feet. A bit more algae was noted in the water and light penetration was reduced because of the algae. The lower area of water was also starting to lose oxygen.

"We can affect this," German said.

He was at the lake after a storm and noticed more runoff than he had ever seen before in the lake. German grew up about three miles from Pickerel Lake.

"The demands of the people living around the lake, cattle and human waste contribute to this," he stated.

On Aug. 18, German was again at the lake conducting tests. He noticed that there was little oxygen in the water below 15 feet and that stratification had occurred (there was a warmer upper layer and a colder bottom layer).

When this happens several things can

See LAKE PROBLEMS Page 2

CONTINUED FROM PAGE 1

occur, German said. Ammonia and gasses that are toxic to fish can be released.

A strong wind came up and mixed the upper layer of water with the lower layer that contained the poisonous gasses.

On Aug. 21, Game, Fish and Parks officials observed that about 200 small fish had died at the lake.

When tests were made at the lake Aug. 23, it was found that the wind had mixed a chunk of water containing poisonous gasses with the upper water. The water had been reoxygenated to a depth of 25 feet.

"Those are some things that can kill fish," German said. "I don't know for sure what killed the fish, but this had the potential to, and I believe this had something to do with it."

Could another fish kill occur at Pickerel Lake?

"I doubt if the conditions that set this up would happen frequently," German said. The frequency would depend on the demands that are placed on the lake.

Everything that grew in the lake that needed oxygen, animal waste and human waste all contributed to the conditions that caused the fish kill, he said.

Less severe at Enemy Swim

Enemy Swim is another of the lakes in the study and German told what the tests revealed about that lake. In mid-June, Enemy Swim had good oxygen levels and was weakly stratified. In mid-July, German began seeing some stratification. In mid-August there was some depletion of oxygen, but the oxygen was never totally depleted.

"So Enemy Swim did about the same thing but not as severely," German said.

Stockade Lake in the Black Hills is another lake in the study. Tests during the summer showed no oxygen below 10 feet and stratification. Custer used to dump sewage into this lake for years, German said. Even though the lake has been dredged, it still shows the effects of sewage, he stated. This shows that once something is put into a lake, it is difficult to get it out and that lakes are difficult to restore once they have been damaged, he emphasized.

"When we come to a lake to enjoy it, we always leave things there. When something goes down through the soil, it will move along until it comes out into the lake," he said.

German said he has found in his studies that the smaller the watershed, the greater impact people have on the lake. Pickerel Lake has a fairly small watershed.

He will begin a study of the Pickerel Lake watershed this fall. The project will identify soil erosion and pollution within the watershed and voluntarily treat these pollution sources and problems.

Efforts are underway to form a sanitary sewer district at Pickerel Lake. Basically, sewage will be collected and transported away from the lake for treatment, German explained.

Making waves at Pickerel Lake

Were dead lobsters on wave-maker's beach a threat or joke?

By RUSS KEEN
American News Writer

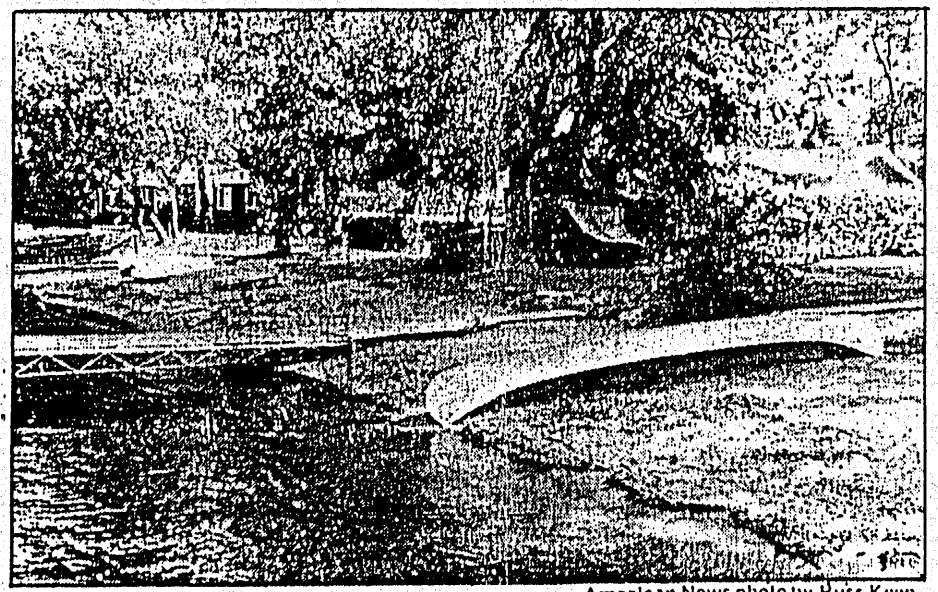
Five dead lobsters and a bloated rat appeared on a beach at Pickerel Lake over Labor Day weekend, near homes of people rocking the boat with environmental questions.

Maybe the dead creatures are someone's idea of humor, or maybe they're a veiled threat of some sort, says lake dweller Penny Rhinehart, one of those who last week called a public meeting about sewage-like water she and others claim construction workers pumped into the lake in northeast Day County.

"Some people are very upset that any fuss has been made. Whenever you make waves, people do get a little uneasy," Rhinehart says.

"That's the thing that is scary about this," says Joe Pearson, another seasonal lake dweller. "It's the Old West mentality that if anybody speaks up about this, there's going to be some problems for them."

Rhinehart hopes not. "Maybe they're just trying to say, 'Oh, you guys were talking so much about the fish kill and worrying about the sewage, so now we're really going to pull your leg a little bit,' " she says.



American News photo by Russ Keen

Dead fish recently washed up on this stretch of sand on Pickerel Lake's south side; dead saltwater lobster later appeared on the same shore near homes of lake dwellers who made waves by asking questions.

Dead fish washed ashore on the lake's south side Aug. 20, during the same week residents say they witnessed sewage-like water being pumped into the lake by workers with Abbott, Arne Schwindt Inc. The Moorhead, Minn., company has a contract with WEB Water Development Association and is hooking up WEB water pipes to some Pickerel Lake homes.

WEB is in the business of delivering treated Missouri River water to towns, farms and residences in much of northeastern South Dakota.

As Abbott, Arne Schwindt workers dig trenches to lay pipes near Pickerel Lake's south shore, they are evidently encountering groundwater that is sewage-like because of septic-tank drain fields, says WEB Manager Arden Wallum.

Game, Fish and Parks officials contend it is highly plausible that fish died when high winds and high temperatures mixed an oxygen-depleted deep layer of water with a fish-inhabited, higher layer of water, a situation the officials say is unrelated to the contractor's presence.

But Game, Fish and Parks is not ruling out other explanations for the dead fish.

Game, Fish and Parks officials estimate 200 dead fish washed ashore. Sally Roesch-Wagner, another lake resident concerned about the sewage, says there were many more dead fish than officials estimate.

(Please see LAKE, Page 8A)

(Continued from Page 1A)

"Most of the dead fish never washed up to shore," she says. Dead fish lined the bottom of the lake along shore, as far out as the lake bottom was visible, she said.

Rhinehart said most seasonal dwellers of the lake's south side don't realize the scope of the fish kill because they weren't at their lake homes on Aug. 20.

"There was hardly anybody here to see the dead fish," Rhinehart said. "It was just startling to me. I've been out here all my life and I had never seen fish swimming vertical with their face right up to the top of the water, gasping for air. It just freaked me out."

Game, Fish and Parks officials arrived the next day, Aug. 21, to inspect the fish kill, Roesch-Wagner said.

"By then, everything was gone. All the dead fish lining the bottom of the lake were gone," she said. The unusual reddish-brown color in the south end of the lake Aug. 20 was also gone the next day, Roesch-Wagner said.

Penny Rhinehart's husband, Stan Rhinehart, said "huge rains and a strong wind" the night of Aug. 20 might have dissipated the dead fish and odd lake color.

Roesch-Wagner, who frequently swims laps in the lake, says she became ill toward the end of last week. She said her doctor told her Aug. 30 that her white blood cell count was elevated. The doctor said swimming in water with sewage in it could be one explanation for the elevated count, "But I don't know for sure that's what caused it," Roesch-Wagner said.

Whether or not it caused illness or dead fish, sewage-like water definitely entered the lake, says Kris Gruba, 15, who publishes a newsletter several times a year for fellow lake dwellers. He says he took a picture of the sewage water running into the lake on Aug. 28.

After snapping the picture, Gruba says he was paddle-boating on the lake when a worker ran out on a dock and yelled, "Hey kid, give me your camera or I'm going to take the film out and shove it where the sun don't shine."

"But he used worse language than that," Gruba said.

Roesch-Wagner — it was on her family's property that the lobsters showed up — says the dead animals felt like a threat. And so did some comments from WEB Manager Arden Wallum, says Rhinehart.

"He threatened people about taking away WEB water from Pickerel Lake," Rhinehart says.

Says Roesch-Wagner, "One of the major concerns to come out of that meeting is, if we continue to question the procedures, does that mean we will lose WEB?"

He did not issue threats, Wallum said.

"Frankly, I resent the fact we have to respond to such accusations," Wallum says. "I merely said that if there is a lot of groundwater contamination in this area, then this might be a bad area for us to serve. But unless somebody proves to me there is a problem, I don't see any reason to discontinue service.

"I said if it gets to be too much of a hassle to service this area, then it may not be feasible for us to serve this area. That was not a threat," Wallum said. The hassle is not people raising questions, he said; the hassle would come from any possible general groundwater contamination.

"We are providing water there because people feel their own wells could be contaminated. We are there to try to make the environment better, not worse," Wallum said.

And if there is contamination, it was there long before WEB arrived, Wallum said.

"All the contractor did was dig a hole," Wallum said; the sewage-like water was already there.

"And if there is a lot of groundwater contamination, that contamination is probably seeping into the lake stream anyhow," Wallum said.

"We're not trying to point our finger at Arden," says Rhinehart. "We just want information. We just want to know. We're concerned about our great-grandchildren being able to use the lake."

Earl Magnuson, project manager with Abbott, Arne Schwindt, arrived in Aberdeen this week and met with WEB officials. He plans to speak to the issues later this week.

"It will take at least a couple days for me to gather all the information I need before I comment. I really know so little about it at this point," Magnuson said.

He added that Abbott, Arne Schwindt's contract with WEB clearly states that the contractor, not WEB, is responsible for meeting all state and federal regulations governing the construction project.

Wallum said Abbott, Arne Schwindt has an outstanding reputation for complying with government rules.

"If they had a questionable reputation, we never would have awarded them the contract. But they don't," Wallum said.

Some answers are expected when testing of water samples is finished in Pierre, says Jay Cofer, regional office manager of the South Dakota Department of Environment and Natural Resources at Watertown.

"Samples we collected from the lake will give us an indication if there was any difference in water quality on the south side compared to the rest of the lake," Cofer said Tuesday. "Samples will tell us if there is any definitive answer as to the cause of the fish kill."

Whether or not the sewage-like water allegedly pumped into the lake is connected with the fish kill, a fine against the contractor is still possible, Cofer said. Samples also were taken of water discharged from construction trenches.

"Results will tell us if there is any sewage in it. There are no charges filed yet, but if that water discharged from construction trenches does not meet state water quality standards, the state has the option of issuing a notice of violation, or a legal suit against the contractor," Cofer says. The maximum fine on the state level is $10,000 per violation, he said.

Appendix F
Pickerel Lake Sanitary Sewer District

- Election On Sanitary District Is Sept. 4
- District Approved
- Plans, Cost For Pickerel Project Are Explained
- Pickerel Lake Sanitary District Okays Ordinance
- District Boundary Map
- Project Outline
- Project Cost Estimate
- Property Owner Survey & Results
- Letters of Support

Election on sanitary district is Sept. 4

An election to incorporate a sanitary district at Pickerel Lake will be this Friday, Sept. 4, at Pickerel Lake Lodge. Polls will be open from 8 a.m.-7 p.m.

If incorporating the district is approved by the majority of voters, another election will take place to elect a three member board of directors. These directors will make decisions regarding the district.

The proposed sanitary district includes all the homes around Pickerel Lake, the two state recreation areas and some land adjacent to the lake. Only people registered to vote within the boundaries of the proposed district may vote in this Friday's election.

A sanitary district is a legal subdivision of the state. It can be formed for waste treatment services, drinking water or garbage disposal. There are about 30 sanitary districts in South Dakota.

Because sanitary districts are a government entity, they have taxing authority. Individuals have a say through the board elected by those in the district. Sanitary districts are eligible for grants and loans that non-entities are not eligible for.

Says district is necessary

"A sanitary district is necessary because there's no doubt sewage is seeping into the lake," said Jim Porter, who lives at Pickerel Lake. " If we want good water quality in the future, we're going to have to start cleaning up the lake now and get proper septic tanks or a sewer system around the lake."

While sewage is not being pumped directly into the lake, it is seeping in through ground water and through old drainage fields, he said. Some septic tanks are 35 years old, he said.

The lake probably receives three times the use it did 15 years ago, according to Porter. More people are staying year-round at the lake and more people with cabins are coming earlier in the spring and staying later in the fall.

There are about 300 homes around the lake.

The vast majority of the lake residents he's talked to are in favor of establishing a sanitary district, Porter said.

"Everybody is concerned about water quality," he said. "We want to get the lake cleaned up so no pollution is going in. We want the lake cleaned up no matter what we have to do to get it done."

Lake is in trouble

A Pickerel Lake Protection Project has begun at the lake. The purpose of the four-year project is to prevent the lake's water quality from deteriorating by reducing the pollutants that are entering the lake from its watershed and shoreline areas. Two of the agencies involved are the Water Resources Institute at South Dakota State University in Brookings and the Soil Conservation Service.

Dave German of the Water Resources Institute is mapping areas of Pickerel Lake's watershed that are important in terms of water quality at the lake.

"The water quality in Pickerel is better than at a lot of lakes, but both last year and this year I saw evidence of depletion of oxygen at lower levels," he said. "The lake is definitely showing signs of trouble. When I take samples of water, I see decreased oxygen levels, algae blooms and weed growth. That lake can be better than this if it's treated properly."

German supports forming a sanitary district at the lake and believes it will benefit the protection project.

"I don't think we'll have credibility in talking to farmers about controlling erosion and stopping animal waste from getting into the lake if the people living around the lake haven't controlled their pollution," he said.

Some people may believe that those

See SANITARY Page 3

Sanitary

CONTINUED FROM PAGE 1

living around the lake are not causing pollution in the lake. The belief is not based on fact, said German.

"You can't have that many cabins around a lake and not impact water quality," he stated.

Tim Nordquist of the Day County SCS office said, "It'll be great news if an adequate sanitary system for Pickerel Lake comes into being. With that, in addition to the measures planned for reducing agricultural pollutants and controlling shoreline erosion, all the pieces will be in place for ensuring the high quality of the lake for many years to come."

District approved

Voters unanimously approved incorporating a sanitary district at Pickerel Lake during an election Friday. A total of 52 people voted, all casting ballots in favor of incorporating the sanitary district.

Day County commissioners will canvass the votes at their meeting this Tuesday and set a date to elect a three member board of directors for the sanitary district.

9/7/92

About 160 attend

Plans, cost for Pickerel project are explained

An estimated 160 Pickerel Lake property and cabin owners spent an hour and a half at a public meeting July 17 listening and asking questions about the proposed Pickerel Lake Sanitary District.

Projected cost to build the system is $2.1 million, with operation and maintenance expense listed at about $20,000 annually.

Initial hookup fee for each cabin/home is estimated at $800-$1,200. Based on 319 users, annual cost per user is estimated at $246.96, or $20.58 per month.

Plan to apply for funds

The next step will be to apply for funding for the project. If funding can be obtained, a vote would be held on whether or not to proceed with the project.

Officers of the sanitary district are Peter John Monzel, president/trustee; Jim Porter and Harold Slinden, trustees; Lucy Parker, clerk. Terry Helms of Aberdeen is consulting engineer, and Jerry Lammers of Madison is attorney and Ambrose Mitzel of Aberdeen is CPA.

It was pointed out by Monzel that the entire project depends upon the district obtaining grants and loans.

He told the *Reporter & Farmer* after the meeting, "The project is basically on schedule, and if we can get our funds lined up we would like to start construction the spring of 1994, completing it in 1995. If we have to borrow all the money however, the project will not be feasible. The more money the district can come up with, the more state grant money the district has an opportunity to obtain."

Gray water system proposed

Helms explained that a gray water system will be used for the sanitary operation. Basically, the pipe system will connect at the discharge point of each cabin/home septic tank and transport the gray water from the tanks to a lift station at the south end of the lake. The water will then be treated and end up in a total stabilizing pond. About 10 pumping stations will be used in the system.

Helms said a gray water system is being used instead of a solid waste gravity system because the latter would be too expensive. Cabin/home owners will be responsible for having the solid waste pumped out of their tanks when necessary and transported away by private operators at the expense of owners.

The consulting engineer, who has been assisting with the proposal for 16 months, noted that people on the lake have shown a lot of interest in the project. He sent out 319 survey forms for input and received over 200 back.

Of the 319 property owners on the lake, 75 list their permanent address as the lake. It was explained that those with a permanent lake address will vote on the project, according to state law.

Type of funding explained

Helms noted that the types of funding being looked at for the project, with estimated figures, are:

- Community development block grant program–$400,000.
- Farmers Home Administration grant–$250,000.
- State revolving loan fund, 20 years at 5 percent–$500,000.
- Farmers Home Administration loan, 5 1/2 percent at 40 years–$300,000.
- Consolidated Water Facility Construction Program Grant–$300,000.

Monzel emphasized that no grants are firm at this point.

Skadsen gives an overview

Dennis Skadsen, coordinator for the Pickerel Lake Protection Project (not connected with the sanitary district) gave an overview of Pickerel Lake, relating that studies on the lake since the 1970s are being reviewed. He noted that

See PLANS, COST Page 3

Plans, cost for Pickerel

CONTINUED FROM PAGE 1

the lake has very good water, but is showing signs of developing problems from ag runoff, shore erosion, wind erosion and septic tank leakage (gray water from septic tanks is among the main polluters of a lake).

Skadsen added that because Pickerel is showing potential for problems in the future, it was decided to set up a protection project, and about $388,000 is available for that purpose. He emphasized that it is a lot less expensive to protect a lake than to have to restore it.

Pickerel has a rather small watershed which is a plus for the lake, and he noted that it is important to address animal waste areas that can flow into the lake. "We want to put in ag waste systems where needed to hold waste and then redistribute it," he said. "Even fertilizing a lawn on the lake can affect it."

Questions answered

Some of the questions asked during the meeting, and answers included:

• Q–My property is on Indian land. What will happen? A–The Bureau of Indian Affairs is in favor of the project, but doesn't have a completed plan drawn up. They are willing to work with us and be a part of a protection program.

• Q–I have 4 1/2 lots. Do I have to pay for a hook-up for all of them. A–The hook-up fee will be only on the structure.

• Q–What will happen to the solid waste? A–The septic tank owner will be responsible for having it pumped out. Because the sanitary system will be taking care of the gray water, cabin owners won't have to pump the tank nearly as often as they do now.

• Q–What types of septic tanks will be allowable? A–About 200 homes have concrete septic tanks, which are allowable if they are okay. Metal tanks won't be allowed, fiberglass tanks may be. Tanks that don't meet specifications will have to be replaced. A 1,000 gallon tank is preferred.

• Q–Will the sanitary sewer system affect the value of my property? A–It should enhance the value of your property.

• Q–Can a property owner at the lake who does not now list the lake as their permanent address, change it to the lake? A–Technically, it may be possible to change your address to the lake to vote on the project and then change it back.

• Q–How will Game, Fish & Parks be charged? A–A GF&P official said it is assumed that GF&P will pay hookup fees and other expenses like everyone else. GF&P thinks the project is a great idea.

• Q–What if the the sewer backs into our basement? Who is liable? A–We have no real answer at this point. An owner can use a backup check valve to provide protection when they are going to be away for awhile.

• Q–After this project is completed, how much will it improve the lake? A–Some who completed similar projects have said they have noticed an improvement. You have to improve both watershed and septic system to make a difference.

• One property owner said he was irritated because the project is pretty much a done deal, and asked if property owners have any say at this time. He was basically told that as a property owner he can still provide input, but would have to decide whether he wanted to list the lake as his residence in order to vote on the project, or keep his present address and not be involved in the vote.

In answer to the complaint by the above property owner, another answered by saying his family had only owned property at Pickerel for two years. He emphasized that his family drives 100 miles one way to enjoy the lake because they lost the lake where they live. He concluded that Pickerel is a beautiful lake and advised people to take care of it.

His comments brought applause from the crowd. . .and the meeting to a close.

Pickerel Lake Sanitary District okays ordinance

ORDINANCE NO. 1

AN ORDINANCE in and for Pickerel Lake Sanitary District, Day County, South Dakota, regulating the use of sewers, drains, and disposal systems; regulating the construction, maintenance and use of wastewater treatment systems and facilities; regulating the installation and connection of building sewers; providing a permit system and the forms therefore; providing for rules and regulations in reference to the foregoing; providing penalties for violations; and providing for variances.

BE IT ORDAINED AND ENACTED by the Board of Trustees of Pickerel Lake Sanitary District, Day County, South Dakota, as follows:

TITLE I

SEWER AND WASTEWATER TREATMENT

Chapter Contents

CHAPTER
1.01 Definitions
1.02 General Provisions
1.03 Wastewater Treatment
1.04 Superintendent and Inspectors
1.05 Permit System and Forms
1.06 Rules and Regulations
1.07 Penal Provisions
1.08 Variances
1.09 Validity

CHAPTER 1.01
DEFINITIONS
Section Contents

Section
1.0101 Definition of Terms

Content

1. "Refuse" shall mean and include any waste product composed wholly or partly of such materials as garbage, trash, rubbish, litter, accumulated waste material, cans, containers, tires, junk, or other such substance which may become a nuisance.

2. "Garbage" shall mean every accumulation of animal, vegetable, or other matter that attends the preparation, consumption, decay, dealing in or storage of meats, fish, fowl, birds, fruit or vegetables, including the cans, containers, or wrappers wasted along with such materials.

3. "Rubbish" shall mean wood, leaves, trimmings from shrubs, dead trees, or branches thereof, shavings, sawdust, excelsiors, wooden ware, dodgers, printed matter, paper, paper board, pasteboard, grass, rags, straw, boots, shoes, hats, and all other combustible material not included under the term "garbage".

4. "Industrial waste" shall mean the liquid waste from industrial manufacturing processes, trade, or business as distinct from sanitary sewage.

5. "Person" shall mean any individual firm, company, association, society, corporation, or group.

6. "Sewer" shall mean a type of conduit for carrying wastewater.

7. "Storm drain" or "Storm Sewer" shall mean a sewer which carries storm and surface water drainage, but excludes wastewater and industrial waste, other than undiluted cooling water.

8. "Water course" shall mean a channel in which a flow of water occurs, either continuously or intermittently.

9. "District" shall mean that Pickerel Lake Sanitary District, Day County, South Dakota.

10. "Superintendent" shall mean the person appointed by the Board of Trustees and by said board appointed and designated as the Superintendent of wastewater works for the Pickerel Lake Sanitary District; or a duly appointed member of the Board of Trustees who is authorized to act in the place instead of, such Superintendent.

11. "Inspector" shall mean any authorized deputy, agent or representative of the Superintendent or person appointed as such either by the Superintendent or by the Board of Trustees.

12. "Shall" is mandatory; "May" is permissive.

Terms not listed above may be defined in South Dakota's "Individual and Small On-Site Wastewater Systems" Regulations, as currently amended.

CHAPTER 1.02
GENERAL PROVISIONS
Section Contents

Section
1.0201 Ordinance in force
1.0202 Approved method of treatment required
1.0203 Treatment systems allowed
1.0204 Approved flushed toilets required
1.0205 Notice to install approved toilets
1.0206 Duty imposed upon owner of property
1.0207 Certain acts, deeds and conduct deemed illegal
1.0208 Validity clause

Content

1.0201 This Ordinance, entitled SEWER and WASTEWATER TREATMENT, shall be in full force and effect from and after its passage, approval, recording and publication as provided by law.

1.0202 Approved method of treatment required. Every residence and building within the territorial limits of the Pickerel Lake Sanitary District, Day County, South Dakota, in which human beings reside, are employed or congregate, shall be provided with an approved method of wastewater treatment in a manner which does not cause pollution of ground or surface waters, or does not create a public health problem or odor as required by this Ordinance.

1.0203 Treatment system allowed. Only the following methods of treatment shall be permitted within the limits of the District.

1.0204 Approved toilets required. Every residence, building or area in which human beings reside, are employed or congregate shall be provided with approved toilets and the contents from said toilets shall be discharged into a wastewater treatment systems and such private system to be constructed in accordance with rules and regulations approved by the Department of Water and Natural Resources of the State of South Dakota, and the applicable provisions of this Ordinance.

1.0205 Notice to install approved toilets. The owner or occupant of any residence or building within the District not provided with water flushed or approved toilets and such residence or building being a place in which human beings reside, are employed or congregate, shall cause water flushed or approved toilets to be installed in said residence or building and connected to an approved wastewater treatment system or holding tank, in the event a public sewer is not accessible, and shall do so within ninety days after receipt of written notice from Pickerel Lake Sanitary District to provide sanitary approved toilets connected to an approved wastewater treatment system.

1.0206 Duty imposed upon owner of property. It is hereby made the specific obligation and duty of the owner of any premises within the limits of the District where human beings reside, are employed or congregate, to provide approved toilets and a method of wastewater treatment to comply with the terms of this Ordinance.

1.0207 Certain acts, deeds and conduct deemed illegal. The following acts, deeds and conduct are hereby deemed illegal and unlawful.

(1) It shall be unlawful for any person to place, deposit, or permit to be deposited in any unsanitary manner on public or private property within the district any human or animal excrement, garbage, rubbish or refuse.

(2) It shall be unlawful to discharge into Pickerel Lake, or into any water course, any wastewater or other polluted waters.

(3) Except as provided in this Ordinance, it shall be unlawful for any person to construct or maintain any privy, vault privy, septic tank or other facility intended or to be used for the treatment of wastewater within the District.

1.0208 Validity clause. The invalidity of any section, subsection, clause, sentence or provision of this Ordinance shall not affect the validity of any other part of this Ordinance which can be given effect without such invalid part or parts.

CHAPTER 1.03
PRIVATE WASTEWATER TREATMENT
Section Contents

Section
1.0301 When authorized
1.0302 Permit requirement
1.0303 Requirements of a disposal system
1.0304 Separate system for each building; exception
1.0305 Excavation safeguard
1.0306 Maintained in a sanitary manner
1.0307 Costs and expenses of installation and maintenance
1.0308 Certification of Installers

Contents

1.0301 Each building sewer shall be connected to a wastewater treatment system complying with the provisions of this chapter and South Dakota's "Individual and Small On-Site Wastewater Systems" Regulations, as currently amended.

1.0302 Permit requirement. A written permit is required from the District before commencing the construction of a wastewater treatment system and subject to the following provisions:

(1) The permit for construction of a wastewater treatment system is hereby designated as a "Class A Sewer Permit".

(2) Before commencing the construction of a wastewater treatment system, the owner or his agent shall first obtain a written permit, issued pursuant to application on the proper form as elsewhere provided for in this Ordinance, signed by the District; and,

(3) A permit and inspection fee of $20.00 shall be paid to the District at the same time such application is filed with the District and before such application may be acted upon or any permit issued therefore.

(4) The issuance of the permit shall authorize the applicant to proceed with the construction of the system but does not authorize any connection with or to the building sewer until the installation of the wastewater treatment has been completed to the satisfaction of the District.

(5) The District shall be allowed to inspect all phases of the work at any stage of construction and, in any event, the applicant for the permit shall notify the District when the work is ready for final inspection and before any underground portions are covered. The inspection by the District shall be made within twenty-four hours after receipt of the notice by him and shall include an inspection of the underground portions, septic tank or tanks, distribution box, absorption field, and all other parts and phase of the system.

(6) No permit shall be issued for any wastewater treatment system employing subsurface soil absorption facilities where the area of the lot is less than 20,000 square feet. The requirements of this section do not apply where wastewater is emptied into a holding tank as approved by the District.

1.0303 Requirements of a private wastewater treatment system. The following provisions for the location, construction, installation and materials of a wastewater treatment system shall be applicable:

(1) The type, capacities, location and layout of a wastewater treatment system shall comply with all the rules and regulations as currently approved by the Department of Environment and Natural Resources of the State of South Dakota, and the applicable provisions of this Ordinance.

(2) The size, slope, alignment, materials for construction of the wastewater treatment system, the methods to be used in excavating, the placing of the pipe and the joining and testing and the size thereof, and the backfilling of the trenches, shall all conform to the provisions and procedures set forth in this Ordinance.

1.0304 Separate system for each building; exception. A separate and independent wastewater system shall be provided for every building, provided, however, that where a building stands at the rear of another or on an interior lot and it so located that no wastewater treatment system used for the front building may be extended to the rear building and the whole may be considered as one wastewater treatment system. If such a combined system is to be constructed, plans and specifications must be approved by the District.

1.0305 Excavation safeguards. All excavations for any wastewater treatment system installation shall be adequately guarded with barricades and lights so as to protect the public from any hazards thereof; and, any streets, sidewalks, parkways, or other public property, disturbed in the course of work shall be restored in a manner satisfactory to the public authority having the supervision and control thereof.

1.0306 Maintained in a sanitary manner. The owner of each wastewater treatment system shall operate and maintain the same and its facilities in a sanitary manner at all times and at no expense to the District.

1.0307 Costs and expenses of installation and maintenance. All costs and expenses incident or necessary to and for the installation and maintenance and repair of wastewater treatment systems shall be borne by the owner; and, the owner shall indemnify the District from any loss or damage that may directly or indirectly be occasioned by such installation, maintenance or repair of such wastewater treatment system.

1.0308 Certification of Installers. No person or firm shall engage in the business of installation or repair of wastewater treatment systems without first obtaining a certificate to conduct such activities from the Department of Environment and Natural Resources.

CHAPTER 1.04
SUPERINTENDENT AND INSPECTORS
Section Contents

1.0401 Appointment of a Superintendent
1.0402 Appointment of Inspectors
1.0403 Powers and duties

Content

1.0401 Appointment of a Superintendent. The Board may appoint and designate a person to act as and be known as the "Sanitary Superintendent" of the District, upon such qualifications, for such time and salary as the Board may determine from time to time; and, provided further, such person may be a member of the Board.

1.0402 Appointment of Inspectors. The Board may appoint and hire such number of Inspectors and upon such qualifications, term and pay that may be directed by the Board.

1.0403 Power and duties. The Superintendent and his Inspectors shall have the powers and perform the duties as follows:

(1) To perform all of the acts and duties necessarily required to be performed or done by them as required by a provision of this ordinance.

(2) The Superintendent and Inspectors, bearing proper credentials and identification, and giving notification, shall be permitted to enter all properties for the purpose of inspection, observation, measurement, and testing in accordance with the provisions of this Ordinance.

CHAPTER 1.05
PERMIT SYSTEM AND FORMS
Section Contents

Section
1.0501 Class of Application and Permit
1.0502 Class A sewer permit application and form

Content

1.0501 Class of application and permit. The District does hereby provide for the following class of application and permit:

(1) An application and permit for the installation and connection of a wastewater treatment system and to be designated as a "Class A Sewer Application and Permit".

1.0502 Class A sewer permit application and form. The following is the suggested form and content, but not limited to the same, for a Class A Sewer Application and Permit:

CLASS A SEWER APPLICATION AND PERMIT TO PICKEREL LAKE SANITARY DISTRICT:

The undersigned, being the _____ (owner) _____ (owner's agent) of the property located at _____ does hereby request a permit to install a wastewater treatment system and facilities to serve a _____ (residential building) _____ (commercial building) at said location and do hereby furnish the following information in reference to the same:

1. The proposed system and facilities will include the following: _____

_____

and to be constructed in complete accordance with the plans and specifications hereunto attaches as Exhibit "A".

2. The area of the property lot to be served and on which the building located is _____ square feet.

3. The name and address of the person or firm who will perform the work is: _____.

4. The maximum number of persons to be ordinarily served by the proposed system and facility is _____.

5. The locations and nature of all sources of private or public water supply within one hundred fifty (150) feet of any boundary line of said property lot are as shown on the plat hereunto attached as Exhibit "B".

In consideration of the granting of this Permit, the undersigned does hereby further agree as follows:

(a) To furnish any additional information relating to the proposed work that shall be requested by the District.

(b) To accept and abide by all applicable provisions of the ordinance on SEWER AND WASTEWATER TREATMENT of Pickerel Lake Sanitary District of Day County, South Dakota, and all other pertinent and applicable rules, regulations and specifications.

(c) To operate and maintain the wastewater treatment facilities covered by this application in a sanitary manner at all times and at no expense to the District.

(d) To notify the District not less than twenty-four (24) hours prior to commencement of the work proposed; and, again to notify the Superintendent when the system is ready for final inspection before connection with any building sewer and before any portion of the work is covered.

Dated this ____ day of _____ 199_.

_____
(owner) (owners agent)

Address of applicant is:

_____

_____

_____

Fee of $20.00 paid _____.

Application approved and permit is hereby granted on this _____ day of _____ 199_.

PICKEREL LAKE SANITARY DISTRICT

CHAPTER 1.06
RULES AND REGULATIONS
Section Contents

1.0601 Authority
1.0602 Procedure

Content

1.0601 Authority. The Board of Trustee of Pickerel Lake Sanitary District may from time to time adopt by Resolution such reasonable rules and regulations as deemed necessary and not inconsistent with any of the provisions of this Ordinance for the administration and enforcement of the provisions of this Ordinance relating to SEWER AND WASTEWATER TREATMENT.

1.0602 Procedure. The procedure by Resolution, as hereinabove provided for, shall be that as set forth by the laws of the State of South Dakota relating to Municipalities.

CHAPTER 1.07
PENAL PROVISIONS
Section Contents

Section
1.0701 Procedure
1.0702 Punishment
1.0703 Civil Redress

Content

1.0701 Procedure. Any person found to be violating any provisions of this Ordinance shall be served by the District with written notice stating the nature of the violation and provided a reasonable time limit for the satisfactory correction thereof. The offender shall, within the period of time stated in such Notice, permanently cease such violation or violations.

1.0702 Punishment. Any person who shall continue any violation continues shall be beyond the time limit provided for in 1.0701 above, shall be guilty of a Class II Misdemeanor. Each day in which such violation continues shall be deemed a separate offense.

1.0703 Civil Redress. Any person violating any of the provisions of this Ordinance shall be subject to any civil redress or remedy that might be available to the District under applicable laws of the State of South Dakota.

CHAPTER 1.08
VARIANCES
Section Contents

Section
1.0801 Exceptional Conditions.

(1) General. Only the Department of Environment and Natural Resources can grant variances to South Dakota Regulations. The District may grant variances from specific provisions of this ordinance, but only after determining that:

(a) There are unique circumstances or conditions affecting the property.

(b) The variance is necessary for the reasonable and acceptable development of the property in question.

(c) The granting of the variance will not be detrimental to the public welfare or injurious to adjacent property.

(d) The variance will not permit or encourage uses contrary to this Ordinance.

(2) Conditions. In approving variances, the District of Department of Environment and Natural Resources may require such conditions as will, in its judgement, secure substantially the objectives of the standards or requirements of this Ordinance.

(3) Procedures. A petition for any such variance shall be submitted in writing for the consideration of the District. The petition shall state fully the grounds for the application and all the facts relied upon by the petitioner.

CHAPTER 1.09
EFFECTIVE DATE
Section Contents

Section
1.0901 Effective date

Content

1.0901 Effective date. This Ordinance shall be in full force and effect from and after its passage, approval, recording, and publication as provided by law.

Pass and adopted by the Board of Trustees of Pickerel Lake Sanitary District, Day County, South Dakota, on the 13th day of May, 1993, by the following vote:

AYES: _____: Namely: Porter, Monzel
NAYS: _____: Namely: _____

Passed First Reading: Saturday, May 8, 1993. AYES: Porter, Slindee, Monzel

Passed Second Reading: AYES: Porter, Monzel

Published:

By: Peter John Monzel, President

ATTEST:

Lucy Parker, Clerk

Special meeting

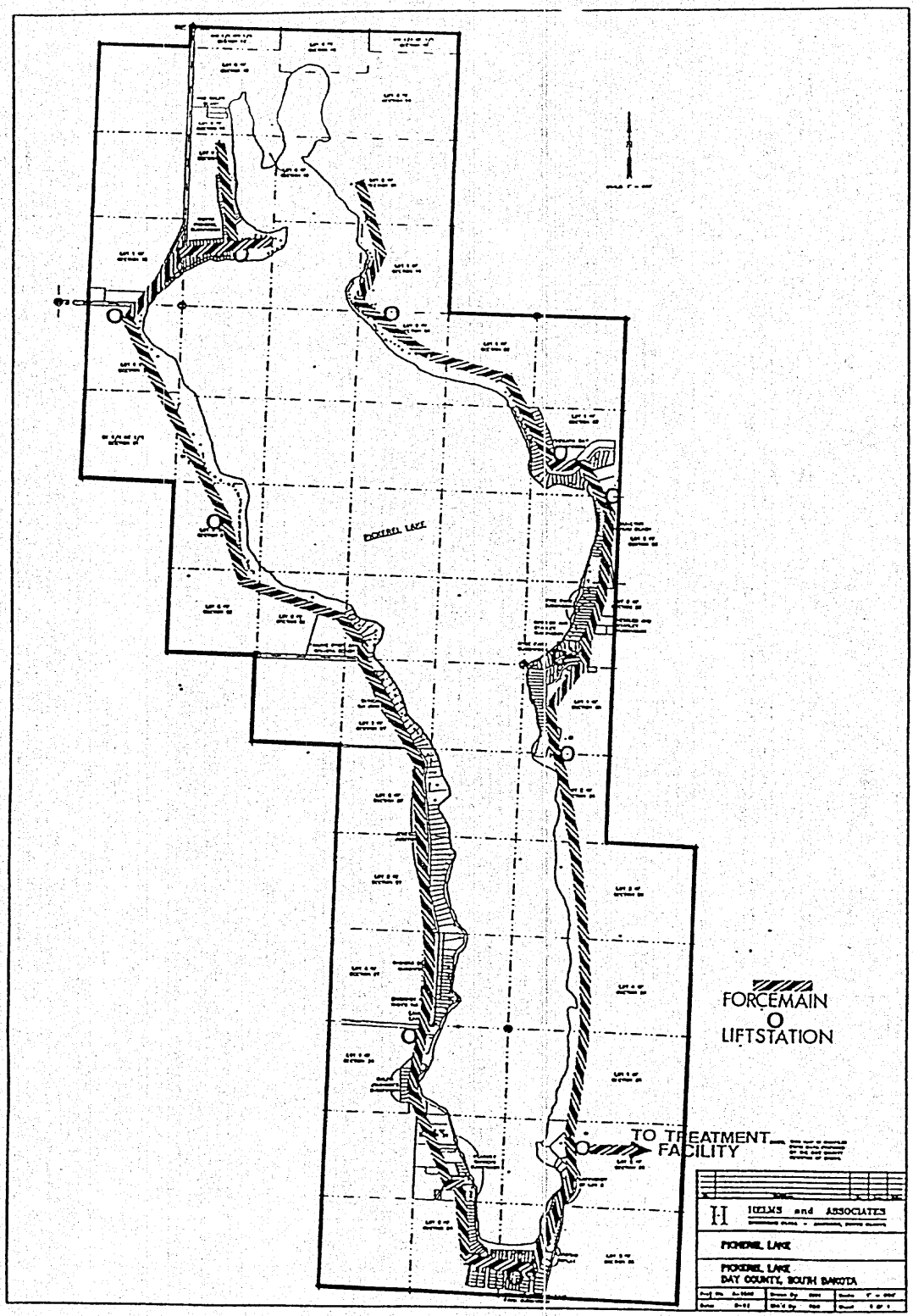
May 13, 1993 7:30 p.m.

President Monzel called the special meeting to order at 7:30 p.m. Present Porter, Monzel, Parker.

Ordinances: Motion to accept the second reading of Ordinance #1 made by Porter, second by Monzel. Motion carried.

Meeting adjourned at 8 p.m.

Lucy Parker, Clerk/treasurer


PICKEREL LAKE
FORCEMAIN
O
LIFTSTATION
TO TREATMENT FACILITY
HELMS and ASSOCIATES
PICKEREL LAKE
PICKEREL LAKE
DAY COUNTY, SOUTH DAKOTA

* Each home/cabin will be connected to the centralized collection system at the effluent discharge from the septic tank.

* Each home/cabin will be required to have a septic tank which meets the State of South Dakota requirements for size and construction.

* Upon completion of the installation or upgrading, to state standards, of individual septic tanks by the home/cabin owner, the Sanitary District will assume the operation, maintenance, and replacement costs of the septic tanks.

* The new system will be a gray water, low pressure, and small diameter gravity system in which some homes/cabins will utilize small diameter gravity sewer to convey the gray water effluent to the centralized collection system and some homes will utilize small pumping stations to pump the gray water effluent into the centralized collection system.

* Gray water is defined as the effluent from a septic tank which would normally discharge into a drainfield system.

* Homes/cabins that require a small pumping station will be required to pay the electric costs for operation of the pump.

* If several homes are connected to a small pumping station, each home/cabin will share an equal portion of the electric utility cost.

* Homes/cabins that require a small pumping station will not be required to maintain or service the pumping station. Maintenance and service of the small pumping stations will be the responsibility of the Sanitary District.

* All effluent collected from the individual homes/cabins will be conveyed to a wastewater stabilization pond facility located approximately 3/4 mile south of the southern portion of Pickerel Lake.

* The wastewater stabilization pond system will use a total retention wetland system which utilizes the natural processes of evaporation, transpiration, and seepage to treat and dispose of the wastewater. There will be no discharge of treated wastewater from this facility.

* During construction a representative of the Sanitary District will be on-site to meet with home/cabin owners to minimize disruptions and disturbances to the home/cabin owner and property.

* After completion of a home/cabin owners service connection, the contractor will fill and level all excavations and place a minimum of 4 inches of clean topsoil over the excavated areas. The home/cabin owner will be required to seed the area.

* Any sidewalks, retaining walls, or other structural systems, damaged by construction activities, will be repaired by the Contractor, to as good or better condition as part of the construction contract.

* Upon completion of the project, the Contractor will be required to provide a one year warranty to repair all trench settlements and other construction disturbances.

CAPITAL COST ESTIMATE
APRIL-1995
PICKEREL LAKE SANITARY DISTRICT
A-1920

TOTAL RETENTION WITH WETLANDS

ITEM	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	AMOUNT
1.	EXCAVATION	40000	YDS	$1.50	$60,000.00
2.	DIKE SEEDING	4.5	ACRE	$450.00	$2,025.00
3.	FENCING	3600	L.F.	$2.50	$9,000.00
4.	INTERPOND PIPING	300	L.F.	$30.00	$9,000.00
5.	POND MANHOLES	4	EA.	$4,000.00	$16,000.00
6.	INLET/OUTLET STRUCTURES	6	EA.	$1,000.00	$6,000.00
7.	DEPTH GAUGES	2	EA.	$500.00	$1,000.00
8.	WETLAND SEEDING	7	ACRE	$500.00	$3,500.00
9.	ACCESS ROAD	1	L.S.	$10,000.00	$10,000.00
10.	GRAVITY SEWER	800	L.F.	$10.00	$8,000.00
	CONSTRUCTION SUB-TOTALS				$124,525.00
	WASTEWATER COLLECTION SYSTEM				
1.	LARGE DUAL SYSTEM LIFT STATIONS	2	EA.	$50,000.00	$100,000.00
2.	LARGE SINGLE LIFT STATIONS	4	EA.	$25,000.00	$100,000.00
3.	SMALL SINGLE LIFT STATIONS	10	EA.	$10,000.00	$100,000.00
4.	SMALL PUMP & PIT	180	EA.	$2,000.00	$360,000.00
5.	MANHOLES	50	EA.	$1,200.00	$60,000.00
6.	CLEAN-OUTS	100	EA.	$250.00	$25,000.00
7.	AIR RELEASE MANHOLES	50	EA.	$2,200.00	$110,000.00
8.	6" GRAVITY SEWER PIPE	4300	L.F.	$10.00	$43,000.00
9.	4" FORCEMAIN PIPE	27000	L.F.	$6.00	$162,000.00
10.	3" FORCEMAIN PIPE	19000	L.F	$5.00	$95,000.00
11.	2" PRESSURE SERVICE PIPE	18000	L.F.	$5.00	$90,000.00
12.	4" GRAVITY SERVICE PIPE	14000	L.F.	$5.00	$70,000.00
13.	SERVICE CONNECT	320	EA.	$100.00	$32,000.00
14.	GRAVEL SURFACING	6000	TON	$6.00	$36,000.00
	CONSTRUCTION SUB-TOTALS				$1,383,000.00
	CONSTRUCTION CONTINGENCY				$151,000.00
	TOTAL CONSTRUCTION COSTS				$1,658,525.00
	SOILS INVESTIGATION/FACILITY PLAN				$20,000.00
	DESIGN ENGINEERING				$109,900.00
	CONSTRUCTION ENGINEERING				$180,000.00
	LAND				$10,000.00
	LEGAL AND ADMINISTRATION				$30,000.00
	INTERIM INTEREST				$30,000.00
	BONDING COST				$30,000.00
	INFLATION COST INCREASE @5%				$103,500.00
	TOTAL CAPITAL COST				$2,171,925.00

PICKEREL LAKE SANITARY DISTRICT
RR 1 BOX 52
GRENVILLE, SD 57239-9737

Peter John Monzel, President
Telephone 605-486-4697
P.O. Box 79
Grenville, SD 57239

Duane H. Podoll, Clerk
Telephone 605-486-4405

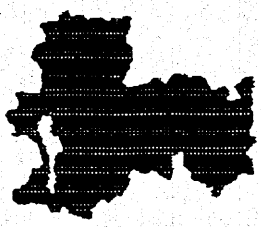
SURVEY

I am an owner of property located in the Pickerel Lake Sanitary District, and as such am interested in the preservation and enhancement of the water quality of Pickerel Lake. In this interest and based upon information provided, I support the project and encourage the Trustees of the District to continue the development of the project and the seeking of funding assistance.

_____ YES _____ NO

PROPERTY OWNER SURVEY RESULTS

		% of Return
Total number of Surveys mailed	295	
Total number of Surveys returned	244	82.71%
Number of Surveys returned with Yes	149	61.07%
Number of Surveys returned with NO	93	38.11%
Number of Surveys returned as UNDECIDED	2	.82%
Leased Property Surveys Mailed	46	
Leased Property Surveys Returned	35	76.09%
Leased Property Surveys Returned YES	9	25.71%
Leased Property Surveys Returned NO	26	74.29%
Owned Property Surveys Mailed	249	
Owned Property Surveys Returned	209	83.94%
Owned Property Surveys Returned YES	140	66.99%
Owned Property Surveys Returned NO	67	32.06%
Owned Property Surveys Returned UNDECIDED	2	0.95%



Pickerel Lake Protection Project
Day Conservation District
710 Main Street
Webster, SD 57274

Phone: 605/345-4661

20 March 1995

Pickerel Lake Sanitary Sewer District
Board of Directors
C/O Mr. Duane Podoll, Secretary
RR 1 Box 52
Grenville, SD 57239

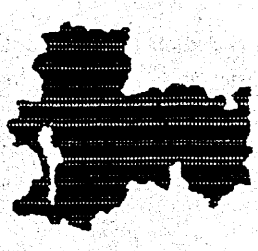
Dear Board Members,

We offer this letter in support of your efforts to obtain finds to protect Pickerel Lake from nonpoint source pollution. The future of Pickerel Lake is the responsibility of all lakeshore property owners, and watershed land owners/operators. By recognizing factors that degrade the quality of Pickerel Lake's water, and by taking steps now to protect the lake from both domestic and agricultural sources of nonpoint source pollution, we can keep Pickerel Lake counted among the ten cleanest lakes in South Dakota.

Our success with the Pickerel Lake Protection Project shows the willingness of agricultural landowners and operators to participate in preserving a unique natural resource. Watershed agricultural landowners and operators have taken note of lakeshore property owners support for the sewer district, thus increasing their willingness to cooperate with the Pickerel Lake Protection Project. The cooperation these diverse groups of people have shown for both projects should be noted by finding agencies and used to promote further protection and restoration of our lakes, rivers, and streams.

Sincerely,

Dennis Skadsen
Project Coordinator



Pickerel Lake Protection Project
Day Conservation District
710 Main Street
Webster, SD 57274

Phone: 605/345-4661

3 April 1995

Mr. James G. Bell, Chairman
Board of Water and Natural Resources
Dept. of Environment and Natural Resources
Joe Foss Bldg
523 East Capitol
Pierre, SD 57501-3181

Re: Pickerel Lake Sanitary District

Dear Mr. Bell,

It has come to my attention that at the Board Meeting of 22 March in Pierre, during public testimony for finding of the above project, Pickerel Lake property owners disputing the need for a sanitary sewer system claimed there were no projects addressing agricultural sources of non point pollution in Pickerel Lake's watershed. There is in fact, a fully funded and highly publicized protection project for Pickerel Lake's watershed in its fourth year of operation. The Pickerel Lake Protection Project was initiated in 1992 and is sponsored by the Day Conservation District (see appendix A).

To date, agricultural landowners have contributed $ 39,192.20 in cash and in-kind contributions to this project. A large portion of this money - $ 33,558.99, were owner/operator cost-share for the construction of two animal waste management systems constructed last fall. These two systems now contain animal waste from two of the largest feedlots in Pickerel Lake's watershed. A third system is slated for construction this spring. Funding for construction of these systems is provided by grants from EPA 319 and the South Dakota Consolidated Water Facilities Construction Program.

Over 1500 acres of watershed cropland are under contract for implementation of Best Management Practices. Owner/operators are receiving cost-share funds for implementing BMPs through the Water Quality Incentive Program (WQIP) of the Consolidated Farm Service Agency (formerly ASCS) and a Coordinated Soil and Water Conservation Grant fund from the state of South Dakota. Further WQIP funds are being used to cost-share the proper management and utilization of approximately 257,000 cubic feet of animal waste in the lakes watershed.

A comprehensive Information & Education program to inform watershed property owners and operators, as well as lake property owners, of practices and life styles which will improve Pickerel's water quality is also being implemented. Several fact sheets and two newsletters (see appendix B) have been published with a wide range of subject matter pertaining to Pickerel's water quality. Press releases in area papers (see appendix C), radio interviews on local radio stations and the "Dakota Farm Talk" radio program, and public meetings, have been utilized to inform the public of project goals and accomplishments.

Pickerel Lake was recently listed in an AP wire service news release, as one of the ten cleanest lakes in South Dakota. A unique opportunity exists for the Pickerel Lake Protection Project and Pickerel Lake Sanitary Sewer District to protect this Lake from non point source pollution now, in lieu of more expensive lake restoration in the future as water quality becomes severely degraded. The Pickerel Lake Protection Project supports the Sanitary Sewer Districts efforts toward this common goal. (see letter of support appendix D).

I urge the Board to approve the Pickerel Lake Sanitary Sewer Districts request for funds.

Very sincerely yours,

Dennis Skadsen
Project Coordinator

cc: Pickerel Lake Sanitary Sewer District
SD Dept. Environment and Natural Resources

May 5, 1995

J.B. Lammers
108 North Egan
P.O. Box 45
Madison, South Dakota 57042-0045

Dear J.B. Lammers:

As you requested, this letter represents my observations of Mr. Butterbrodt's letter to the Board of Water and Natural Resources concerning funding for the Pickerel Lake Sanitary District. I have limited my comments to portions of the letter which are in my area of expertise. As a limnologist, I have studied lakes in South Dakota since 1976. Although our knowledge of lakes has increased substantially in the past few decades, there is much we still do not know. There will always be people like Mr. Butterbrodt who use this uncertainty and lack of complete understanding of lakes as evidence that we should delay decisions to commit resources that, based on our best judgement, are needed to protect our lake resources.

Mr. Butterbrodt's suggestion that additional studies are needed may have some merit but careful selection of methodology is needed to produce useful data. You must also ask how the data would be used and will it really save any money. Leachate detection using a "Septic Snooper" or other devices that rely on measurements of conductivity and fluorescence have been used to detect plumes from septic tanks (Kerfoot, 1978) (Kerfoot and Skinner, 1981) (Jourdonnais and Stanford, 1985). I worked for the Department of Water and Natural Resources at the time the 1985 report on Pickerel Lake was published. We had high hopes for the leachate detection system because it appeared to be a simple process. Leachate detection is not without its problems, however. Fluorometric readings can be elevated due to naturally occurring humic compounds. Jourdonnais and Stanford (1985) determined that additional equipment and detailed testing was necessary to identify plumes. He used a scanning fluorometer to identify fingerprints of fabric whiteners to verify seepage plumes and separate them from naturally occurring fluorescence in Flathead Lake Montana. In reality the process of leachate detection at Pickerel Lake would be more complex and expensive than the 1985 DENR report indicates. Even if plumes were detected and verified to be other than natural background, the source of the plume would still be unknown. Additional work using tracer dyes and installation of wells or piezometers to identify specific faulty septic tank systems would be required.

At some point the costs of identifying individual systems outweighs the cost of hooking all septic tanks up to a common collection system. This is especially true if repeated studies are needed in the future to identify systems that fail as they age. How often would the survey have to be repeated and who would pay for repeated studies?

Infrared photography was used in 1980 to identify failing septic systems but this method has limitations also. The method detects drain fields that have become saturated causing sewage, to come to the surface. It does not detect sewage seeping through porous soils into the lake. Identification of only 9 sites out of 319 probably indicates that most septic systems do not have overland flow of sewage into the lake. Additional infrared studies may help identify public health hazards associated with surfacing sewage but it would be of little use to determine the effect of septic tank leachate on the lake. Dense tree cover prevents accurate determination of saturated drain fields so in forested areas on site surveys would be necessary.

I would not disagree with Professor Henry Quades statement that "they have never encountered a situation where septic systems were a major contributor of nonpoint source pollution as compared with agricultural erosion." Although this statement is true it should not be used to support a position of inaction to control pollution from septic tanks. All controllable pollution sources should be considered for remediation since the damage to the lake from excess nutrients is cumulative. We can reduce nutrient loadings from the watershed but we cannot eliminate them. If all sources add up to a loading that exceeds what the lake can handle, rapid eutrophication will occur.

Those benefiting most from this rare public resource (lake shore residents) should be willing to accept responsibility for the pollution they cause before asking landowners in the watershed to spend large sums of money to control pollution. I am currently involved in a lake improvement project for Lake Campbell in Brookings County that was resisted by landowners in the watershed until a sanitary sewer district was formed. The smaller task may need to be completed before the larger task becomes possible.

The Hansen study estimated 1.4 percent of total phosphate and 16.1 percent of total nitrogen inputs from septic tanks. Mr. Butterbrodt cites these as insignificant percentages. One must consider that these are crude estimates. Also as work in the watershed proceeds and inputs from runoff is reduced and as more development on the lake occurs these percentages will increase regardless of what they are at present. Also keep in mind that much of the total phosphorus load entering the lake through surface runoff is unavailable to algae and other plants because it is not in a soluble form. Total phosphorus is commonly 10 times higher than dissolved phosphorus in runoff. The phosphorus reaching the lake through groundwater seepage is all in a dissolved form and would be much more available to grow algae. The effect of septic tank seepage on the lake would be expected to be much greater than the estimated 1.4 percent of total phosphorus entering the lake would seem to indicate.

Mr. Butterbrodt suggests that inspections, education, voluntary compliance or enforcement measures are all that may be needed to solve the problem. One should keep in mind that current regulations of septic tanks are primarily for public health concerns. Septic tanks that pose a hazard to public health are certainly also a danger to the lake. It is my opinion, however, that even if all septic tanks in the Pickerel Lake area were brought up to health standards they would still pose a threat to the lake. There is no mechanism for removal of the phosphorus from the proximity of the lake with on site disposal systems. Phosphorus is an earth element and it cannot be converted to a gas and removed from the site through bacterial action like nitrogen. It will accumulate in the soil or in the water if it is not removed from the site or recycled back to plants in some way. The longer people live around the lake the more phosphorus will build up that can potentially enter the lake and contribute to its demise. I cannot accept the assumption that the threat to the lake will be removed by upgrading existing septic tanks until someone explains how the phosphorus that accumulates will be prevented from entering the lake. It is true that soil binds phosphorus and insoluble precipitates form but these processes are finite and as systems age and binding sites in the soil are used up, the soil will become less effective at removing phosphorus.

Any system that removes phosphorus from close proximity to the lake, whether it is closed individual systems (that are managed properly), cluster systems with off site disposal or the proposed gray water collection system would be preferable to continued on site disposal of waste as is currently the case.

If one uses the method discussed in the National Eutrophication Survey to estimate phosphorus loadings to Pickerel Lake a significant percentage of phosphorus loading that the lake can safely receive is indicated. The method assumes that 0.25 lb/capita/yr or 7% of the 3.5 lb/capita/yr of phosphorus found in raw wastewater will reach the lake. If one assumes 319 septic systems used by 2.5 persons per system approximately 200 pounds of phosphorus would enter the lake each year. That may not seem like much but when you consider that each pound of phosphorus has the potential to grow 500 pounds of algae (Wetzel, 1983) you can see how much damage a small amount of phosphorus can do. Vollenweider (1968) would consider a loading of .13g/m^2/year of phosphorus to be a dangerous load (would cause rapid eutrophication) for a lake with a mean depth of 5 meters (Pickerel Lake). Based on this standard the 200 pounds of phosphorus from drain fields would equal 18.5% of that which would lead to rapid eutrophication. If drain fields were the only source of phosphorus, there would be no problem. They are not however, and added to the other sources of phosphorus entering the lake the total loading probably exceeds the level that will lead to eutrophication.

Literature Cited:

Hansen. 1976. Eutrophication of South Dakota Lakes - Generalized Model of Nutrient and Sediment Sources to Pickerel Lake. SD. Dept of Game, Fish and Parks. 2p.

Jourdonnais, J. H. and J. A. Stanford. 1985. Verification of Shoreline Sewage Leachates in Flathead Lake, Montana. Completion Report No. 146. Montana Water Resources Research Center.

Kerfoot, W. B. and E. C. Brainard. 1978. Septic Leachate Detection - A Technological Breakthrough for Shoreline On-lot System Performance Evaluation. State of Knowledge in Land Treatment of Wastewater. International Symposium at Cold Regions Research and Eng. Lab., Hanover, NH.

Kerfoot, W. B. and S. M. Skinner. 1981. Septic Leachate Surveys for Lakeside Sewer Needs Evaluation. Journal of Water Pollution Control Federation. 53(12):1717-1725.

Vollenweider, R. A. and J. J. Kerekes. 1980. OECD Eutrophication Program, Synthesis Report, Organization of Economic Cooperation and Development, Paris France.

Wetzel, R. G. 1983. Limnology. Saunders College Publishing, New York.

Sincerely,

David German

David R. German
Research Associate

DRG:ijb

Appendix G - Information & Education Work Outline

PICKEREL LAKE PROTECTION PROJECT
Information and Education Work Outline

Date: 02/17/93
Rev.: 08/18/93

I. Groups utilizing Pickerel Lake

A. Lakeshore Property Owners

1. Permanent Residents - reside on lake in year-round homes on privately owned land

2. Seasonal Permanent Residents - reside on lake in year-round homes on privately owned land only during warm weather months, early spring to late fall

3. Weekend/Vacation Residents - occupy unimproved cabin/mobile home only on weekends and holidays late May - early September

   a. Lease land and own cabin/mobile home
   b. Own land and cabin/mobile home

4. Own land adjacent to lake.

   a. Sisseton Wahpeton Sioux Tribe - leases land to cabin owners
   b. Bureau of Indian Affairs (BIA)
   c. Owners of unimproved lakeshore lots
   d. Owners of agricultural land
   e. State of South Dakota - park, lakeside use areas
   f. Private Business (bait shop, restaurant)

B. Recreational Users

1. Pickerel Lake State Recreation Area (fee areas)

2. Lakeside use areas (free access-old fish hatchery)

3. Visitors to cabins/year-round homes

4. Lutheran Bible Camp

5. YMCA Camp

II. Activities which utilize Pickerel Lakes resources

1. Fishing

2. Recreational boating

   a. Motorized (including jet skis)
   b. Nonmotorized (sailboats/boards, canoes, paddleboats)

3. Swimming/Water skiing

4. Camping

5. Hunting

   a. Upland game
   b. Waterfowl
   c. Big game

6. Natural history investigation

   a. birdwatching
   b. hiking
   c. environmental education (state park)

7. Winter Activities

   a. Snowmobiling
   b. Cross country skiing

III. Identify Lakeshore Property Owners

A. Identify home/cabin/mobile home owners

1. Name
2. Permanent mailing address
3. Pickerel lake mailing address
4. Home phone number
5. Business phone number
6. Pickerel lake phone number
7. Lot number

(update database semianually during project)

B. Identify owners of Leased Land

1. Name
2. Permanent mailing address
3. Home phone number
4. Business phone number
5. Lot numbers leased

C. Identify managers of State Land

a. State Recreation Areas
b. Lakeside Use and Access Areas
c. Game Production Areas

1. Managers Name
2. Department
3. Mailing address
4. Phone number

D. Identify managers of Tribal Lands

1. Managers Name
2. Department
3. Mailing address
4. Phone number

E. Identify owners of Agricultural Land

1. Name
2. Permanent mailing address
3. Phone number

F. Identify owners of businesses adjacent to lakes

1. Owners name
2. Permanent mailing address
3. Business mailing address
4. Home phone number
5. Business phone number

G. Place information into a database with capability of generating mailing labels and form letters.

H. Lake Associations

1. Identify various Pickerel Lake Associations.
2. Form a steering committee to study the formation of one lake association.
3. If interest shown, form lake association with representatives from each group or area of the lake.

IV. Methods to disseminate information to property owners

A. Regional meetings in towns/cities with large numbers of Pickerel Lake property/cabin owners

Aberdeen
Milbank
Sioux Falls
Sisseton
Watertown
Webster

B. Meetings held at Pickerel Lake during peak user periods.

1. Locate meeting places which can accommodate large numbers of people.

   a. YMCA camp (west side of lake)
   b. Lutheran Bible camp (east side of lake)

2. High user weekends

   a. Memorial Day
   b. 4th of July
   c. Labor Day

C. Quarterly Newsletters

1. Computer/Desktop publishing
2. Laser Printer (Waubay National Wildlife Refuge)
3. Printing costs
4. Mailing costs

D. Press releases in regional/local newspapers:

Aberdeen
Milbank
Sioux Falls
Sisseton
Watertown
Webster

1. Project Coordinator Introduction
2. meeting notices
3. project progress

V. Methods to disseminate information to recreational users

A. Pickerel Lake State Recreation Area

1. Enclosed waterproof information boards attached or next to project signs in East/West boat ramps in-kind from SD Parks Department.

2. Weekend camp fire programs by Project Coordinator

B. Information placed in public buildings

1. Waubay National Wildlife Refuge Visitors Center
2. Blue Dog State Fish Hatchery Visitors Center

C. Information Booths

1. Farm and Home Shows
2. Sportsman Show

Aberdeen
Milbank
Sioux Falls
Sisseton
Watertown
Webster

D. Magazine articles

1. South Dakota Conservation Digest
2. South Dakota Magazine

E. Present programs to local and state organizations which benefit from or are interested in preserving Pickerel Lakes various resources. Gain public support from each.

1. American Fisheries Society: SD Chapter
2. Chamber of Commerce: Webster
3. Ducks Unlimited local chapters: Sisseton, Watertown, Webster
4. Izaak Walton local chapters: Watertown, Webster
5. Glacial Lakes and Prairies Tourism Association.
6. Monday Morning Breakfast Club: Webster
7. S.D. Bass Chapter Federation
8. S.D. Farm Bureau
9. S.D. Farmers Union
10. S.D. Water Congress

11. S.D. Wildlife Federation
12. Soil and Water Conservation Society S.D. Chapter
13. Soo Bassmasters: Sioux Falls chapter
14. Technical Information Project
15. The Wildlife Society: SD chapter

F. Television

1. KABY - Aberdeen
2. KDLO - Watertown

VI. Public Schools/Environmental Education

A. Present programs to School Districts located around lake and within watershed

Sisseton
Roslyn
Waubay
Webster

B. Project S.A.V.E.

C. Youth Conservation Camp (July @ Camp Ne-So-Dak)

D. Glacial Lakes Outdoor School (@ Camp Ne-So-Dak)

VII. Materials and Publications

A. Slide presentation

1. Photograph activities on and around lake/watershed.
2. Photograph construction and progress of:
   a. animal waste systems
   b. shoreline stabilization

B. Fact sheets

Water Quality and: Agricultural Runoff
Algae Blooms
Animal Waste Management Systems
Aquatic Weeds (control)
Boats
Fisheries
Septic Tanks (coauthor with Sanitary District)
Shoreline Erosion
Watersheds and Wetlands
Geological History of Pickerel Lake

C. Brochure with general information on the Pickerel Lake Protection Project.

VIII. Additional funding for Pickerel Lake Protection Project

A. Financial support or contributions from organizations listed in Section V:E 1-15.

B. Development and sale of a Pickerel Lake Atlas listing property owners, lot numbers, and maps. Proceeds from sale of atlas would go toward project as local matching funds.

C. Formation of "Friends of Pickerel Lake" with membership dues and contributions as local matching funds toward project.

1. Sponsor fishing derby

2. Reprint Alice Fiksdal's "Nature Sings At Pickerel Lake" poem as membership incentive.

3. Commission local artist to paint picture of Pickerel lake or feature of lake. Reprints sold as fundraiser.

D. Corporate Sponsors

Appendix H - 1992 Informational Meeting Notes

PICKEREL LAKE PROTECTION MEETING
Pickerel Lake Lodge
July 18, 1992

District Chairman, Rodney Tobin opened the meeting with group introductions, consisting of farmers in the watershed, lake owners and various agencies. Tobin introduced Dave German, Water Resources Institute, SDSU, Brookings, SD. German gave an update of research that had been done on Pickerel Lake, including study done 10 yrs ago. German sees an improvement in the lake, possibly due to the CRP program. He stated Pickerel Lake is in reasonably good shape and we need to keep it that way. The project is designed to protect the lake from further pollutants. The main source of problem is animal waste and septic tanks. The lake is eutrophic with high concentrations of organic nitrogen and total phosphorus. There are a lot of plant materials in the water. The level of algea in lake in '91 was 11.626.

Questions raised: Reason for fish kill past year? Possibly chlorine and hydrogen sulfite in lower layers. Herbicide may also have been used on area weeds which can be very damaging to lake. Low oxygen levels in lake is alarming and need to be addressed. What effect do cattle in area have on the lake? Cattle feeding in a concentrated area by streams, even as far away as 10 miles, have a major effect on the lake. Cattle standing in the lake have a lesser effect. Questions on other lakes discussed. Enemy Swim had less algae in lake in '91 and is a top priority lake for protection. Blue Dog is a shallow lake with much ground water coming into the lake. A project on this lake would be in the millions of dollars and is not feasible.

Problems to be addressed: A detailed watershed inventory of critical areas. Produce a set of maps to put practices on the land where needed. Shoreline erosions and wetland areas identified. Which areas are protected with grass waterways and how many more are needed. Location of CRP acres, areas in which AgWaste systems are needed, location of shallow ground water. HU Plan - land use. Slinden reported that they are in the process of circulating a petition for forming a Sanitary District. An engineer has begun a study of lake elevations.

DC Nordquist informed the group of the different agencies that will be involved in this project. Day Conservation District, Cooperative Extension Service, ASCS, SCS, USF&W, Game,Fish & Parks, DENR, SDSU, EPA, Pickerel Lake Assn's, Local Farmers & Ranchers and possibly other organizations. Water Quality Project signs will be erected at lake access areas with participating agencies, individuals and groups involved. Nordquist showed slides of problems that may need to be addressed in the watershed area and of the available programs through the various agencies for assistance. A Pickerel Lake Planning Commission will be formed to address these problems.

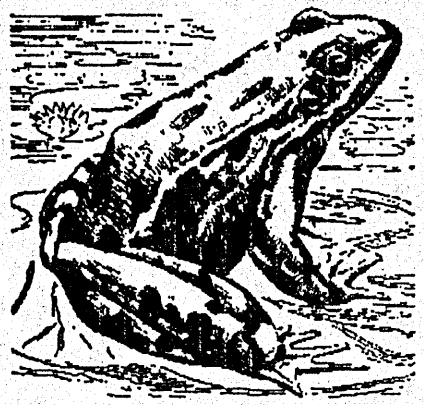
Pickerel Lake Protection Meeting
7-18-92

Name	Address	Would You Like to Participate in the Pickerel Water shed Planning Commission?
Dennis Okrai	RR1, Box 129A, Grenville, SD 57239	? undecided
Halvor Skaarhaug	RR1 Box 27 Grenville SD 57239	"
John E. Sigdestad	RR1 Box 15 Bristol SD. 57219	"
Roxann H Okrai	RR1 Box 130 Grenville SD 57239	
Rodney E Tobin	RR 1 Box 9 Pierpont SD 57468	
James Hendrickson	RR1 Box 16 Roslyn SD 57261	yes
Jay Jost	RR2 Box 22A Warley - Day Co Extension	
Roy Boschee	SCS - BROOKINGS SD	
Bill Lemmond	RT#1 Box 50 Grenville, SD 57239	
Arnold Stens	RR1 Box 105 GRENVILLE	
Wallace Loe	Box 179 Pierpont S.D.	
Claire Buechler	Rte 1 Box 128 Webster	
Ed Weber	Box 73 Roslyn SD	
Doug Leschisen	RR Webster, SD	
Rick Canter	RR1 Box 29 Waubay SD.	
Martin Vost	707 W 9th Ave Webster 57274	Yes
Sylvester Wicka	RR2 Box 46 Webster 57274	
Marlyn Symonson	R.R. 1 Box 103A Grenville 57239	
Eldred Druba	RR #1 Box 88, Grenville, SD. 57239	
Stanley Gruby	R. 1 Box 55 Grenville S. Dak 57239	
Marvin Burg	512 W. 5TH Webster, S. D. 57274	
Dennis & Lori Skadsen	Pickerel Lake St Rec Area Grenville	yes 57239
Mark Anderson	Webster - Buenos Hgts. Day Cons. Dist	
Duane Podoll	RR1 Box 52 Grenville SD 57239 - yes	
AL. FEDJE	302 N 7TH WATERTOWN SD 57201	

Township supervisers

Appendix I - Project Flyers

- Adopt-A-Stream, Adopt-A-Shoreline Program
- Shoreline In Need Of Repair?
- Lake Awareness Seminar
- Lake Awareness Seminar II
- We Need Your Help!
- Pickerel Lake Tour



For more information:

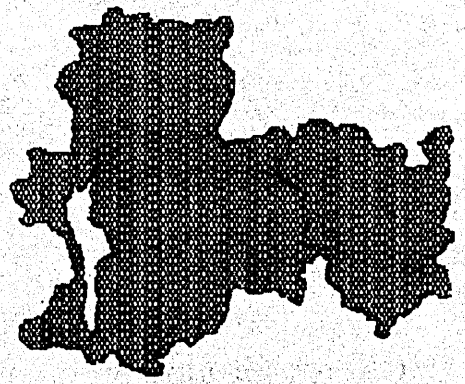
Write to:

Pickerel Lake Protection Project
RR1 Box 113
Grenville, SD 57239

Or Call: 486-4759

Pickerel Lake Protection Project

Day Conservation District

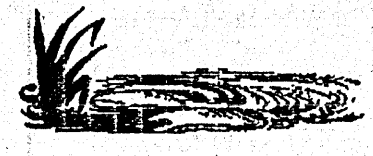


Adopt-A-Stream Adopt-A-Shoreline Program

Introduction

The Pickerel Lake Protection Project and Pickerel Lake State Recreation Area are jointly inviting interested groups to participate in the South Dakota Non point Information & Education Adopt-A-Stream program. This stream awareness activity is designed for groups of all ages interested in learning more about South Dakota's streams, rivers and lakes. Participants adopt a section of stream or shoreline, and twice a year visit these sites to collect litter and debris.

The SD Non point Source Information & Education program is a cooperative effort of SD Depot's. of Environment & Natural Resources and SD Dept of Agriculture.



Locations

Several sites are available for adoption:

1. Outlet creek running through Pickerel Lake State Recreation Area - West Unit, from boat ramp to Day Co. Hwy. 1.

2. Shoreline of West Unit - Pickerel Lake State Recreation Area.

3. Creek and shoreline at Old Hatchery Site Public Access.

4. Shoreline of campground and boat basin of Pickerel Lake State Recreation Unit - East Unit.

5. Areas of undeveloped shoreline outside of Game, Fish & Park land. (Would be reached by boat)

Who can participate?

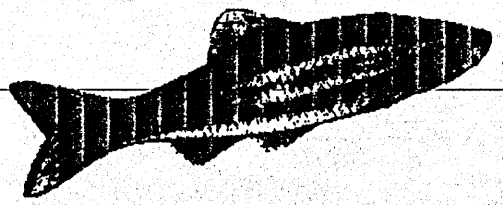
* Boy/Girl Scout Troops (including Cub Scouts & Brownie Troops)

* 4-H Groups

* Lake Associations

* Church Groups

* Other interested groups or individuals



Information & Education

In addition to cleanup activities groups or individuals can participate in same day on-site educational programs conducted by project and park personnel.

Activities include:

* Pond studies of aquatic invertebrates

* Seining

* The Lake Game (an exciting role-playing game)

* Investigating aquatic food chains

SHORELINE IN NEED OF REPAIR?

THE PICKEREL LAKE PROTECTION PROJECT CAN HELP YOU!

Who's Eligible?

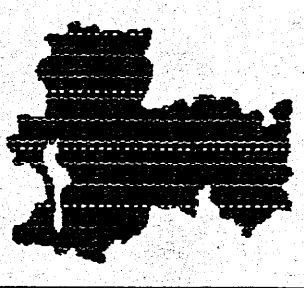
Any owner of shoreline property at Pickerel Lake! Priority will be given to sites on the basis of threat to Pickerel Lake and/or lakeshore property.

How much will it Cost?

Each site may require a different design to solve shoreline erosion problems. The Pickerel Lake Protection Project will pay 25% of the final construction costs on sites chosen. Contractors & construction costs will be determined by competitive bids.

Here's what you need to do!

Fill out and return this form by June 15, 1994. The Project Coordinator will visit your property to determine the type of erosion control needed. If your property is eligible, you will receive an estimate of construction costs. If you choose to go ahead with construction, you will be required to sign an agreement with the Day Conservation District requiring your payment of 75% of final construction costs. All required federal, state and county permits will be obtained by the Pickerel Lake Protection Project before construction begins.



For more information contact:

Pickerel Lake Protection Project
Day Conservation District
710 Main Street
Webster, SD 57272
Main Office Phone: 605/345-4661 Project Coordinator: 486-4759

Name:_____ Brief description of shoreline & lineal feet requiring

Address:_____ treatment:_____

_____ _____

_____

Lake property location:_____

Pickerel Lake Protection Project

Lake Awareness Seminar

July 9,1994

1 - 4:30 P.M. at the Pickerel Lake Lutheran Bible Camp

TENTATIVE SCHEDULE

1:00 P.M. Open Exhibition & Refreshments
1:30 P.M. Welcome & Opening Remarks - Dennis Skadsen, Project Coordinator
1:40 P.M. Clean Water, Clear Choices (Video)
2:00 P.M. Pickerel Lake Water Quality & Monitoring - Dave German, SDSU
2:30 P.M. Pickerel Lake Fisheries Studies - Shane Clark, Fisheries Biologist SD GF&P
3:00 P.M. Break
3:10 P.M. Update on Pickerel Lake Protection Project - Dennis Skadsen, Project Coordinator
3:20 P.M. Status Report on the Pickerel Lake Sanitary Sewer District
3:30 P.M. Open Forum/Question & Answer
4:20 P.M. Closing Remarks - Dennis Skadsen, Project Coordinator

Don't Miss This Seminar!

This is your chance to learn more about Pickerel Lake's past, present and future! Share your questions, concerns, and ideas about Pickerel Lake with your neighbors and the agencies involved with it's protection and preservation.

Exhibits, fact sheets and refreshments will be available in the camp Dining Hall. Seminar sessions will take place in the Chapel. In addition to the above listed participants, representatives from the Soil Conservation Service, Bureau of Indian Affairs, Sisseton-Wahpeton Sioux Tribe, SD Lakes & Streams Association, and SD Department of Environment & Natural Resources will take part in the open forum.

Directions To Pickerel Lake Bible Camp

The Pickerel Lake Bible Camp is located on the eastside of Pickerel Lake in Hyde Park Subdivision. Take Day County Highway 6 to the east side of Pickerel, look for the Bible Camp & Ed's Bait Shop signs (1 mile north of the State Park East Unit entrance), turn west and take gravel road approximately 1 mile straight west, turn south just past the beige storage shed. Signs will be posted.

Seminar sponsored by the:

Pickerel Lake Protection Project
Day Conservation District
710 Main Street
Webster, SD 57274
Phone: 605/345-4661

Pickerel Lake Protection Project

Lake Awareness Seminar II

17 June 1995

1 - 4:30 P.M. Pickerel Lake Lutheran Bible Camp

Seminar Agenda

1-2 pm	**Open Forum to Discuss the Formation of a Pickerel - Lake Association**
2-2:30	**Controlling the Spread of Exotic Plants & Animals**
2:45-3:30	**Dave Lucchesi, SD Game, Fish & Parks - Pickerel Lake Fisheries**
3:30-4	**Controlling Nonpoint Source Pollution on Pickerel Lake - A Project Update**
4-4:30	**Tour of Animal Waste Management System**

New Fact Sheets Available:

* On-Site Septic System Maintenance
* Controlling Shoreline Erosion
* WaterWise Boating

Seminar Sponsored By:
Pickerel Lake Protection Project
Day Conservation District
710 Main Street
Webster, SD 57274
Phone: 345-4661

Directions to Pickerel Lake Bible Camp

The Pickerel Lake Bible Camp is located on the eastside of Pickerel Lake in Hyde Park Subdivision. Take Day County Highway 6 to the east side of Pickerel, look for the Bible Camp & Ed's Bait Shop signs (1 mile north of the state park east unit entrance) turn west and take gravel road approximately 1 mile west, turn south just past the beige storage shed. Signs will be posted.

Order Form for Pickerel Lake Fact Sheets & Brochures

Fact Sheets

Qty	Title
____	A Brief Geological History of Pickerel Lake
____	A Pictorial Key to Pickerel Lake Fish
____	A Self-Guided Tour of Pickerel Lake's Watershed **(Available late-summer)**
____	A Summary Report of Water Quality in Pickerel Lake
____	Controlling Shoreline Erosion **(New)**
____	Lake Protection Tips
____	Managing Lawns to Protect Water Quality
____	Pickerel Lake Fisheries
____	Pickerel Lake Water Levels 1923-1993
____	Understanding & Maintaining Your On-Site Septic System **(New)**
____	Water Get the Facts - Volume 1
____	Water Get the Facts - Volume 2
____	WaterWise Boating **(New)**

Exotic Plants & Animals

Qty	Title
____	A Field Guide to Aquatic Exotic Plants & Animals
____	Eurasian Watermilfoil Identification Card
____	Purple Loosestrife in SD, Threatening Our Aquatic Resources

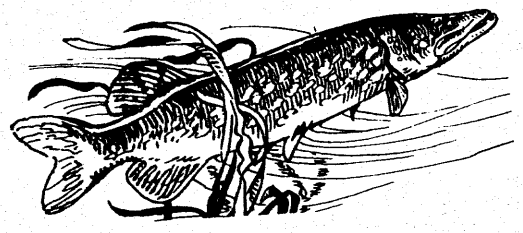
Reprints (SD Conservation Digest)

____	Facts About Fish Stocking
____	Farewell to Pickerel Lake Fish Hatchery
____	Natural Pond Walleyes
____	Of Father, Fishing, and Pickerel Lake
____	South Dakota Fisheries, Over a Hundred Years of Change
____	Stocking Walleyes, Is it Magic?
____	Survival of Young Walleyes
____	Walleye Length Limit Regulations
____	What is Zooplankton

Fact Sheets, Brochures & Reprints are provided at no charge.

Return Completed Form To:

Pickerel Lake Protection Project
Day Conservation District
710 Main Street
Webster, SD 57274



Name_____

Address_____

City_____ **State**_____ **Zip**_____

What other information would you like to see provided by the Pickerel Lake Protection Project (fact sheets, water quality data, lake ecology etc)?_____

_____

Revised Lake Directory Planned

A second edition of the Pickerel Lake Directory will be available this fall. If you were not listed in the first edition (note below) and would like your name added to the second edition, please fill out the form below and return to the project coordinator. If you have changed your permanent address since the first edition or purchased a new cabin also denote below.

Listed in first edition Not listed in first edtion

Name:_____

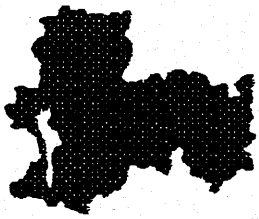
Legal Description, Lot #:_____

Permanent Mailing Address:_____

City_____State_____Zip_____

Name of adjoining cabin owners (optional; helps us locate your lake cottage):_____

_____



Pickerel Lake Protection Project
Day Conservation District
710 Main Street
Webster, SD 57274

Pickerel lake Protection Project

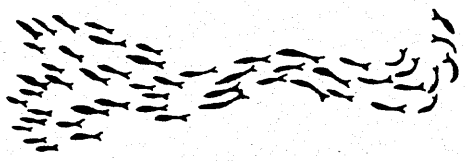
Day Conservation District

We Need Your Help!

Current funding for the Pickerel Lake Protection Project will cease next April. Major goals of the Protection Project are to construct three Animal Waste Management Systems (two have been built to date), complete one Shoreline Erosion Control Demonstration Site (just completed on the northeast shore of the lake), and reduce soil erosion on 1500 acres of cropland (ongoing). An important goal of the Protection Project is too inform and educate the public about nonpoint source pollution prevention. To date; two Lake Awareness Seminars have been held, three newsletters have been mailed to lake and watershed property owners, and eight fact sheets have been written specifically for Pickerel Lake. Information provided in these fact sheets include geological and natural history, and tips on reducing nonpoint source pollution. Three new fact sheets are now available; *Controlling Shoreline Erosion, Understanding & Maintaining Your On-Site Septic System*, and *WaterWise Boating*.

How can you help? Obtain these fact sheets and other information provided by the Protection Project. Follow the suggested "Best Management Practices" for maintaining your lake cottage and yard. Post fact sheets for easy reference until they become daily habits. Keep a file of all fact sheets and newsletters pertaining to Pickerel Lake, preferably at your lake cottage.

The project will end soon, but efforts to keep Pickerel Lake clean will continue. The Day Conservation District is committed to preserving the natural resources of Day County. As state and federal funds become available new projects and the continuation of existing projects will be undertaken to preserve northeastern South Dakota's water resources.

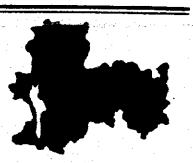


Shoreline Eroding?

A new fact sheet, ***Controlling Shoreline Erosion***, is now available. This four page fact sheet describes several methods for stabilizing shorelines, design considerations (Do you know your shorelines fetch?), and who to contact for technical assistance and permits. The recently completed Shoreline Erosion Control Demonstration Site, located along the shore of Bullhead Bay on Pickerel Lake's northwest side, employs many of the methods described in this fact sheet.

Pickerel Lake Protection Project

Day Conservation District



Controlling Shoreline Erosion

Sediment is the number one source of nonpoint pollution threatening South Dakota lakes. Sediment is defined as: The bottom material in a lake that has been deposited after the formation of a lake basin. Sedimentation occurs when erosion is taking place in a lakes watershed and along its shoreline. Pickerel Lake has been naturally losing depth from sedimentation since its birth during the last glacial period. However, poor land management practices can speed up this natural process causing a lake to lose depth at an accelerated pace. Sediment also carries nutrients that can fertilize algae and rooted aquatic plants, further degrading a lakes water quality. Agricultural landowners and operators in Pickerel Lake's watershed have implemented Best Management Practices (BMPs) to reduce soil erosion from cropland, pastures, and riparian corridors along streams and drainages. However, these efforts can be undermined if erosion of Pickerel Lake's shoreline is not controlled. Designing shoreline protection is complex and involves analysis of shoreline slope, wave height and wave runup, soil types, and existing vegetation. Improperly designed and constructed shoreline erosion controls often fail within a few years. This fact sheet will provide information on the types of shoreline erosion control methods commonly used, where to get help in designing shoreline protection, and information on obtaining the proper permits required before constructing shoreline erosion controls.

Nonstructural Controls

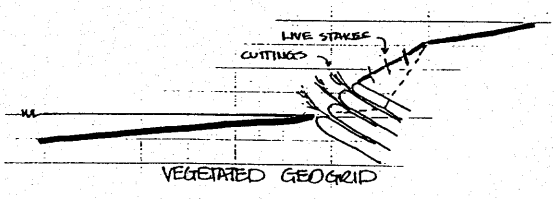
Nonstructural controls employ the use of plants to stabilize shorelines. Several species of trees, shrubs, grasses, and herbaceous plants can be used. Contact your local County Extension Agent, Conservation District or nursery for help in choosing species adapted to the local clime. Pickerel lake property owners have successfully used Crown vetch to stabilize high banks with extremely steep slopes that are typical of this lakes shoreline. Crown vetch is slow growing and is best planted with a nurse crop of oats or fescue. On some slopes it will be necessary to use erosion control mats made of straw, coconut fiber or plastic mesh to hold the soil in place until the cover crop of grass or plants becomes established.

Aquascaping

Aquascaping involves the placement of emergent aquatic plants such as cattail and submerged plants like coontail along the shoreline where waves break to stabilize sediment on the shoreline. Upland plants are used to stabilize soil on the banks above the ordinary high water line. Aquascaping enhances wildlife and fish habitat and provides a natural landscape. However, aquascaping works only in protected areas where wave energy is relatively low. Unfortunately, Pickerel Lake has little shoreline suitable for this method of erosion control.

Soil Bioengineering

Soil bioengineering is a nontraditional approach to shoreline protection that employs a combination of nonstructural and structural methods. Trees and shrubs are incorporated with structural systems like gabions, rock rip rap, and fiber rolls, geogrids and filter cloth. As the trees and shrubs mature their root systems further reinforce the shoreline and provide a natural looking landscape.



Out-of-sight, Out-of-mind?

Pickerel Lake Protection Project

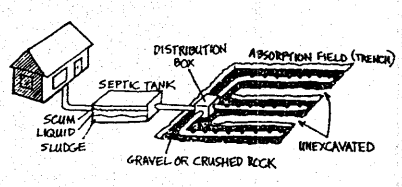
Day Conservation District

Understanding & Maintaining Your On-site Septic System

A septic tank and drain (or absorption) field is the most common system for "on-site" treatment and disposal of sewage from private rural homes. Since septic systems are hidden underground, many homeowners forget about their existence. This fact sheet will help you understand how your septic system operates and secondly, provide tips on the proper use and maintenance of on-site septic systems.

How does an on-site septic system work?

An on-site septic system is designed to biologically treat wastewater. The system is comprised of two primary components, a septic tank and a drain field. (See drawing below) The septic tank functions as a collection basin for solid materials carried with wastewater (called influent). There are three distinct levels in a septic tank. The bottom level consists of solids that do not float called sludge. Grease and lightweight materials that float, make up the top layer called scum. The middle layer consists of water, dissolved materials (such as detergents), and suspended solids. The sludge and scum are digested (or decomposed) by bacteria present in the tank. Approximately 50 percent of these solids are converted to a gas or liquid form by these bacteria. Undigested sludge and scum will remain in the septic tank as solids and must be removed from the tank every two to five years by pumping. If these solids are not removed they will enter and clog a drain field causing system failure. Each time influent enters a septic tank, an equal amount of liquid called effluent is forced out of the septic tank and into the drain field. The effluent then trickles through a gravel layer placed under the drain pipes and into the underlying soil where microorganisms further breakdown and absorb disease causing organisms, and nutrients.



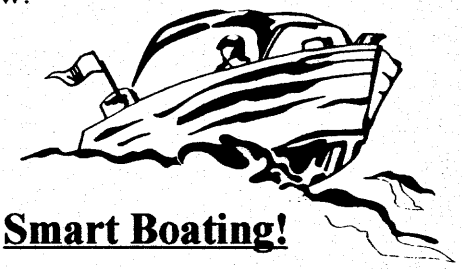
Signs of On-Site Septic System Failure:

- toilets that back-up or flush slowly
- floor and sink drains that back-up
- sewer gas odors around the septic tank or drain field
- lush vegetation or plants associated with wetlands growing over the drain field
- foul smelling water surfacing near the septic tank or drain field
- water rising to the surface of the drain field during heavy use periods, washing clothes etc. or during heavy rains
- the system is over 20 years old - soils under drain fields may loose the capacity to absorb and treat waste water after this period of time

Is your on-site septic system failing?

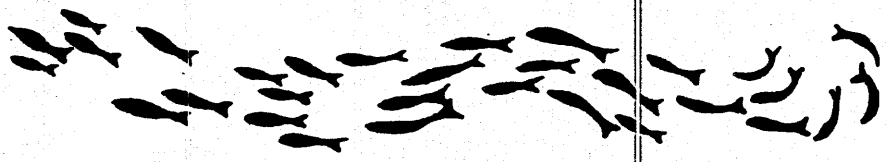
A properly designed, installed and maintained system will minimize the effect treated sewage has on nearby groundwater and surface water. However, septic systems can fail due to improper maintenance, poor soil conditions, high water tables, or the systems age and location. Common signs of septic system failure are described in the highlighted column to the right. A failing septic system is a threat to human health and water quality. If you suspect system failure have a certified plumber inspect your septic tank and drain field. State and local codes specify how on-site systems are to be installed and maintained. SD administrative rules Chapter 74:03:01, administered by the SD Dept. of Environment and Natural Resources, sets the minimum standards for on-site septic systems. Consideration should be given to designing and maintaining systems beyond the minimum site conditions to insure sufficient protection of groundwater and surface water.

Their underground, out-of-sight and easily forgotten, your septic system that is! However, a poorly maintained or failing septic system can contribute nonpoint source pollution to Pickerel Lake. Recent plans to construct a sanitary sewer system around the lake has heightened awareness of on-site septic systems and alternative waste collection systems. ***Understanding & Maintaining Your On-site Septic System*** provides maintenance tips and water conservation suggestions that will reduce the load to your septic system and improve it's operation now!

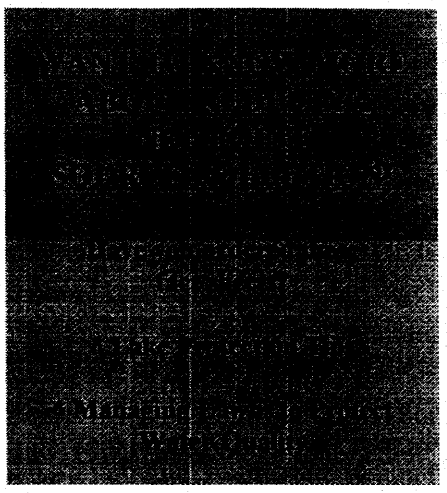


Smart Boating!

Are boats and jet skis a source of nonpoint pollution? The answer can be found in a new fact sheet entitled ***WaterWise Boating***. This fact sheet offers tips on reducing noise pollution, time & space zoning, and reducing the threat of exotic species to Pickerel Lake.



Coming Attractions!



Do you know where the community of Wist was once located? Can you find the Pickerel moraine or native tall grass prairie where Pincushion cactus can still be found. A new publication entitled ***"A Self-Guided Tour of Pickerel Lake's Watershed"*** available late this summer will answer these questions! The guide will take you on a thirty stop tour of Pickerel Lake's watershed. Stops will include geological and historical points of interest, locations of Animal Waste Management Systems, and point out various land practices beneficial to Pickerel Lake's water quality. The tour is 30 miles long and takes about 1.5 hours to complete.

PICKEREL LAKE TOUR

PICKEREL LAKE - WEST PARK

TUESDAY -JUNE 20TH

PICNIC SUPPER - 6:30 p.m.

TOURING

SHORELINE PROJECT - BRUCE BLOCK

AG-WASTE SYSTEMS
DAVID GRUBY - TERRY KULESA

DISTRICT BOARD MEETING FOLLOWING

Family Members invited.

Appendix J - Project News Releases

- Pickerel Project Is Okayed
- Project Begins At Pickerel
- Lake Project Meeting Set
- Special Funds Are Available
- Help Wanted
- Is Project Coordinator
- Runoff Dirties Lake Pickerel
- Project Aims At Protection To Avoid Restoration
- Busy Buddies Clean Shoreline
- Lake Awareness Seminar
- Residents Unite For Water Quality At Pickerel Lake
- Pickerel, Enemy Swim Lakes Clean
- Project Completed To Protect Pickerel
- Other Related News Releases

For improvement

5/25/92

Pickerel project is okayed

A contract has been signed between the Day County Conservation District and the South Dakota Department of Environment and Natural Resources officially beginning the Pickerel Lake Protection Project.

The contract provides for U.S. Environmental Protection Agency Section 319 non-point source pollution control grant funds as well as other funding, and lays out the work plan, schedules and responsible organizations and individuals for the project. The project is being sponsored by the Day County Conservation District.

Pickerel Lake, located in northeast Day County, is South Dakota's deepest natural lake. It is a popular recreational lake with over 300 homes, cabins, and trailer homes, as well as two state parks and several other access areas. The watershed of Pickerel Lake covers about 15,000 acres of Day, Marshall, and Roberts counties.

From 1979 to 1984 the lake's water quality was monitored by the S.D. Department of Environment and Natural Resources. From this study, officials determined that the lake was receiving excessive nutrient loading from the watershed area, and that in-lake water quality appeared to be declining. If left unchecked, natural deterioration would be accelerated and beneficial uses of the lake would be affected, officials said.

Listed as high priority

This situation, in part, led to Pickerel Lake being listed as a high priority in the recently adopted South Dakota lake protection strategy. This strategy provides for the development of projects aimed at maintaining the quality of lakes which have not as of yet been severely impacted by nutrient and sediment pollution, such as Pickerel Lake. This is in contrast to the traditional approach of promoting projects geared toward the restoration of already seriously impaired lakes. Pickerel Lake will be the first lake in South Dakota to undergo a protection plan under this strategy.

Protection needs outlined

The work plan for the project outlines the tasks needed to protect Pickerel Lake from accelerated deterioration. The tasks include preparation of detailed watershed maps to be used throughout the project; improved or new animal waste management systems; shoreline stabilization, application of best management practices (for erosion control, prevention of nutrient runoff, etc.); water quality monitoring; and an intensive information/education program.

Project participants will include the Day County Conservation District, South Dakota State University, South Dakota Department of Environment and Natural Resources, Soil Conservation Service, Agricultural Stabilization and Conservation Service, Cooperative Extension Service, Pickerel Lake Watershed Planning Commission, and local landowners and volunteers.

Project begins at Pickerel

7/27/92

Pickerel Lake has good water quality, and several people are working to ensure that the water quality stays good.

The Pickerel Lake Protection Project has begun at the lake in northeastern Day County. The purpose of the four-year project is to prevent the lake's water quality from deteriorating by reducing the pollutants that are entering the lake from its watershed and shoreline areas.

About 35 people attended a recent public meeting to explain the project.

Speakers included Dave German of the Water Resources Institute at South Dakota State University and Tim Nordquist of the Soil Conservation Service office in Day County.

German will be mapping the lake's watershed to identify areas that will need treatment. The watershed covers about 15,000 acres in Day, Marshall and Roberts counties. There are also about 300 cabins or homes at the lake. When German finishes identifying sources of pollution, Nordquist will contact landowners and work with them in applying needed conservation practices. Nordquist will also be working to find funding for incentives for people to apply conservation practices.

Time to save lake is now

It is difficult for people to become enthused about such a project because the quality of water in Pickerel Lake is good. However, the time to save the lake is now, German said.

He explained that efforts at lake restoration in the past focused on lakes where the water quality had deteriorated. The water quality at some lakes can be improved, but they will never have as good of water quality as Pickerel Lake, he said.

Some lake projects now will concentrate on maintaining good water quality in lakes.

Tests taken at Pickerel Lake last summer showed that the lake has better water quality than 10 years ago.

German believes the reason is that much of the land in the watershed is in the Conservation Reserve Program. There is not as much eroded soil and run-off from farm chemicals in Pickerel Lake. Even if grasslands have cattle grazing on them, the grassland absorbs most of the nutrients before the animal waste goes into the lake. One of his goals will be to keep as much of the watershed in grassland as possible.

German showed graphs of oxygen levels from tests taken at the lake in June, July and August of 1991.

According to tests, Pickerel Lake had good concentrations of oxygen at all levels in mid-June and there was not too much difference in water temperature at all depths of the lake.

In mid-July, tests showed a stronger difference in temperatures, mainly in the top 10 feet. A bit more algae was noted in the water. The lower area of water was also starting to lose oxygen.

In mid-August, tests at the lake showed there was little oxygen in the water below 17 feet and that stratification had occurred (there was a warmer upper layer of water and a colder bottom layer).

A few days after the test, a strong wind came up and mixed the layers of water, causing fish to be in water with little oxygen. Department of Game, Fish and Parks officials observed that about 200 small fish had died and washed up on the lake's south shore. Because the wind was from the northwest, the dead fish would naturally have floated to the south end of the lake, German said.

One of the people attending the meeting disputed that this was the cause of the fish kill, but German said that these conditions will kill fish.

Outlines existing problems

Nordquist gave a slide presentation showing the types of problems that exist in the Pickerel Lake watershed. They are soil erosion, animal wastes and shoreline erosion.

Treatment of soil erosion includes several different methods of conservation, residue management, conservation tillage, grassed waterways, permanent grass or alfalfa or grass/alfalfa rotations, and terraces.

For preventing animal wastes from entering the lake, money has been received to install two demonstration ag waste management systems. These are usually holding ponds that will prevent ag waste from entering streams.

There are about 2,400 feet of shoreline that needs to be treated to prevent erosion. This will be stabilized by adding rock along the shoreline to keep waves from beating it down, Nordquist said.

It was reported at the meeting that petitions have been circulated to form a sanitary district at the lake. The petitions will be submitted to the Day County commissioners, and if they are in compliance with state laws, an election date will be set so people can vote on incorporating the sanitary district.

Soil conservation
Tim Nordquist

Lake project meeting set

A public meeting on the Pickerel Lake protection project will be Saturday, July 18, at 2 p.m., at the Pickerel Lake Lodge on Pickerel Lake. The goal of the project is to protect Pickerel Lake from further degradation of its water quality by reducing the pollutants that are entering the lake from its watershed and shoreline areas.

The Day County Conservation District, who is the primary sponsor of the project, will provide background information on the project and will outline its work plan and time schedule for treating the lake's watershed.

Several water quality experts will be on hand to explain the past research that has been conducted on Pickerel Lake. They will also describe what the anticipated results of the project will be in regards to the water quality of the lake.

A further goal of this meeting will be to establish a Pickerel Lake watershed planning commission. The purpose of this commission will be to provide direction for the local agencies involved and to facilitate public input into the project.

Public comment and questions at this meeting will be welcomed and anyone with an interest in Pickerel Lake is welcome to attend.

Soil conservation
Tim Nordquist

Special funds are available

ASCS has received special Water Quality Incentive Project (WQIP) funds to be used as incentive payments in the Pickerel Lake Protection Project area. Sign up is scheduled at ASCS Jan. 11-29, 1993.

WQIP funds are to be used as incentive payments to land users in the Pickerel Lake watershed for adopting land use management practices that would reduce the levels of agricultural pollutants that reach Pickerel Lake. Land users can receive payments of up to $25 per acre per year for three years for the adoption of approved management practices.

Typical of the approved management practices is conservation tillage, according to officials. Payments of $12 per acre per year for three years would be made for controlling tillage so that at least 30 percent of the soil surface is covered by residue after planting a crop. By contour farming, participating land users could receive an additional $12 per acre per year.

Other payments available

A number of other cropland management practices are also eligible for incentive payments.

Incentive payments are available for applying management practices on grazing and hayland. Payments of up to $7 per acre per year can be made for proper treatment of pasture and hayland forage species. Payments are also available for establishing new pastures and haylands, and additional payments can be made for adopting rotational grazing systems.

The eligible watershed area consists of approximately 15,000 acres of land, mostly north and east of Pickerel Lake, in Day, Marshall and Roberts counties. Participants will need to sign up for the program at the ASCS office where they normally conduct their business.

Day County Conservation District, the primary sponsor of the Pickerel Lake project, strongly encourages land users in the project area to participate. It is an excellent opportunity to demonstrate how agriculture and good water quality can co-exist. For more information contact the Day County Conservation District office at 345-4661. Services are provided to all on an equal basis.

Help Wanted

POSITION: Pickerel Lake Protection Project Coordinator.
LOCATION: Day County Conservation District, 710 Main St., Webster, S.D. 57274. Pickerel Lake is located 20 miles N.E.
POSITION DESCRIPTION:
The individual is responsible for coordination of the Pickerel Lake Protection Project activities as outlined in the Project Workplan. Activities are to include but are not limited to the following:

1. Implement Project Activities.
2. Coordinate activities of participating agencies and local organizations as required for successful completion of the workplan.
3. Design and prepare a presentation to be used when soliciting cooperation from local land users for application of best management practices. Presentation will define the need for the conservation practices being promoted, and the benefit to be realized by the land owner from applying the practices.
4. Assemble a list of land users in the watershed and on the lake to facilitate the one on one contact that will be essential for successful application of practices for control in nonpoint source pollution.
5. Gather information on the economic value of Pickerel Lake and its watershed to the area.
6. Generate progress reports as required by workplan and related contracts.
7. Conduct an information program as outlined in workplan.

REQUIRED QUALIFICATION:
Graduation from a college or university with a bachelor's degree in agricultural sciences, biological science, natural resources management, environmental engineering or other related field. Experience can be substituted for education.
POSITION TIME FRAME:
Project scheduled for completion in April, 1996.
STARTING SALARY:
$10,000 based on 50% time
$15,000 based on 75% time (depends on procurement of additional grant funds)
STARTING DATE: January 18, 1993
APPLICATION DEADLINE: Dec. 31, 1992
KNOWLEDGE, SKILLS AND ABILITIES:
Applicant must have good written and oral communication skills, public speaking ability and good public relations skills. Applicant should be knowledgeable of agriculture, water quality and Best Management Practice terminology. Must have a valid South Dakota drivers license.

HOW TO APPLY: Please submit:
Resume
References (3)
Supporting Information

Submit to: Noel Anderson, Business Manager
Day County Conservation District
710 Main
Webster, S.D. 57274

16-1tc

Dennis Skadsen

Is project coordinator

Dennis Skadsen has accepted the position of project coordinator for the Pickerel Lake Protection Project. The project, sponsored by the Day County Conservation District, will identify nonpoint source pollution in the Pickerel Lake watershed.

Skadsen resides at Pickerel Lake with his wife and two children. He previously worked for Dakotah, Inc. in

Watertown Public Opinion July 26 93

ONLY WAY OUT — Lake Pickerel's sole outlet usually flows light to moderately through this culvert. Up to seven inches of rain in the area filled the lake, and turned the gentle outlet into a massive torrent of water and debris Monday morning. (Public Opinion photos by Jason Williams)

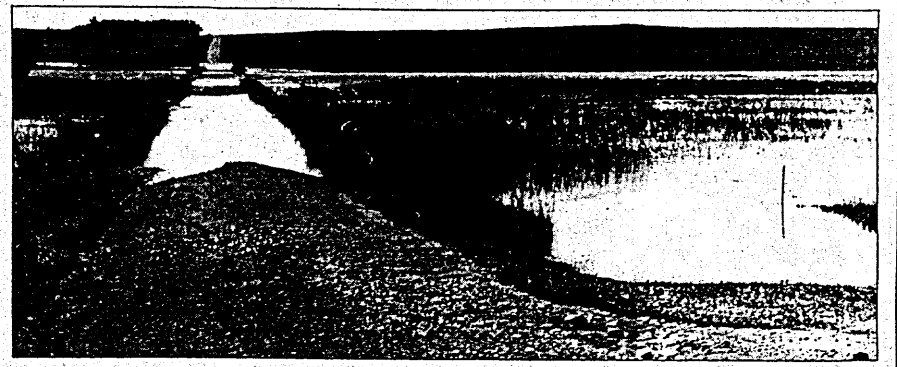
Runoff dirties Lake Pickerel

By JASON WILLIAMS
P.O. Staff Writer

LAKE PICKEREL — One of northeastern South Dakota's cleanest, clearest lakes was dirtied by runoff water created by more than six inches of rain that fell Saturday evening.

Several homes and roadways around Lake Pickerel became inundated beginning Saturday evening as the lake began swelling over sea walls and shorelines. Property owners scrambled to save their docks and boats throughout the night, according to Dennis Skadsen, coordinator of the Pickerel Lake Protection Project.

"People were taking their boats out until midnight (Saturday)," he said. "We could see the poles on docks floating in the middle of the lake Sunday morning."



ONWARD TO WAUBAY — Water flows through a valley over a road from Lake Pickerel towards Waubay Lake. Between Saturday and Monday morning, the water level at Pickerel has been full, two feet over full and then one foot over full.

VERONA AND REUBEN Hemmah's cabin was completely surrounded, but water did not seep through the foundation or walls of their place on the south side of Pickerel.

"If you don't have boots on, don't come to visit," Mrs. Hemmah said. "I think some of the cabin owners just said 'the heck with it' and left. They just didn't want to be a part of it."

Although flood waters consumed several docks and roads, no injuries were reported in the Pickerel area, according to local officials. Few cabin owners actually got water inside their homes, Hemmah said, but many sewer lines and septic tanks were rendered useless by the huge influx of water.

Three campers had to be evacuated from Pickerel Lake State Park Saturday night when the deluge sent waters rushing into low lying areas, according to Park Manager Lori Skadsen.

"I CAME OUT to the park at 3 in the morning (Sunday) and saw there were some people still taking their boats out," she said. "There was high winds and lightning, but I guess some people just thought their boats were more valuable than their lives."

Mrs. Skadsen said rain water accumulated so fast that people didn't have time to think about sandbagging. Most protective measures were spur-of-the-moment, Hemmah said.

"We could see how fast the water was rising and everybody started preparing right away," she said. "We started tying docks and everything else to trees."

LAKE PICKEREL

Project aims at protection to avoid restoration

By JASON WILLIAMS
P.O. Staff Writer

LAKE PICKEREL — Day County residents near and around Lake Pickerel are spending a little money now to preserve water quality instead of reeling amuck cleaning the lake with expensive restoration projects later.

The Pickerel Lake Protection Project has two primary objectives, according to Project Coordinator Dennis Skadsen; mapping the lake's watershed and encouraging the implementation of land use practices to maintain quality water.

A PROTECTION PROJECT, as opposed to lake restoration, is designed to limit human activity that may be degrading a lake versus restoring a polluted lake that would require huge amounts of money and massive clean-up projects.

"We're protecting the lake so it doesn't become a more serious problem," Skadsen said.

Skadsen said since Pickerel is surrounded by a lot of CRP land, runoff into the lake is relatively clean. But a few livestock feedlots and some older septic tanks at cabins on the lake's shore are enough of a menace to cause concern, he said.

Pickerel has only one small outlet which normally flows moderately and consistently out of the lake. A blast of up to 7 inches of rain Saturday turned the creek into an outlet 10 times it's normal size, flooding some homes and pumping debris into the waters.

But Skadsen said the outlet usually flows consistently since the lake's water level rarely changes because it is naturally fed by a spring. At its deepest point, Pickerel is 43 feet with an average of 22 feet, according to Skadsen.

"There's no big stream of river that carries silt into the lake," he said.

SKADSEN SAID THE Pickerel Protection Project is targeting non-point source pollution, contamination caused by runoff from agricultural lands and feedlots, leaking septic systems and shoreline erosion. Projects are currently underway to stop any further dirtying of the water, he said.

"Right now we've got a lot of money for ag management practices," he said. "We've had a real good response from people living in the watershed."

One farm's feedlot which now flows almost directly into Pickerel has already begun work on an ag waste system, Skadsen said. The farm and feedlot topography are being examined by specialists to determine the best location for an animal waste holding pond.

Holding ponds must be positioned so they do not jeopardize lake waters and also at a place where it would be feasible for the landowner to apply the nitrate rich water as a fertilizer.

PICKEREL'S PROTECTOR — Dennis Skadsen, Pickerel Lake Protection Project coordinator, stands on a wooden platform at Pickerel Lake State Park and surveys the water down below. Viewing platforms were built at the park to help reduce erosion from human traffic and rain water runoff along the bluffs of the lake. (Public Opinion photo by Jason Williams)

FUNDING IS COMING from federal, county and local sources. The Environmental Protection Agency has donated funds and Pickerel residences are constantly working on attaining matching funds, Skadsen said.

The Day County Conservation District serves as grant applicant and project sponsor, according to Skadsen.

"There's a lot of interest on the lake to keep it clean," Skadsen said.

Pickerel's watershed is relatively small compared with other major northeastern South Dakota lakes, Skadsen said. The watershed encompasses 15,015 acres in Day, Marshall and Roberts counties.

Busy Buddies clean shoreline

The Busy Buddies 4-H Club removed over 500 pounds of litter and debris from the outlet creek running through Pickerel Lake State Recreation Area April 24. The group was participating in the S.D. Adopt-A-Stream program.

Adopt-A-Stream is part of the S.D. Nonpoint Source Pollution Information and Education (NPS I&E) program cooperatively managed by the S.D. Departments of Environment and Natural Resources and Agriculture, with a grant from the U.S. Environmental Protection Agency.

The Busy Buddies "adopted" about 1/16 of a mile of shoreline along Pickerel Lake's outlet creek. The group removed several pieces of docks, deadfalls and litter. GF&P personnel from the Pickerel Lake State Recreation Area provided waders, rubber boats and a trailer for participants to fill with the debris. NPS I&E provided large litter bags and information on procedures and precautions. Upon completion of the cleanup, a report detailing the type and amount of waste collected was filed with the S.D. NPS I&E coordinator in Pierre.

The cleanup was sponsored by the Pickerel Lake Protection Project and Pickerel Lake State Recreation Area as an activity to increase awareness of nonpoint source pollution at Pickerel Lake.

Any group interested in participating in this program at Pickerel Lake can contact Dennis Skadsen, coordinator of the Pickerel Lake Protection Project of the S.D. Department of Environment and Natural Resources, Division of Water Resources Management, 523 East Capitol Avenue, Pierre, for more information.

Lake Awareness Seminar

The Pickerel Lake Protection Project will hold a Lake Awareness Seminar from 1-4:30 p.m. July 9 at the Pickerel Lake Lutheran Bible Camp. All persons interested in learning about Pickerel Lake's past, present and future are invited to attend.

Several agencies involved with the regulation and protection of Pickerel Lake and its watershed will present programs and provide information to the public.

The Pickerel Lake Protection Project is sponsored by the Day Conservation District. Adv.

Residents unite for water quality at Pickerel Lake

By JASON NORDMARK
P.O. Staff Writer

PICKEREL LAKE — Dennis Skadsen looks across a pond full of water contaminated with manure and feels satisfied.

After all, the waste could have ended up in Pickerel Lake, one of South Dakota's 10 cleanest bodies of water.

Skadsen, coordinator of the Pickerel Lake Protection Project (PLPP), said everyone living near or next to the lake wants it to stay on the top 10 list.

"We're all working together towards the same goal," said Skadsen as he walks near an animal waste management system near the Terry Kulesa farm. "So far it's been easy to start any project."

> "We're all working together towards the same goal. So far it's been easy to start any project.
>
> • Dennis Skadsen, coordinator of the Pickerel Laek Protection Project

COOPERATION AMONG landowners and lake cabin dwellers is helping protect water quality in the state's deepest natural lake.

The PLPP originated in 1992 and will continue through 1996. Skadsen said both farmers and cabin owners are encouraged by the actions of the other.

"They all see the money both groups are putting into (PLPP) to keep the lake clean," Skadsen said. "I think we have every piece of crop land in the watershed under some type of program."

Two major and three minor drainages make up the Pickerel Lake watershed. Chekepa Creek enters the lake from the east and Dry Creek drains the second largest area from the north.

Skadsen said the lake's glacial history is the reason it's started out so clean. "We are attempting to keep it that way," said Lori Skadsen, Dennis' wife and park manager of Pickerel Lake State Recreation Area.

The U.S. Environmental Protection Agency funds much of the PLPP's activities through grants. However, Skadsen said the EPA is far from the only entity involved in the projects.

"It's almost gets confusing at times," said Skadsen of the numerous state and federal agencies with an interest in Pickerel Lake.

ANOTHER LOCAL but separate project is also playing a big part in keeping the pollution out of Pickerel.

The Pickerel Lake Sanitary Sewer District (PLSSD) held its monthly meeting Friday on the shores of the 955-acre lake. The district hopes to install sewer lines around the lake.

"There is very little opposition to the project," Lori Skadsen said. "Most realize it will help the lake in the long run but some aren't happy with the cost and money up front."

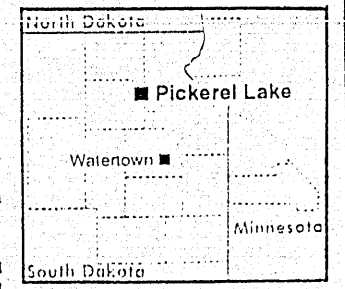
Lake residents formed the group in 1992 in hopes of eliminating non-point source pollution from septic tank seepage. The $2.1 million sewer line endeavor is still in its preliminary stages.

Peter John Monzel, president of PLSSD, hopes to have sewer line user and hook-up fees set by the first of the year.

SUCCESSFUL STOPPING — Dennis Skadsen stands near an animal waste management dike just down the hill from a feedlot on Terry Kulesa's farm near Pickerel Lake. The $10,000 project, just completed about two weeks ago, will keep animal waste out of the already clean lake. (Public Opinion photo by Jason Nordmark)

About 350 cabins dot the lake's 9.4 miles of shoreline. About 10 percent of the property is trust land owned by the Sisseton-Wahpeton Dakota Nation.

Getting the sewer line across trust land means the Dakota Nation must cooperate with PLSSD for the project to work. Representatives from the tribe attended a recent meeting and will schedule a special meeting with residents of the trust land meeting with members of PLSSD.



Monzel said the PLSSD will do whatever it can to help inform people about the project. "We're just waiting now to get everyone into the fold," he said.

Make the top 10 list

Pickerel, Enemy Swim lakes clean

by Dennis Skadsen,
Project Coordinator,
Pickerel Lake Protection Project

An Associated Press news release published in several major South Dakota newspapers last summer listed the 10 cleanest and 10 worst lakes in South Dakota. Two of the cleanest lakes, Enemy Swim (ranked 5th) and Pickerel (ranked 7th) are located in Day County. How does Day County benefit economically from these lakes and how do lake property owners feel about the future of Day County lakes?

A recent survey of Pickerel Lake property owners by the Pickerel Lake Protection Project provides some answers.

Seventy-five percent of Pickerel Lake's property owners live outside of Day County (The largest of this group, 35 percent, reside in Brown County). Survey results found that on average, this group brings over $130,000 a month into Day County. The typical summer season being three months long amounts to over $300,000 lake property owners spend on gasoline, groceries, entertainment, and other goods and services provided by Day County businesses in Webster, Roslyn, Waubay, and Grenville. In addition, 40 percent of the property owners hire local people for yard care and cabin cleaning, paying an estimated $45,000 a year for these services.

Currently, there are 309 cabins and homes located along Pickerel Lake's 9.4 miles of shoreline. These include 16 permanent residents, and 44 semi-permanent residents who live full time at the lake for a period of six months or less. The majority of Pickerel Lake property owners however, spend only weekends at the lake. Lake property owners on average have owned their lake home or cabin for 19 years.

Lake property is also an important source of tax revenue for Day County. The current assessed value of property along Pickerel Lake's shores totals 11.4 million dollars. Two school districts, Roslyn and Webster, receive these tax dollars. Currently, only one family living along the lake's shore send children to these schools. Many lake property owners commented on the need for improved local government services like road maintenance, fire and police protection in return for their property tax dollars.

How do lake property owners feel about Pickerel Lake's future? According to those responding to the survey:

Q. The most important reason to protect Pickerel Lake's water quality

A. To save the lake for use by future generations.

Q. The most important beneficial use of the lake

A. Recreational boating/water skiing

Q. The greatest threat to water quality

A. Failing septic systems

Q. Future development beneficial to the lake

A. Sanitary sewer district

Q. Future development detrimental to the lake

A. More residential development

Projects like the Pickerel Lake Protection Project, Pickerel Lake Sanitary Sewer District, and the continued cooperation of lake property owners, watershed farmers and ranchers will keep Pickerel Lake high on the list of South Dakota's cleanest lakes and ensure further economic benefits to Day County.

More information on Day County lakes will be available at the Pickerel Lake Protection Project's booth at the Day County Farm and Home Show in Webster Wednesday and Thursday.

The 10 cleanest lakes

1. Pactola Reservoir
2. Deerfield Lake
3. Angostura Reservoir
4. Cold Brook Reservoir
5. **Enemy Swim Lake**
6. Orman Dam
7. **Pickerel Lake**
8. Clear Lake (Marshall County)
9. Lake Cochrane
10. Sheridan Lake

The 10 worst lakes

1. Lake Preston
2. Dewberry Lake
3. School Lake
4. Burke Lake
5. Sully Lake
6. Whitewood Lake
7. Redfield Lake
8. Lake Kampeska
9. Lake Byron
10. Flat Creek Dam

Reporter & Farmer, Webster, South Dakota

Projects completed to protect Pickerel

by Dennis Skadsen,
Project Coordinator

Thanks to the many watershed landowners and operators who have participated in agricultural programs sponsored by the Pickerel Lake Protection Project, runoff from this winter's snowmelt will have less impact on the lake's water quality than previous years.

Runoff from rain and snowmelt can carry non point source pollution. Nonpoint source is defined as a diffuse source of pollutants that can include nutrients such as nitrogen and phosphorous from agricultural runoff, animal waste from feedlots, and sediment from eroding shorelines. Nonpoint source pollution can cause a number of water quality problems. High levels of nutrients such as phosphorous can cause dense algae blooms and excessive growth of aquatic plants. Animal waste can cause high bacteria counts that threaten human health. A goal of the Pickerel Lake Protection Project is to reduce the amount of nonpoint source pollution to Pickerel Lake. One way to accomplish this is for landowners and operators to implement best management practices (BMPs) on their land.

BMPs are agricultural practices designed to maintain productivity on the land while protecting surface and ground water from nonpoint source pollutants. Beginning last spring, landowners and operators implemented BMPs on 1500 acres of cropland in Pickerel Lake's watershed. BMPs implemented include conservation tillage, conservation cropping sequences, and grass/legume rotation. Lake property owners are also being encouraged to practice BMPs on their lakeside lawns and gardens. Two fact sheets, "Lake Protection Tips" and "Managing Lawns to Protect Water Quality," have been distributed to Pickerel Lake property owners.

Animal Waste Management Systems were built last fall on two feedlots located in the lake's watershed. A third system will be constructed by spring. An Animal Waste Management System collects feedlot runoff containing animal waste and stores this wastewater in evaporation ponds. Evaporation ponds are constructed with compacted clay bottoms and dikes to prevent contaminated water from entering surface waters and seeping into shallow aquifers and ground water supplies. Owners of these systems also manage the solid manure from their feedlots. A total of 257,000 cubic feet of manure was applied to cropland in the watershed in 1994. This nutrient rich animal waste provides a natural fertilizer to crop and hay land when applied during the proper season and at the proper rate per acre.

Incentive payments for implementing BMPs were paid to landowners and operators from the Water Quality Incentive Program of the Consolidated Farm Service Agency (formerly ASCS), and a grant from the South Dakota Division of Conservation's–Coordinated Soil and Water Conservation Grant Program. These payments will be made through the 1996 growing season. Cost-share funds to pay for construction of Animal Waste Management Systems are provided by grants from the Environmental Protection Agency, and the South Dakota Consolidated Water Fund.

The future of one of South Dakota's cleanest lakes is the responsibility of all watershed landowners and operators, shoreline property owners, and lake users. Through information and education the Pickerel Lake Protection Project and the Day Conservation District strives to inform all those who use the lake and its watershed about the various programs, practices, and lifestyles available that will sustain Pickerel Lake's water quality.

American News Photo by Kevin Michalowski

Best of both: Anglers, like these on Roy Lake, can have equally good fishing from boats or from docks when they head to any of the dozens of lakes in the northeast corner of the state. Roy Lake is producing good catches of perch, and walleye can be had on several area lakes like Big Stone and Enemy Swim.

Northeast Lakes

The other half of South Dakota fishing

By Kevin Michalowski
American News Writer

Those who only head to Lake Oahe in search of good fishing and great outdoor recreation could be missing half of what South Dakota has to offer.

South Dakota's northeast corner is defined by rolling glacier-carved hills and dotted with lakes left behind when the giant sheets of ice finally retreated. These lakes provide the setting for outstanding fishing and exciting outdoor recreation.

"People sometimes tend to overlook the northeastern lakes, and they really shouldn't," said Dave Daberkow.

Daberkow manages Roy Lake State Park, Fort Sisseton State Historical Park and Sica Hollow State Park in the center of the glacial lakes region. He said he's seen more and more people coming back to the region to fish, hunt and spend their vacation.

"I say coming back, because a lot of people spent time here as kids and they are starting to rediscover what this area has to offer," he said.

One of the big draws is the fishing, which continues to improve thanks to several years of above average rainfall. For the first time in years the lakes are all full and the fishing has been great.

"Thanks to all this water, the whole region has become a virtual fish factory," he said.

A recent study by fisheries biologists confirms that fish in the region are doing well. Dave Lucchesi of the South Dakota Department of Game, Fish and Parks has been studying the survival of hatchery reared walleyes compared to naturally reproduced fish in Pickerel Lake.

"Initial results show that the naturally reproduced fish and the hatchery-raised fingerlings are doing equally well," said Lucchesi.

The nearly two dozen lakes northeast of Aberdeen produce just about every species of fish that swims in South Dakota waters.

The survival of fingerlings, said Lucchesi, is an indicator of good habitat and he said good habitat seems to be a characteristic common to most of the lakes in the area.

The nearly two dozen lakes between Webster and Lake City, northeast of Aberdeen, produce just about every species of fish that swims in South Dakota waters. From perch to pike, Daberkow said there's usually a lake in the area where something is biting.

"Late summer and early autumn signals the start of the really good perch fishing on Roy Lake," said Daberkow. "People can get some really nice perch both off the docks or from boats."

Recently perch in the 3/4 to 1 pound range have been fairly common on Roy Lake. Anglers usually take perch using a slip bobber that suspends the bait just above the bottom.

"I see a lot of guys taking perch in about 12 feet of water, especially near dropoffs and along the weed edges," said Daberkow.

The smaller lakes in the region receive less fishing pressure because access can be more difficult. Some have boat ramps, others are serviced only by state-maintained Lakeside Use Areas that are equipped with the bare minimum. Still there are nearly a dozen lakes within easy driving distance of Roy Lake State Park that offer good fishing for perch, pike, bass and walleye.

Eyes on walleyes: Mention walleyes and most South Dakotans automatically think of Lake Oahe. But long before walleyes were stocked in the Missouri River reservoirs, anglers were chasing ol' stone eyes in the lakes of the northeast.

"The absolute best walleye fishing on the lake comes after dark," said Ray Foster, owner of Bur Oak Lodge on Enemy Swim Lake. "That's in September, when you get the first chill in the air."

Foster said anglers jump into chest waders and walk the shorelines casting bucktail jigs.

During August, Foster said most anglers drift bottom bouncers with nightcrawlers and can catch a nice mix of walleyes and panfish.

Farther east, Jeff Nodsle has been fishing Big Stone Lake for the past six years. As manager of Hartford Beach State Park, Nodsle sees the lake every day and has ample opportunity to chat with anglers.

"The late summer pattern of trolling the basin of the lake with crankbaits is constantly productive," said Nodsle. "That's a daytime thing, with the best bites coming from about 10 a.m. to 2 p.m."

As summer gives way to fall, Big Stone walleye fishing shifts to the shore. Casting crankbaits in the late evening and early morning can be very productive.

"Starting with the full moon in August, the fishing just keeps getting better and better through November," said Nodsle.

Back at Roy Lake, Daberkow said many of the walleye being caught are smaller than the 14-inch minimum but the number of fish is incredible.

"We've got tons of small walleye and they are growing very quickly," he said. "That bodes well for the future of the lake and I think it's indicative of the condition of all lakes in the area. Fishing should be very good in the near future and for some time to come."

16 March 14, 1994

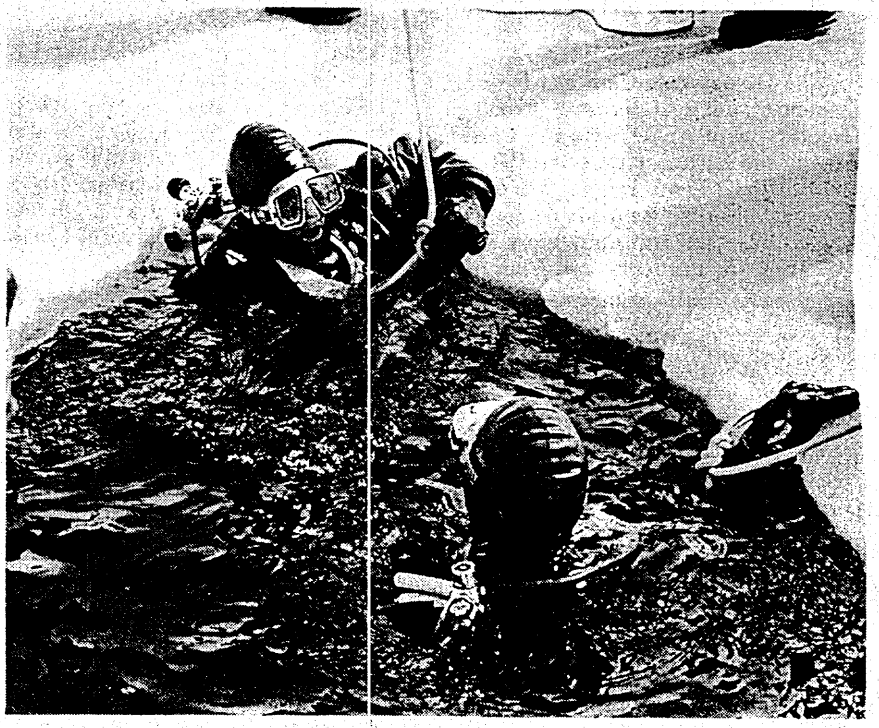
Cool divers. . .

The Codington County Diver Rescue team participated in a training session at Pickerel Lake last Wednesday. The top picture shows two of the 12 divers in the water. Below, divers talked with coordinators before going in.

The divers used Pickerel Lake because it is deep, has good clarity and low silt. The training session included an experienced diver going under water with two inexperienced divers. Depth of water at the hole was about 14 feet, dropping off sharply to about 40 feet.

Purpose of Wednesday's session was to familiarize divers with under ice diving procedures. The team assists in drownings or when vehicles go through the ice.

Jay Grandprey is president of the dive team organization. Law enforcement and conservation officers were invited to the session which lasted most of the day. Martin Yost of Webster helped coordinate the diving site.



P-O State/Area page 6
Monday, August 1, 1994

Almost half of the state's lakes are in trouble

SIOUX FALLS, S.D. (AP) — Water quality is declining in nearly half of the 110 lakes being monitored by the S.D. Department of Environment and Natural Resources, officials say.

The worsening water quality means more silt and algae and less oxygen for fish in the lakes, which include some of the largest and most popular in eastern South Dakota.

Of the 110 lakes monitored since 1979, 17 are improving, 39 are listed as stable and 49 are deteriorating, state officials said. Another five lakes had undetermined trends.

A slow deterioration is part of the natural aging process of a prairie lake, said department official Bill Stewart.

"Lakes are not permanent features on the landscape out here. All lakes when they're formed begin the process of filling in," he said.

"But we can greatly accelerate it. Given the fact that South Dakota is an intensive agricultural state, I don't think it's surprising that we've got some degrading of water quality."

Formal and informal programs to improve water quality can slow down or even reverse that process, however, Stewart said. Improvements include installing sewer systems near lakes, starting erosion-control programs in lake watersheds and limiting the use of farm and lawn chemicals nearby.

"The lakes that have a high population around them are discovering essentially that they've been fouling their own nest," said Linda Hilde, who has lived near Lake Madison for more than 30 years.

A federal grant of $100,000 and a $42,000 contribution by the city of Madison will pay for a two-year study of the 4,900-acre lake. Hilde and some other residents near the lake hope a restoration project will help improve the water quality and reduce the ugly algae blooms in the lake.

In past years, Madison dumped partially treated sewage into the lake's watershed, and area homes had leaking septic tanks, Hilde said.

"There were days when you didn't have to be pure of heart to walk on water out here," she said. "There was just a crust on it."

The city has fixed its sewer problems, and lakeside residents use a sewer system built in 1989.

Frank Johnson, who owns Smith's Park on the lake's eastern shore, is not so sure the lake has problems.

"I don't think there's a whole lot to do," said Johnson, 80. "That's just the way it is. It was this way when there wasn't all that fertilizer."

The statewide effort to clean up lakes is being helped by the South Dakota Lakes and Streams Association, which was formed two years ago. The group operates three dredges to pull silt from the bottom of troubled lakes.

The dredges do not provide a long-term answer to pollution problems, however, said the group's executive director, Dave Hauschild of Pierre.

"It doesn't make any sense to dredge a lake unless you're going to stop the sediment from coming in," he said. "You go in and encourage the local people to look at the entire watershed, to clean up septic tanks, stop the sediment and animal waste from coming in."

SIOUX FALLS, S.D. (AP) — Here are lists of the 10 best and worst lakes in South Dakota, according to tests of nutrient and algae levels by the state Department of Environment and Natural Resources:

The 10 Worst Lakes

1. Lake Preston
2. Dewberry Lake
3. School Lake
4. Burke Lake
5. Sully Lake
6. Whitewood Lake
7. Redfield Lake
8. Lake Kampeska
9. Lake Byron
10. Flat Creek Dam

The 10 Best Lakes

1. Pactola Reservoir
2. Deerfield Lake
3. Angostura Reservoir
4. Cold Brook Reservoir
5. Enemy Swim Lake
6. Orman Dam
7. Pickerel Lake
8. Clear Lake, Marshall
9. Lake Cochrane
10. Sheridan Lake

Lakes will be tested for toxins

SIOUX FALLS, S.D. (AP) — State officials plan to test fish in 10 South Dakota lakes for traces of toxic chemicals.

Experts with the state departments of Game, Fish and Parks and Environment and Natural Resources will test the fish for mercury, polychlorinated biphenyls or PCBs, and the pesticides Toxaphene and Chlordane.

"Our sincere hope is that we don't get hits on any of these," said Bill Stewart of the DENR.

The 10 lakes to be tested are Thompson, Pickerel, Madison, Mitchell, Kampeska, Angostura, Orman, Pactola, Shadehill and Clear in Marshall County.

Crews took samples from lakes Mitchell and Madison during July, said Allen Knapp of Sioux Falls, an official with the Department of Game, Fish and Parks. The crews will take tissue samples from five individual fish in each of five species during annual net surveys of fish populations in the lakes.

"I don't anticipate any problems," Knapp said. "But you don't have to go very far east from South Dakota before you run into fish advisories on how much of a certain fish you can eat in a certain area.

"Generally, that's in more industrialized states where you'll get a lot of those kinds of pollutants."

Pickerel, nine others boast 'clean catch'

Pickerel Lake in northeast Day County is among 10 lakes listed by the Department of Environment and Natural Resources as having fish ". . . very safe to eat."

The Department of Environment and Natural Resources initiated the study last summer to determine whether or not the fish in South Dakota's lakes are contaminated by pollutants. Fish fillets were tested for concentrations of mercury, PCBs, chlordane and toxaphene.

"We tested for those elements because the U.S. Food and Drug Administration had classified them as potential health concerns," said Bill Stewart of DENR. "The results we got back are well below the levels of concern established by the FDA.

Targeted popular fishing lakes

Game, Fish and Parks Fisheries Chief Bob Hanten noted, "We targeted some of the most popular fishing lakes across the state to get a good representative sample of different species. The fish used were of average size, the size most likely to be caught and taken home for supper. We are very happy with this preliminary report." The fish taken for the samples were netted in July and August of 1994 and sent to Braun Intertec Corporation in Minneapolis for analysis.

Lakes tested besides Pickerel were Lake Madison, Lake County; Lake Thompson, Kingsbury; Lake Kampeska, Codington; Lake Mitchell, Davison; Clear Lake, Marshall; Angostura Reservoir, Fall River; Orman Dam, Butte; Shadehill Reservoir, Perkins; Pactola Reservoir, Pennington.

Appendix K - Project Newsletters

THE PICKEREL LAKE PROTECTION PROJECT

Day County Conservation District

INTRODUCTION

Northeastern South Dakota is fortunate to have many beautiful clean lakes. However, these lakes are showing the early signs of degradation due to nonpoint source pollution.

Nonpoint source pollution in SD is commonly caused by runoff from agricultural lands and feedlots in a lakes watershed, leaking septic systems, and shoreline erosion.

Signs of lake degradation due to nonpoint source pollution include an increase in algal blooms, dense aquatic weed beds, increase in rough fish populations, increased winter-kills, and loss of depth.

A 1985 water quality study stated that Pickerel Lake receives dangerous nutrient loading from nonpoint source pollution. Pickerel Lake is showing signs of excessive nutrient loading as evidenced by algae blooms and excessive aquatic weed growth.

In 1991, the South Dakota Nonpoint Source Task Force adopted its SD Lake Protection Strategy. This task force named 21 lakes on its priority list including Pickerel, Enemy Swim, and Minnewasta Lakes, all located in Day County.

Pickerel is the first lake in South Dakota to undergo a protection plan under this strategy.

PICKEREL LAKE

Pickerel Lake is South Dakota's deepest natural lake, having a maximum depth of 43 feet and an average depth of 22 feet. The lake covers 955 acres with 9.4 miles of shoreline. Located along this shoreline are over 300 homes, cabins and trailer houses, two businesses, a church camp, two state recreation areas, and public access areas. Approximately 55% of the lakes shoreline is developed.

Pickerel Lake is an important recreational resource. Lake activities include boating, waterskiing, swimming, camping, and fishing.

The lake is a very important source of tax revenue for Day County. In 1992, the assessed value of property owned along the lakes shore was 7.3 million dollars. Visitors to the lake spend their money at businesses located at Pickerel Lake and in nearby towns.

Continued degradation of Pickerel Lakes water quality will negatively affect its recreational use, future property values and the local tax base.

THE PICKEREL LAKE PROTECTION PROJECT

In 1992, the Day Conservation District initiated a Lake Protection Project for Pickerel Lake. The goal of this project is to prevent further degradation of Pickerel Lakes water quality.

The project has two main goals. First, map the lakes watershed to direct protection activities. Secondly, encourage implementation of land use practices to maintain Pickerel Lakes water quality. These best management practices (BMPs) are the most efficient and practical methods of preventing and stopping the amount of nutrients reaching Pickerel Lake through nonpoint source pollution.

Specifically the project will:

* Improve the condition of farm and rangeland in the watershed, reducing nonpoint source pollution.

* Protect areas of shoreline that are contributing sediment to the lake through erosion.

* Through information and education keep lake users and local residents informed about what they can do to protect Pickerel Lake from nonpoint source pollution.

The Pickerel Lake Protection Project is not a regulatory or law enforcement agency. All project activities involving property owners are voluntary with many incentives and cost-sharing options available.

A COOPERATIVE VENTURE

The Day County Conservation District located in Webster, SD serves as grant applicant and project sponsor. This office will oversee all project activities through a Project Coordinator.

A Cooperative Venture cont.

The SD Department of Environment and Natural Resources (DENR) administers project EPA monies and provides technical assistance on water quality issues.

The Water Resources Institute located at South Dakota State University is involved in project planning, watershed inventory, and water quality testing.

The Soil Conservation Service (SCS) provides technical assistance in implementing BMPs in Pickerel Lakes watershed.

The Agricultural Stablilization and Conservation Service (ASCS) provides information about land use and cost-share through the Water Quality Incentive Program (WQIP).

PUBLIC INPUT & COOPERATION

Taking good care of Pickerel Lake is the responsibility of every home and cabin owner, lake user, and agricultural landowner located within the watershed. All must practice good lake stewardship to insure the success of this project.

Lake stewardship is the first important step in protecting Pickerel Lake. Stewardship requires an understanding that what we do in the water and on the land within the watershed affects Pickerel Lake.

Specifically good lake stewardship involves:

* Attending all public meetings and forums on the Pickerel Lake Protection Project.
* Reading all information pertinent to the project.
* Agricultural landowners within the watershed voluntarily implementing BMPs practices on their land.
* Lake home and cabin owners voluntarily implementing recommendations made by the project to prevent nonpoint source pollution including shoreline erosion.
* Formation of a unified Pickerel Lake Association with members representing all areas of the lake.
* Asking questions and openly communicating with project representatives.

PROJECT FUNDING & COST INCENTIVES

Many Pickerel Lake Protection Project activities are funded by a 319 Nonpoint Source Pollution Control Grant from the Environmental Protection Agency (EPA). Money from EPA 319 will be used for animal waste management systems and shoreline stabilization.

Incentives will be paid to farmers located within Pickerel Lakes watershed by the ASCS if they adopt BMPs beneficial to both landowner and Pickerel Lake. These WQIP monies will be paid on a per acre basis for conservation tillage, contour farming, animal waste management systems, and other BMPs.

Local matching funds for this project are provided by the Day County Conservation District, SDSU, Day County, and local citizens and groups interested in the project.

LAKE PROTECTION VS LAKE RESTORATION

A lake protection project involves activities designed to maintain a lake not already seriously degraded by human activity.

A lake restoration Project involves larger scale activities designed to restore a seriously polluted lake to its former condition. Lake restoration projects cost millions of dollars and usually involve expensive methods such as dredging of lake bottom sediments, aeration, and chemical treatments.

It is more cost effective to eliminate the problems now through lake protection activities, thereby eliminating more expensive lake restoration projects in the future.

THE PICKEREL LAKE SANITARY SEWER DISTRICT

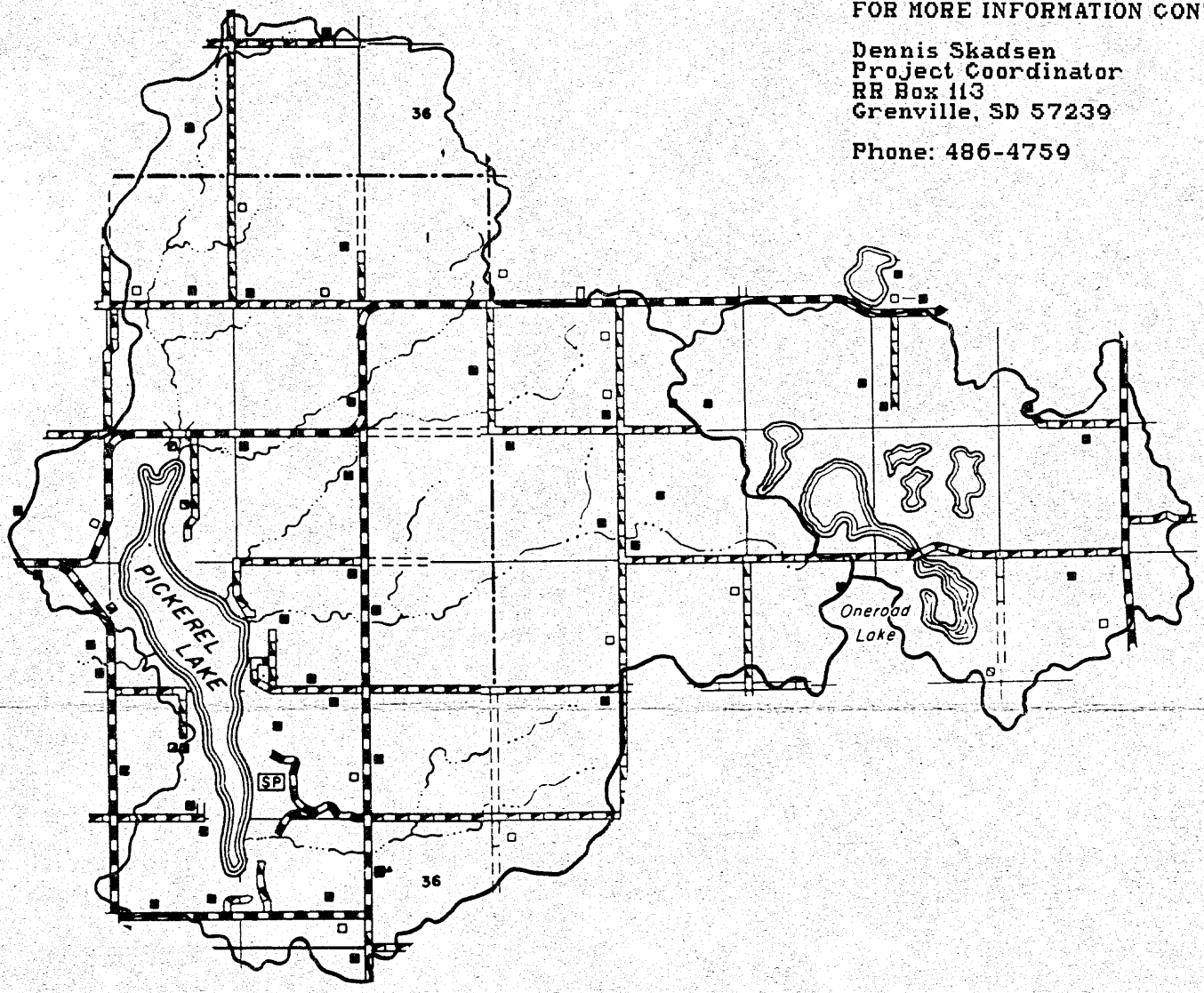
A separate but equally important project benefiting Pickerel Lake is the sanitary sewer district formed in 1992 by lake residents. This project will eliminate only nonpoint source pollution from septic tank seepage.

Funding for these projects is separate. However, both the Pickerel Lake Protection Project and Sanitary Sewer District will work together to keep Pickerel Lake clean and safe.

FOR MORE INFORMATION CONTACT:

Dennis Skadsen
Project Coordinator
RR Box 113
Grenville, SD 57239

Phone: 486-4759



PICKEREL LAKE WATERSHED

Pickerel Lakes watershed is situated in the Coteau des Prairie, a hilly plateau of glacial moraine. The watershed encompasses 15,015 acres of predominately agricultural lands in Day, Marshall, and Roberts counties, mainly east and north of Pickerel Lake.

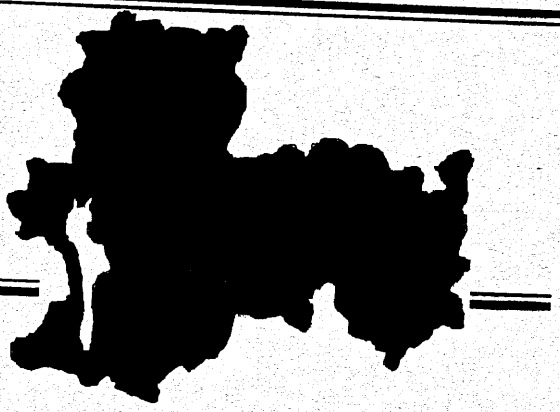
Two major and three minor drainages makeup the Pickerel Lake watershed. Chekepa Creek enters the lake from the east draining the largest section of the watershed. Dry Creek drains the second largest area and enters Pickerel Lake from the north.

Day County Conservation District

710 Main
Webster, SD 57274

Pickerel Lake Protection Project

Day Co. Conservation District



March 1994

NEWSLETTER

From the Coordinator:

I've talked to many of you during the past year and appreciate your concerns about Pickerel Lake. Several of you have brought nonpoint pollution sources to my attention. The project goal is to correct as many of these problems as possible whether large or small. However, several major sources of nonpoint pollution have been identified in the lake's watershed and when corrected will have the most benefit to Pickerel Lake per dollar spent.

This coming spring and summer will see several project activities carried out to control the major sources of nonpoint pollution. Designs for three Animal Waste Management Systems are completed. Construction of these systems may begin, late spring 1994. When built, these three systems will contain and utilize the feedlot waste of more than 600 head of cattle, controlling nutrients that now reach Pickerel Lake. Landowners and operators in the lake's watershed will implement Best Management Practices on 1460 acres of cropland. These practices include conservation cropping sequences, conservation tillage, nutrient management, and seeding highly erodible land to grass or legumes. Some of this cropland may currently contribute sediments and nutrients to the lake via soil erosion.

Engineers are working on plans to repair flood damage to shoreline on the northwest side of Pickerel Lake. The project has funds to cost share shoreline stabilization. A shoreline survey of Pickerel Lake was completed last October. The survey identifies areas in need of shoreline stabilization around the entire lake.

If you completed shoreline stabilization on your property (riprap, sea walls etc.) in 1993, please consider contributing the cost of this work as local matching funds. Local match is needed whenever agencies receive state and federal grants. To date, over $18,000 of local matching funds

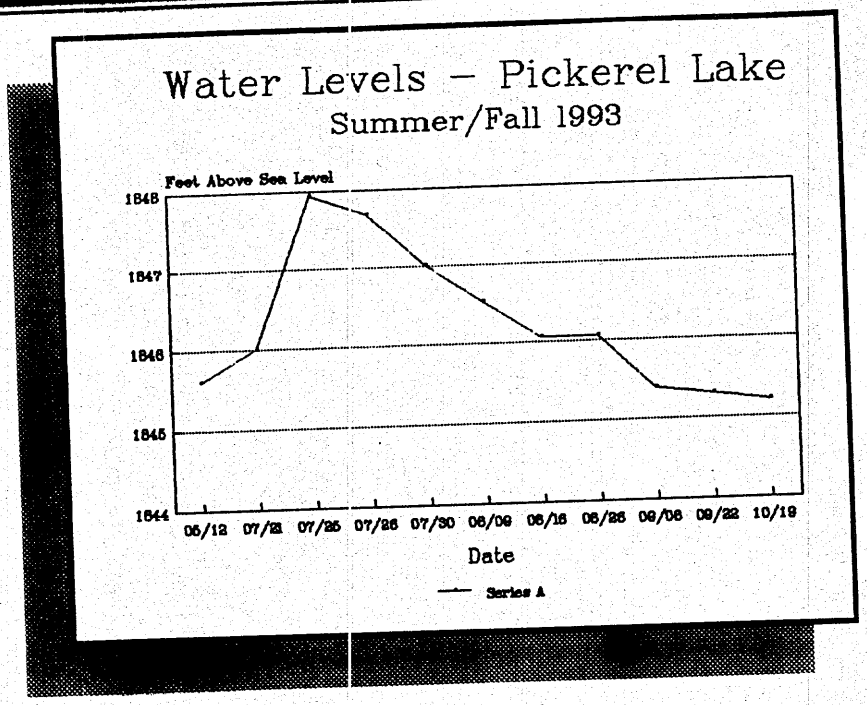
From the Coordinator-cont'd

have been contributed to the Pickerel Lake Protection Project.

It's a very simple process to contribute your funds. Just send us a copy of the bill or statement showing construction costs for work completed along your shoreline. If you have questions on contributing local match, contact the project coordinator.

Information and education is an important part of the Pickerel Lake Protection Project. To date, a project brochure and two fact sheets have been published. If you have not received the blue project brochure, please let me know. Two fact sheets, "A Brief Geological History of Pickerel Lake", and "Pickerel Lake Water Levels 1928 - 1993", will be distributed soon. Future fact sheets will provide information on the lakes fisheries, eutrophication, and lawn care for lake property owners.

I would like to thank everyone who responded to my letter. One of the most difficult and important aspects of the project is keeping an up-to-date mailing list of watershed and lake property owners. It is important we keep you informed of project activities and provide information on how you can help keep Pickerel Lake clean and healthy. If you have moved please forward your new address. If you have recently sold your cabin, please send us the name and address of the new owners.

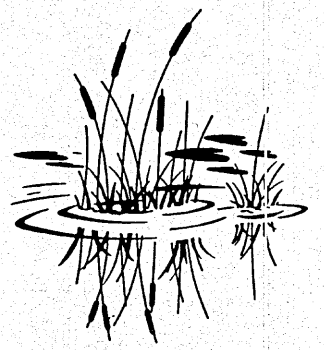


Your support of the protection project is appreciated. If you have any questions or need information about Pickerel Lake, please write or call:

Dennis Skadsen, Coordinator
Pickerel Lake Protection Project
RR 1 Box 113
Grenville, SD 57239
Phone: 605/486-4759

or

Day Conservation District
710 Main Street
Webster, SD 57274
Phone: 605/486-4759



Who Controls Lake Levels?

There is some misunderstanding as to which state agencies control lake levels and spillway elevations on Pickerel Lake.

The South Dakota Department of Environment & Natural Resources - Water Management Board, is mandated by State law to establish Ordinary High Water Marks (OHWM) on all public lakes in South Dakota. The ordinary high water mark is established by the DENR after examination of the lake's shoreline for distinct marks left by the action of water such as erosion and shoreline vegetation. Pickerel Lake's OHWM is established at an elevation of 1845.6. The original spillway and weir, built in 1929, was established with an elevation of 1844.9, 0.7 feet below the OHWM.

Lake Levels - cont'd

In 1992, it was determined the weir was no longer at the proper elevation due to damage by ice and sedimentation. Bids were received in 1993 for construction of a new weir. However, wet conditions delayed construction from May 1993 until late August. The new weir was built using the previously established elevation of 1844.9.

The weir and spillway are located on land owned by the SD Dept. Game, Fish & Parks - Division of Parks, Pickerel Lake State Recreation Area. The Division of Wildlife's - Lake Access Crew is responsible for maintenance of the weir and spillway. Lake elevations are measured by the SD DENR twice a year. The graph on page 2 shows lake elevations during 1993 as recorded by the DENR and the Protection Project.

Pickerel Lake Directory

A directory listing the names and addresses of Pickerel Lake cottage owners will soon be available. Indexed maps of each lake development will show cottage locations. The directory will be sold for a minimal fee with free copies provided to fire & ambulance services, and local law enforcement agencies. Letters have been sent to all cottage owners requesting address corrections and permission to include their names in the atlas.

Lake Association Steering Committee

An effective way for lakefront property owners to protect and manage their lake is by forming a lake association. Pickerel Lake has several small lake associations with membership limited to property owners of specific areas. A lake association that represents all lakefront property owners will have a stronger voice with local and state government.

The first step in developing a lake association is the formation of a steering committee. This committee will be responsible for developing bylaws, and nominating officers and directors. If you are interested in becoming a steering committee member, contact the project coordinator. The steering committee will hold it's first meeting sometime in May.

How Important is a Lake's Watershed?

On 24 July 1993, Pickerel Lake experienced over 6 inches of rain in just a few hours time. Lakefront property was spared severe flood damage due to the excellent nature of the lake's watershed.

The majority land use of Pickerel Lakes watershed is grassland (about 60%). Grass reduces the amount of runoff during heavy rains and snow melt by allowing water time to soak into underlying soils. Grass & legume cover on highly erodible soil prevents erosion. Grassed waterways trap soil, reducing the amount of sediments that enter a lake through its tributaries by 80 to 90%.

Wetlands are very important during extreme rainfall years, like 1993. Wetlands in a watershed act as large sponges that hold and retain millions of gallons of water. If wetlands are drained and converted to cropland, a watershed will lose a large portion of its capacity to hold water. Severe flooding of lakes and rivers than occurs. In Pickerel Lake's watershed, many wetlands have been left in their natural state. Had these wetlands been drained, lake levels during the 93 flood may have been higher causing further damage to lakefront property. Several wetlands in Pickerel and Oneroad Lake's watersheds have been restored. Protection project goals include restoring additional wetlands in these watersheds where possible.

Pickerel Lake Fast Facts

Deepest Natural Lake in South Dakota
Maximum depth: 43 ft. Mean depth 22 ft.

Lake Volume: 19,100 acre/feet
Surface Area: 955 acres
Shoreline: 9.4 miles
Watershed: 17,496 acres
(includes Oneroad Lake watershed)

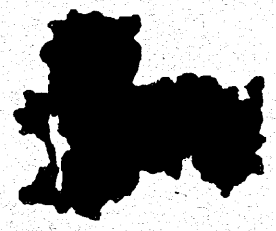
Former Name: Lake Wilson
Named after C.G. Wilson, U.S. Surveyor General

Dakota Sioux Name: Lake Tamahe
Meaning - thin fish or pickerel

Warm Water Fisheries
18 species of fish: 16 native, 1 introduced, 1 exotic

Report Available

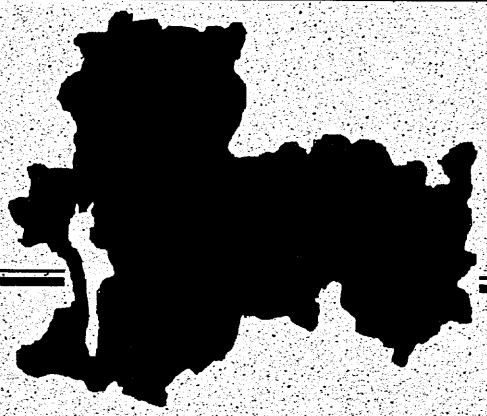
"A Summary Report of Water Quality in Pickerel Lake" is now available. The report summarizes results of water quality monitoring from 1991 through 1993. The on-going study is being conducted by the Water Resources Institute at South Dakota State University. Copies are available free of charge from the Project Coordinator.



Pickerel Lake Protection Project
Day Conservation District
710 Main Street
Webster, SD 57274

Pickerel Lake Protection Project

Day Co. Conservation District



February 1995

NEWSLETTER

From the Coordinator.

First, I would like to thank all of those who answered and returned the Lake Property Owners Survey last fall. Survey results are found on page 2 of this newsletter. Information obtained by this survey was crucial in obtaining $5,000.00 in additional project funds from the Day County Commission. This additional money will help pay administrative costs and fund further Information & Education activities.

Secondly, I would like to update you on project activities. Many of you attended the Lake Awareness Seminar held last July at the Pickerel Lake Bible Camp. Participants heard updates about Protection Project activities, progress of the Sanitary Sewer District, and information on the lakes water quality and fisheries. A second lake seminar is planned for this coming summer. This seminar will offer tours of Pickerel Lake's watershed and waste management sites, and discuss the feasibility of organizing a lake association. The date and location of this seminar will be announced through a mailing and the local media.

Over 100 Pickerel Lake Directories were sold to lake property owners. The money donated for these directories will be used for Information and Education activities such as this newsletter. I hope to publish a revised and updated directory by next fall. Those who purchased the first edition will receive the revised directory for free. Copies of the first edition are still available from the Project Coordinator for $6.00.

Two Animal Waste Management Systems were built last fall. Properly constructed and maintained systems can reduce the amount of phosphate and bacteria that reaches a lake from feedlot runoff by 90%. Construction of these systems cost $97,000.00 with project grants paying over sixty percent of the total cost of construction. Construction of a third system will begin this spring.

Incentive payments of $17,000.00 were paid to operators implementing Best Management Practices on 1500 acres of cropland in Pickerel Lake's watershed. An additional $5,000.00 paid for the proper application of 257,000 cubic feet of animal waste to cropland in the lake's watershed.

Bids will be awarded this spring for the construction of structural shoreline erosion control revetments. Approximately 400 feet of shoreline will be stabilized using riprap and fabric treatments. Project funds will provide cost share to participating landowners.

Last but not least, thanks to all of you who have participated in the various programs and activities sponsored by the Protection Project. To date, over $80,000 of local cash and in-kind contributions have been generated by lake property owners and watershed operators. Future projects and funding depend on your continued support and participation. We have much more to do!

Lake Property Owners Survey Results

Compiled by Dennis Skadsen, Project Coordinator

Last July, surveys were mailed to 310 Pickerel Lake cabin owners. One hundred and ten surveys (35%) were completed and returned to the Project Coordinator. Below is a brief summary of the answers and opinions of those returning the survey concerning Pickerel Lake's past, present, and future.

* Average number of years property or cabin held by owner: 19.5

* Average number of weekends a lake cottage is used during a year: 15

* Average number of visitors to a lake cottage during a year: 16

* 16% of those answering the survey said they planned to live at Pickerel Lake year-round in the future.

* 37% of those answering the survey said they planned to improve their lake property or buildings in the future.

* Activities, in order of popularity, lake property owners most often participate in:

1. Boating
2. Fishing
3. Swimming
4. Walking/Hiking
5. Bird/Wildlife Watching
6. Hunting (waterfowl)

Q. What are the most important reasons to protect Pickerel Lake's water quality?

Answers given in order of importance:
1. Save for future generations use
2. It's a rare natural resource
3. Protecting the value of my lake property
4. Northeastern South Dakota's economic health

Q. What are the most important beneficial uses of Pickerel Lake?

Answers given in order of importance:
1. Recreational boating & water-skiing
2. Fish propagation
3. Sport fishing
4. Wildlife propagation
5. Livestock watering

Q. In your opinion what water quality problems apply to Pickerel Lake?

Answers given in order of significance:
1. Decline in good fishing
2. Carp/roughfish
3. Algae blooms
4. Aquatic weeds
5. Cloudy/murky water
6. Sedimentation
7. Trash/garbage in water
8. Over fishing
9. Winter/summer fish kills

Q. In your opinion what are the major sources of nonpoint pollution to Pickerel Lake?

Answers given in order of significance:
1. Septic system failure
2. Fertilizer/pesticides
3. Feedlot runoff
4. Cropland erosion
5. Shoreline erosion
6. Overgrazed pastures
7. Livestock along shoreline

Q. What poses the greatest threat to Pickerel Lake's water Quality?
A: Failing septic systems

Q. What poses the least threat to Pickerel Lake's water quality?
A: Shoreline erosion

Q. What future development will benefit Pickerel Lake and its residents?
A: Sanitary Sewer District

Q. What future development will be detrimental to Pickerel Lake and its residents?
A: Further residential development

Q. What local government services do you feel need improving at Pickerel Lake?

Suggestions included the following:
* Improved road maintenance & snow removal
* Improved fire & police protection
* More laws regulating high-powered boats & jet-skis

* Survey participants report spending an average of $575.0 a month for products such as gasoline, groceries, entertainment, hardware, and lumber from businesses located within a 30 mile radius of Pickerel Lake. Thus, a typical lake season, June through August, generates over $300,000.0 in revenue to businesses located along the lake, in Grenville, Roslyn, Waubay, and Webster. (Webster ranked number one for these services)

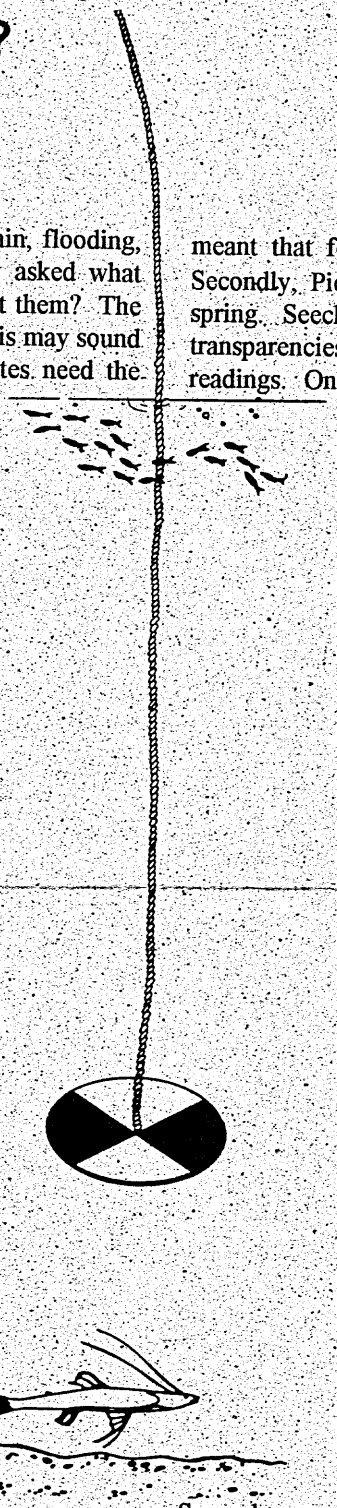
* Forty-one percent of those surveyed hired on average, two local people for yard work, house cleaning etc. They paid an average of $380.00 a year for these services.

Where Were the Weeds?

by Dennis Skadsen, Project Coordinator

Remember the summer of 1993, too much rain, flooding, and an overabundance of aquatic weeds. Many asked what happened to the weeds in 1994. Did the Carp eat them? The answer is no, it was just a bad growing season. This may sound a bit ridiculous, but aquatic weeds or macrophytes need the same things to grow as terrestrial plants; water, sunlight and fertilizer.

Water conditions during the spring of 1993 were perfect for growing macrophytes. First, the water was extremely clear allowing sunlight to reach a greater proportion of the lake's bottom. Secchi disk readings during June 1993 showed transparency to a depth of thirteen feet. The Secchi disk is one of the most frequently used water quality tests. The disk is a 20 cm plastic or metal disk painted black and white. (see drawing at right) The disk is lowered into the water and the observer measures the depth at which the disk can no longer be seen. Generally, greater Seechi disk readings indicate better quality water.



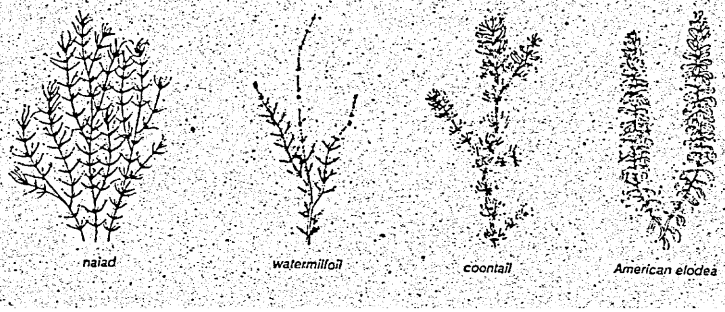
Secondly, spring thaw occurred quickly in 1993 allowing runoff from snowmelt to reach the lake. Runoff carries sediment and animal wastes containing nutrients such as nitrate and phosphate, common plant fertilizers. Runoff from heavy summer rains carried further nutrients to Pickerel Lake. (Most protection project activities are designed to lower the amount of nutrients reaching Pickerel Lake from sediments and animal waste) During the July flood, many septic systems were breached providing another source of nutrients for aquatic plants to use. More sunlight, abundant fertilizers, the result - dense beds of macrophytes were common at creek inlets and along shorelines heavily populated with cabins.

What were conditions in 1994? First, spring weather favored a much slower snowmelt. Low nighttime temperatures allowed runoff to freeze overnight. Ground conditions were also different than 1993. Heavy snowfall during late October prevented the ground from freezing. During snowmelt much of the water seeped into the ground rather than flowing as runoff across the normally frozen surface. Less surface runoff in 1994 meant that fewer nutrients probably reached Pickerel Lake. Secondly, Pickerel Lake's water was more turbid during the spring. Seechi disk readings in June 1994 were very low with transparencies at only six feet, less than half the depth of 1993 readings. One reason for the high turbidity, a large population of diatoms, a form of golden brown algae, bloomed in May lowering the lakes transparency. You may have noted a brown hue to the lake's water throughout the summer. Lower water transparencies, fewer nutrients equaled less aquatic weeds in 1994.

What will happen this year? We will have to wait and see. However, if excessive growth occurs this summer there are solutions to decrease the amount of macrophytes along your shoreline.

Aquatic herbicides are effective but require a permit for use from the SD Dept. of Environment and Natural Resources. Aquathol, Rodeo, and Sonar are just a few of the brand name herbicides available. Cost for applying these chemicals range from $1 to $3 per linear foot of application. It may take two to three applications during a summer since regrowth often occurs within 10 days after the first application. It is not fully understood how aquatic herbicides affect a lake's ecosystem. However, some aquatic herbicides are toxic to fish.

Removing aquatic weeds by mechanical means is more environmentally sound. An old fashioned garden rake is very effective in removing weeds. Homemade drags and harrows are also effective. Several companies sell specially designed aquatic rakes, cutters, and uprooters. For more information on where to purchase this equipment contact the Project Coordinator.



A Response to Questions About Pickerel Lake's Fishery

by Dave Lucchesi, Fisheries Biologist, SD Dept. Game, Fish & Parks - Webster, SD

Coordinator's Note:

Many of you returned the Lake Property Owners Survey with comments and questions about Pickerel Lake's fisheries. Commonly asked questions dealt with the lake's carp population, lack of fish, walleye stocking, and does the GF&P remove walleyes from Pickerel Lake for stocking in the Missouri River system. Dave Lucchesi gives the following response to your questions and comments.

First, the SD Dept. of Game, Fish, and Parks does not remove any species of fish from Pickerel Lake for stocking in the Missouri River impoundments! In fact, just the opposite occurs! For the past ten years the Missouri River has provided walleyes for stocking Pickerel and other eastern South Dakota lakes. Almost all walleye spawning operations take place on Lake Oahe. These eggs are transported to the Blue Dog State Hatchery where they are hatched and either raised as fry or fingerlings.

Pickerel Lake has been stocked with more walleye fry per acre than any other South Dakota lake. Table 1 page 5, lists the number, species, and size of all fish placed into Pickerel Lake from 1980 through 1994. Unfortunately since 1982, both walleye stocking and natural reproduction have not produced an extremely strong year class that would provide good fishing. The 1994 year class is relatively strong and hopefully will provide good walleye fishing by the 1996-97 season. One bright note, patient walleye anglers last May caught several 3 to 7 pound fish at Pickerel Lake.

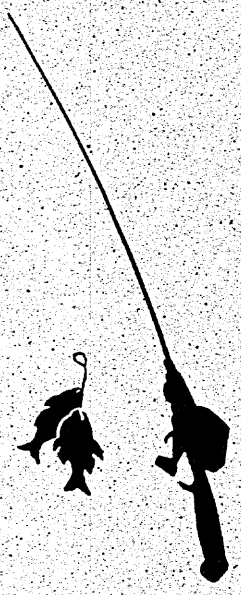
Approximately two million large walleye fingerlings have been stocked into eastern South Dakota lakes since 1984. The Blue Dog State Fish Hatchery releases walleye fry into winterkill ponds to be raised as fingerlings. Large walleye fingerlings are harvested from these ponds during the months of September and October to be stocked into area lakes. It was speculated that stocking of larger fingerlings would greatly improve the walleye fisheries of lakes such as Pickerel. However, ten years after the programs start, significant results have not been seen. Thus a study was initiated to evaluate the survival and subsequent contributions of these large fingerlings. Pickerel Lake was chosen as one of two study lakes.

Approximately 20,000 large walleye fingerlings have been stocked into Pickerel each fall since 1992. Stocked fingerlings are marked by freeze branding to distinguish these fish from naturally reproduced or fry-stocked fish. Two hundred fingerlings are retained in fish pockets for 48 hours at the time of stocking to determine the effects of trapping, marking, and transferring on their survival. Electrofishing by boat is used during summer and fall to sample walleye fingerlings. Study results show that stocked walleyes comprised approximately 90% of the 1992 year class and 30% of the 1993 year class. Unfortunately, a large enough sample was not obtained to estimate their survival overwinter. However, it appears that less than twenty percent survive through the first winter. Pickerel Lake will be sampled again in 1995 to evaluate the survival of 1994 stocked fish.

Electrofishing is conducted after dark. You may have seen or heard the electrofishing boat following the shoreline. This boat has two large spotlights mounted on the front. Electricity is generated by an onboard generator that creates a low voltage field around the front of the boat. Fish are temporarily stunned by the electrical field and netted by the boats crew, who then place the fish in a live well. At the end of a sample run these fish are measured, weighed, and in some instances tagged, then returned to Pickerel Lake.

During the winter of 93-94, Pickerel Lake undoubtedly provided the best yellow perch fishing in South Dakota. The size of yellow perch is increasing and northern pike numbers are excellent with good natural reproduction noted during the last two years. Smallmouth bass populations also look promising. Both smallmouth and largemouth bass have provided good fishing during the last five years.

Pickerel Lake does have a healthy population of carp. Despite their bad reputation, carp probably have not dramatically affected the game fish population in Pickerel Lake. Carp do not consume large quantities of game fish eggs or aquatic vegetation. These fish prefer to eat invertebrates from the lake's bottom. Removal of carp by commercial fisheries would have little effect on improving fishing at Pickerel Lake. The GF&P has issued a permit to commercial fisherman Fritz LeClair to remove rough fish. However, due to low prices and difficulties in seining because of the lake's structure, it is not economically feasible to seine Pickerel at this time. A commercial fishing committee tabled by Ron Meester, Todd

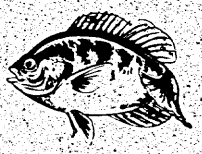


St.Sauver, and myself are presently looking for strategies and methods to make commercial fishing more feasible on lakes such as Pickerel.

I hope this answers a few of your questions. If you have further questions or would like to participate in electrofishing or lake surveys, contact Dave Lucchesi at 345-3381, weekdays from 8 a.m. to 5 p.m.

Want More Information on Fish, Stocking and Pickerel Lake?

The following reprints from the SD Conservation Digest can be obtained by writing the Project Coordinator.



* Farewell to Pickerel Lake Fish Hatchery
* Of Father, Fishing, and Pickerel lake
* Survival of Young Walleyes
* Stocking Walleyes, Is It Magic?
* Facts About Fish Stocking
* What is Zooplankton?
* Zooplankton, SD animals many people never see.
* Walleye Length Limit Regulations
* South Dakota Fisheries, Over a hundred years of change
* Natural Pond Walleyes

Table 1. Stocking Records for Pickerel Lake 1980 - 1994

Year	Species	Size	Number Stocked
1980	Largemouth Bass	Fingerling	17,000
1983	Smallmouth Bass	Fingerling	15,300
1984	Smallmouth Bass	Fingerling	4,850
1985	Smallmouth Bass	Fingerling	42,500
1986	Northern Pike	Fingerling	32
	Smallmouth Bass	Fingerling	25,000
	Walleye	Large Fingerling	26,269
1987	Walleye	Large Fingerling	38,873
1988	Walleye	Adult	1,405
		Large Fingerling	51,111
		Small Fingerling	34,250
		Fry	1,910,000
1989	Walleye	Fry	1,910,000
		Small Fingerling	99,905
		Large Fingerling	60,235
1990	Walleye	Fry	1,910,000
		Large Fingerling	76,818
1991	Largemouth Bass	Adult	25
		Medium Fingerling	16,820
	Smallmouth Bass	Adult	35
	Walleye	Adult	288
		Fry	1,910,000
		Small Fingerling	100,000
		Large Fingerling	40,500
1992	Largemouth Bass	Medium Fingerling	15,000
	Walleye	Fry	1,910,000
		Large Fingerling	24,006
1993	Walleye	Fry	1,910,000
		Large Fingerling	20,988
1994	Walleye	Large Fingerling	20,588

Do New Exotics Threaten Pickerel Lake?

by Dennis Skadsen, Project Coordinator

Exotics are plants and animals that have been introduced into habitats where they are not native. These plants and animals have few or no predators, parasites, pathogens or competitors to keep their populations in check. The carp is a good example of an exotic. This fish native to the Caspian Sea and Asia, was brought to North America by European settlers in the 1800's. It quickly spread throughout the continent and today, accounts for a large percentage of the fish biomass in lakes, rivers, and streams. As demonstrated by the carp, once exotics become established they rarely are eliminated. With this in mind, it is important to be aware of new exotics that have the potential of degrading Pickerel Lake's recreational use and water quality.

Eurasian watermilfoil has the greatest potential of being introduced into Pickerel Lake. This aquatic plant from Europe has become established in several central Minnesota Lakes as close as 50 miles east of the South Dakota border. A single segment of the plants stem or leaves clinging to a boat motor or trailer can establish a new colony in uninfested waters. Eurasian watermilfoil forms dense beds that crowd out native plants and interferes with aquatic sports such as swimming, fishing, and boating.

Purple Loosestrife is another exotic plant that has been found in Day County, but currently not known to occur at Pickerel Lake or in the lake's watershed. Loosestrife forms dense stands of vegetation along shorelines and stream banks that crowd out native plants destroying valuable wildlife habitat.

The Zebra Mussel is a small clam native to Asia that became established in the Great Lakes and is now being found in many inland lakes. Zebra Mussels have the potential of disrupting the food chain by reducing the plankton young fish feed upon. The microscopic larvae of these clams can be carried to new lakes in a boats livewell or bilge water, and the motors cooling systems.

If you use your boat in other waters, especially Minnesota Lakes, take the time to remove all plants and animals from the trailer and boat motor. Drain bilge water and livewells before leaving the lake's access area. For more information the brochure "A Field Guide to Aquatic Exotic Plants and Animals" is available from the Project Coordinator.

Pickerel Lake Protection Project
Day Conservation District
710 Main Street
Webster, SD 57274

Pickerel Lake Protection Project

Day Conservation District

February 1996

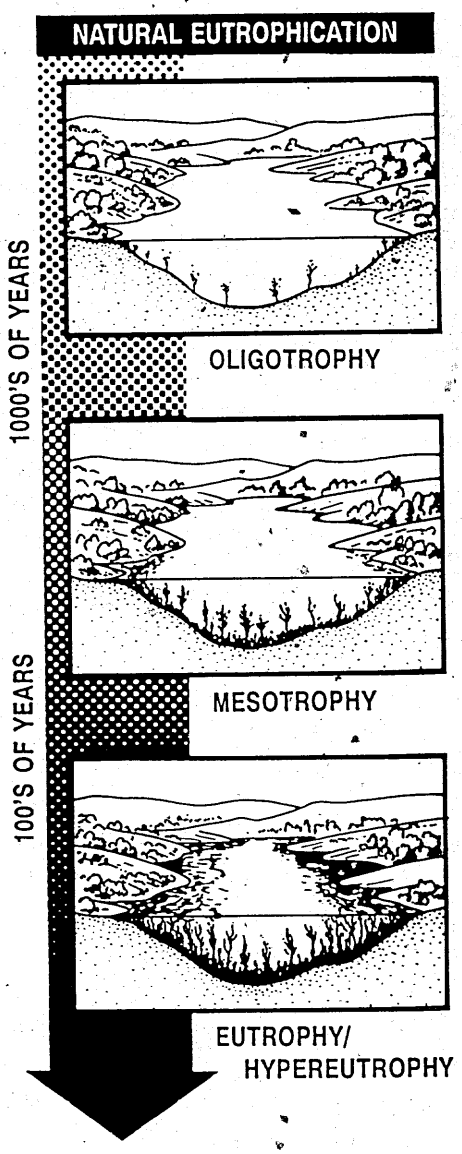
NEWSLETTER

The Trophic State

by Dennis Skadsen, Project Coordinator

Since the early 1900's lakes have been classified according to their trophic state. The word "trophic" means nutrition or growth. Lakes are placed into one of four trophic states based on the amount of nutrients (nitrate and phosphate), algae, and aquatic plants found in their waters. As lakes age, they progress towards a eutrophic state as the lake basin gradually accumulates sediments and nutrients from the watershed (see the illustration below). A typical lake is said to age from a young oligotrophic lake, to a older eutrophic lake. The following paragraphs will briefly describe each trophic state, and how natural eutrophication progresses.

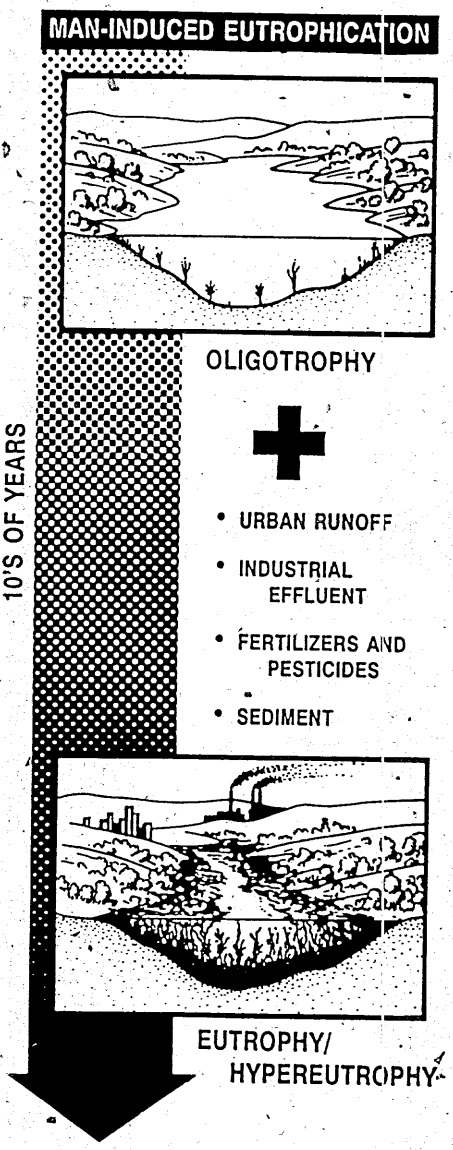
Oligotrophic lakes have low nutrient concentrations and a corresponding low plant growth, thus biologically unproductive. Pactola Reservoir located in the Black Hills, is one of the few oligotrophic lakes found in South Dakota. Mesotrophic lakes have intermediate nutrient availability and biological productivity. Enemy Swim Lake, located just south of Pickerel, is one of the states few mesotrophic lakes. Eutrophic lakes, the next progression down the trophic scale, are nutrient-rich and highly productive. Hypereutrophic lakes are at the extreme end of the eutrophic stage. Unfortunately, most South Dakota lakes are categorized as hypereutrophic. These lakes exhibit thick smelly algae blooms during summer months that degrade their recreational potential. Also, hypereutrophic lakes often experience winter and occasionally summer fish kills, and must be restocked with game fish to provide a fisheries. Blue Dog Lake near Waubay, SD is categorized as a hypereutrophic lake. Pickerel Lake currently alternates between a eutrophic and mesotrophic state. However, a 1985 study of Pickerel Lake showed dangerous amounts of nutrients from nonpoint source pollution were threatening to change this lakes trophic state for the worse. Nonpoint source pollution is a diffuse source of pollutants that washes off the land or seeps into ground water. Typical nonpoint source pollutants include agricultural runoff from fields and feedlots, leakage from failing or poorly designed septic systems, and nutrients from drained wetlands. These pollutants cause cultural or man-induced eutrophication.



Pickerel Lake was formed approximately 12,000 years ago during the end of the Wisconsin Glacial Period. As portions of this glacier retreated, large chunks of ice broke from the main body of the glacier and became buried in debris called outwash. The depressions left in the surrounding landscape after these buried icebergs melted formed the basins for all of northeastern South Dakota's glacial lakes - including Pickerel, and the thousands of prairie potholes that dot the countryside. The landscape surrounding these

The Trophic State cont.

newly formed lakes were often barren with little vegetation, thus most lakes were oligotrophic Over time as the climate warmed with the glaciers retreat, plant communities would become established and lakes shallower and more eutrophic as decaying plant and animal material accumulated on the bottom. This natural eutrophication process usually takes hundreds of years to occur however, cultural eutrophication can hasten the process - causing lakes to reach a hypereutrophic state in just a few decades (see illustration at right).



Prior to 1892, all of Pickerel Lake's watershed lay in the Sisseton--Wahpeton Reservation and was sparsely populated. This quickly changed after the reservation was opened to settlement in 1892. Then, almost every quarter section of Pickerel Lake's watershed was claimed for settlement. Families or adults over 21 were allowed to homestead 160 acres of land for $2.50. To gain ownership, the homesteader had to live on the land for five years and pay an additional $2.50 an acre to obtain title to the land. Many of these sodbusters settled near wetlands, streams or the lakes shore to have a ready supply of water for their animals and themselves. Now cultural sources of nutrients from animal and human waste would be added to the natural nutrients carried into the lake. The virgin tallgrass prairie was broken and converted to cropland, exposing soil to wind and water erosion. During spring snowmelt and summer rainstorms sheet erosion would carry the exposed soil of croplands into Pickerel Lake via streams and drainage's. Man-induced or cultural eutrophication had begun. The droughts of the 1930's eliminated many of the homesteads settled in the late 1800's however, the remaining farms became bigger - breaking more cropland and building larger feedlots. Today, only thirteen active farms remain in Pickerel Lake's watershed. Pickerel Lake's shoreline became the location of several resorts and lake cottages. Today, 80% of the lakes shoreline is developed with year-round homes replacing the basic summer cottage of yore. Shoreline development added further sources of nonpoint source pollution to the lake from failing and poorly maintained and designed septic systems, and lawn fertilizers.

What can be done to reduce or eliminate sources of nonpoint pollution? First, an assessment of the lakes shoreline and watershed must be completed to obtain information on the types of nonpoint source pollutants that threaten a lake. Pickerel Lake's assessment was completed in 1986. Next a plan to reduce the amount of nonpoint pollutants reaching Pickerel Lake was developed. To reduce nonpoint pollution this plan would have to include provisions for reducing soil erosion from watershed cropland, construction of animal waste management systems to reduce phosphate and bacteria from feedlots, shoreline stabilization to reduce shoreline erosion, and a comprehensive information & education program. Implementation of this plan began in 1992 with the start of the Pickerel Lake Protection Project.

The Pickerel Lake Protection Project is now completed. On the following pages we will document the project accomplishments and costs. Will we see Pickerel Lake's water quality improve? Because this is a "protection project" significant changes in water quality are not expected. The goal of the project was to maintain and prevent further accelerated cultural eutrophication. Initial water quality samples below completed animal waste management systems show a marked decrease in the amount of phosphates and bacteria reaching Pickerel Lake. It is hoped the State will continue in-lake sampling to monitor the state of Pickerel Lake's water quality. A start at reducing nonpoint pollution to Pickerel Lake has been made, and the publics awareness of what can be done to improve this lakes water quality has been increased. Protecting Pickerel Lake will be an ongoing project. New developments along the lakes shoreline and changing agricultural practices will provide additional challenges to conservation resource agencies and to those lake and watershed property owners who are dedicated to improving and maintaining the water quality of Pickerel Lake and other northeast South Dakota Lakes.

A Final Report on the Pickerel Lake Protection Project

by Dennis Skadsen, Project Coordinator

"The goal of the Pickerel Lake Protection Project is to maintain and prevent further degradation of lake water quality."

Introduction

The following is a brief report on the activities, accomplishments and expenditures of the Pickerel Lake Protection Project. A more detailed final report on the project, and a complete audit of project expenditures will be completed by June 1996. Copies of this report will be deposited with the Day Conservation District and the Pickerel Lake Sanitary Sewer District for review.

Project Funding

All federal and state grants for this project were received on a competitive basis. The Day Conservation District is the project sponsor, and applied and is fiscally responsible for dispersal of these grant funds. Both federal and state grants required local match and in-kind contributions.

Federal Grants:
United States Environmental Protection Agency 319 Clean Lakes Program **$95,740.00**

South Dakota State Grants:
SD Consolidated Water Facilities Construction Program **$40,000.00**

SD Dept. of Agriculture, Coordinated Soil & Water Conservation Fund **$77.591.00**

Total Grants: $213,331.00

Contributed Funds
These funds were contributed to the project by local, state, and federal agencies for use by the Pickerel Lake Protection Project. These funds did not require a local match however, several counted as local match towards both federal and state project grants.

Natural Resources Conservation Service (formerly SCS): $25,000.00

(For technical assistance in writing conservation plans, surveying and design of animal waste management systems)

Farm Service Agency (formerly ASCS): $51,000.00
(WQIP - Water Quality Incentive Program and ACP - Agricultural Conservation Programs provided financial incentives to landowners to implement Best Management Practice's in Pickerel Lake's watershed)

Day County Commission: $5,000.00
(For administrative costs and Information & Education programs)

Day Conservation District: $1,000.00
(For administrative costs)

Project Activities and Accomplishments

Information & Education

A lake protection plan such as Pickerel's required extensive interaction with the public and with various State and Federal agencies. The 319 project work plan defined several activities to accomplish this need. $4,944.00 were budgeted for Information & Education activities.

Initiate and participate in local meetings of landowners and homeowners

* 7/18/92 - Public meeting at the Pickerel Lake Lodge attended by 26 people.
* 7/17/93 - Joint public meeting with Pickerel Lake Sanitary Sewer District held at Camp Wisagoma. Meeting attended by approximately 160 people.
* 7/9/94 - First "Lake Awareness Seminar" held at Pickerel Lake Bible Camp. Approximately 75 people attended.
* 6/17/95 - Second "Lake Awareness Seminar" held at Pickerel Lake Bible Camp. Approximately 20 people attended.

Additional programs were presented by the Project Coordinator to the following groups and organizations:

Enemy Swim Sanitary Sewer District; Pickerel Lake State Recreation Area - weekend programs; SDACD Area 1 Legislative Banquet - Webster; SD Assoc. of Conservation Districts, Area 1 Annual Meeting - Webster; Webster Farm & Home Show - booth; Webster Izaak Walton League; Webster Kiwanis Club; Webster Knights of Columbus; Webster-Pickerel Lake Park Subdivision - annual meeting

Final Report cont.

Meetings, Workshops, and Training Seminars attended by the Project Coordinator:

Coordinated Resource Management Training - Sioux Falls; EPA Region 6 Clean Lakes Conference - Sioux Falls; Management & Restoration for Wetland Functions and Values - Huron; NRCS Basic Principles of Ecology - Huron; Pickerel Lake Sanitary Sewer District - monthly meetings; Richmond Lake Water Quality Project Tour - Brown Co; Roy Lake Rendezvous - NRCS Training Workshop; SD Water Congress, Fall Legislative Forums - Pierre; Sisseton-Wahpeton Dakota Nation Environmental Protection Forum - Sisseton; Volunteer Lake Monitoring Seminar - Lake Poinsett; Watershed Management Workshop - Huron; WacinTanka - Healing Relationships with the Earth and Each Other - Enemy Swim Lake

Write news releases for local media to publicize the project.

News Releases

* Webster Reporter & Farmer:
1992) Pickerel Project Is Okayed; Lake Project Meeting Set; Project Begins At Pickerel Lake; Special Funds Are Available
1993) Is Project Coordinator;
1994) Busy Buddies Clean Shoreline; Lake Awareness Seminar
1995)Pickerel, Enemy Swim Lakes Clean; Project Completed to Protect Pickerel

* Watertown Public Opinion:
1993) Runoff Dirties Lake Pickerel; Project Aims At Protection To Avoid Restoration
1994) Residents Unite For Water Quality At Pickerel Lake

* Aberdeen American News:
1994) Lake Awareness Seminar

* KABY TV - Aberdeen:
1992) Story on project
1994) Community Calendar Announcement

* KBWS Radio Station - Eden:
1992) Outdoors In The Glacial Lakes (interview about project)
1994) Community Calendar Announcement; Dakota Farm Talk Program (interview about project)

Produce and distribute annual reports to all interested persons

Project accomplishments published in the Day Conservation Districts annual report, and through project newsletters mailed to all watershed landowners & operators and lake shore property owners in 1993,1994,1995 & 1996.

Develop water quality fact sheets targeted towards local governments, private groups, and local landowners.

The following fact sheets were produced and distributed at local meetings and through mail order:

History/Geography
* A Brief Geological History of Pickerel Lake
* Pickerel Lake Water Levels 1928-1993

Biology/Fisheries
* A Pictorial Key to Pickerel Lake Fish
* Pickerel Lake Fisheries

Best Management Practices
* Controlling Shoreline Erosion
* Lake Protection Tips
* Understanding & Maintaining Your On-Site Septic System
* WaterWise Boating

Pickerel Lake Recreation Area Campers/Boaters
* Wanted - A Clean Lake, Lake Protection Tips for Boaters & Campers

The following fact sheets produced by other conservation agencies were also distributed;

* Managing Lawns to Protect Water Quality
* Water Get The Facts, Volume 1,2

Additional Information & Education Activities:

* A "Lake Ecology" curriculum was developed in partnership with the Glacial Lakes Outdoor School located on Enemy Swim Lake. The curriculum includes hands-on testing of water quality, collecting aquatic invertebrates for bio-assessment, fisheries, and information on watershed care and nonpoint source pollution prevention. 4th - 6th grade students from Bristol, Britton, Milbank, Rosholt, Summit, Tiospa Zina, Webster, and the Enemy Swim Day school have participated in the program. This curriculum has also been used at the Youth Conservation Camp held each summer at GLOS. To date, 886 students have participated in this course. This class has become part of the standard curriculum offered to schools visiting GLOS. A similar presentation on lake ecology was given at the Roslyn and Waubay Elementary Schools.

Continued on page 5.

Information & Education cont.

* In 1993, four project signs promoting the Pickerel Lake Protection Project and listing project participants were placed along the lakes shoreline at the east and west boat ramps located in Pickerel Lake State Recreation Area, the boat ramp located at the old hatchery site, and at the Pickerel Lake Lodge parking lot. These signs were put in place by State Park Employees as an in-kind contribution towards the project. A fifth sign is located at the Shoreline Stabilization Demonstration Project.

* On 24 April 1994, the Busy Buddies 4-H Club picked up litter along the Pickerel Lake Outlet Creek - from the mouth of the creek to Day Co. Highway #1. Eleven 4-H members and their leaders volunteered to participate in the "Adopt-A-Stream" - program sponsored by the SD Dept. of Environment & Natural Resources. Over 500 pounds of debris were removed from the creek including tree branches, tires, railroad ties, pieces of dock, aluminum and plastic soda containers, and one water ski.

* In July 1994, the "Lake Property Owners Survey" was mailed to 310 Pickerel Lake property owners. One hundred ten surveys (35%) were answered and returned to the Project Coordinator. Participants answered 25 questions which provided the project with data on the economic impact the lake has on Day County, attitudes and opinions about the lakes uses, water quality, and future development. Survey results were published in the February 1995 project newsletter.

* In 1994, a "Lake Directory" was published showing the locations of lake cabins and homes, and listing the owners names and home address. The directory was available to lake property owners for a $6.00 contribution. One-hundred eleven atlases were sold raising $666.00 dollars which were used to fund additional Information & Education activities.

* In 1996, work was completed on a "Self-Guided Tour Of Pickerel Lake's Watershed." The tour has 26 stops along a 30 mile route through the lakes watershed. The tour guide is available through mail order.

Shoreline Stabilization

The 319 Workplan called for a detailed survey of Pickerel Lake's shoreline. This survey was completed in October 1992 by NRCS and Water Resources Institute personnel. The survey included a map of Pickerel's shoreline and detailed notes on the type of stabilization needed. The 319 Grant provided $11,000.00 in federal funds for shoreline stabilization cost share. It was estimated that 2,400 feet of shoreline was in need of stabilization. Methods used to stabilize this shoreline would include rip-rap, earthwork construction, and permanent vegetative cover.

On 24 July 1993, a 6 to 11 inch rain fell in the lakes watershed causing Pickerel to rise approximately three feet over the lakes ordinary high water mark. This flooding caused additional shoreline erosion, making the prior survey obsolete. On 30 July 1993, the Project Coordinator and Dave German of the Water Resources Institute conducted a second shoreline survey. Extensive erosion was noted along a portion of the lakes northwest shoreline along Bullhead Bay, and portions of the eastern shoreline along Chekapa Bay.

On 10 May 1994, 213 fliers were mailed to Pickerel Lake property owners advertising cost share for shoreline stabilization. (Leased sites were not included in this mailing) Eighteen property owners returned completed forms. Each site was visited by the Project Coordinator and NRCS personnel. Sites were prioritized according to the extent of erosion occurring. Six sites were selected and surveyed by NRCS personal. Two of the six sites were repaired by the owners without cost share. Designs for stabilizing the remaining four sites were completed by NRCS engineers and advertised for bids in February 1995. (Federal regulations require that construction projects utilizing federal funds be let for competitive bids) Agreements were made with each property owner to pay 40% of the final construction cost with 319 federal funds. NRCS engineers estimated the cost of stabilizing these four sites to be $18,928.19, approximately $47.0 per lineal foot of shoreline. The project was let on 21 March 1995, with only one bid received. The bid price of $127.0 per lineal foot was rejected. It was felt a competitive bid was not received with only one bidder. (Many construction companies were busy repairing and rebuilding flood damaged roads thus, not bidding on additional work in 1994 & 1995) The project was not rebid. Plans and specifications were given to each property owner for use in hiring their own contractor without use of federal cost share.

Five lakeshore property owners have sent documentation of completed shoreline stabilization projects to the Project Coordinator. Approximately 300 feet of shoreline was stabilized using rip-rap. Costs incurred by these property owners count as local match towards state and federal project grants.

Construction of a Shoreline Stabilization Demonstration Site began on June 19, 1995. The site is located along the lakes northwest shore in Bullhead Bay, where a large washout formed during the 1993 flood. Several stabilization techniques were incorporated. The shoreline was stabilized to the ordinary high water mark using rip rap and filter fabric. Two retaining walls constructed from power poles were used to contain sediment removed from the lake. The upper bank was reshaped and covered with topsoil, then seeded with a mixture of Smooth brome, Rye, and Crown vetch. The rye is utilized as a fast growing nurse crop used to stabilize and protect seeds and seedlings of the slower

Shoreline Stabilization cont.

growing Crown vetch. Seeded areas were covered with erosion control mats for further protection. Erosion control mats are used when runoff velocities such as that experienced on steep slopes ... ...oo high for grass or other vegetation to become established. Willows were planted along the sides of the upper bank to provide additional soil stabilization.

Cost for this demonstration site totaled $4,804.63. Manual labor was provided by nine AmeriCorp volunteers. AmeriCorp volunteers worked 157 hours providing $1,099.00 of in-kind labor to the project. The property owner constructed stairs to provide safe access to the shoreline and prevent erosion to the upper banks from human traffic.

Animal Waste Management

The original project workplan called for two Animal Waste Management Systems (AWMS) to be built in Pickerel Lake's watershed. The EPA 319 Grant provided $35,000.00 for this activity. The project applied for and successfully obtained a $40,000.00 grant from the SD Consolidated Water Facilities Construction Program. This state grant provided the necessary funds to construct a third AWMS.

Sites for AWMS were selected using the following criteria; proximity to the lake or major tributary, dairy operation, number of animals, willingness of the owner operator to cooperate on a voluntary basis - and pay at least forty percent of the total construction cost of the system. Using this criteria the following sites were chosen;

1) Dairy Operation - 363 dairy cows/calves & stock cows, feedlot located approximately 200 feet from a main tributary to Pickerel Lake (This site is currently the largest dairy operation in Pickerel Lake's watershed)

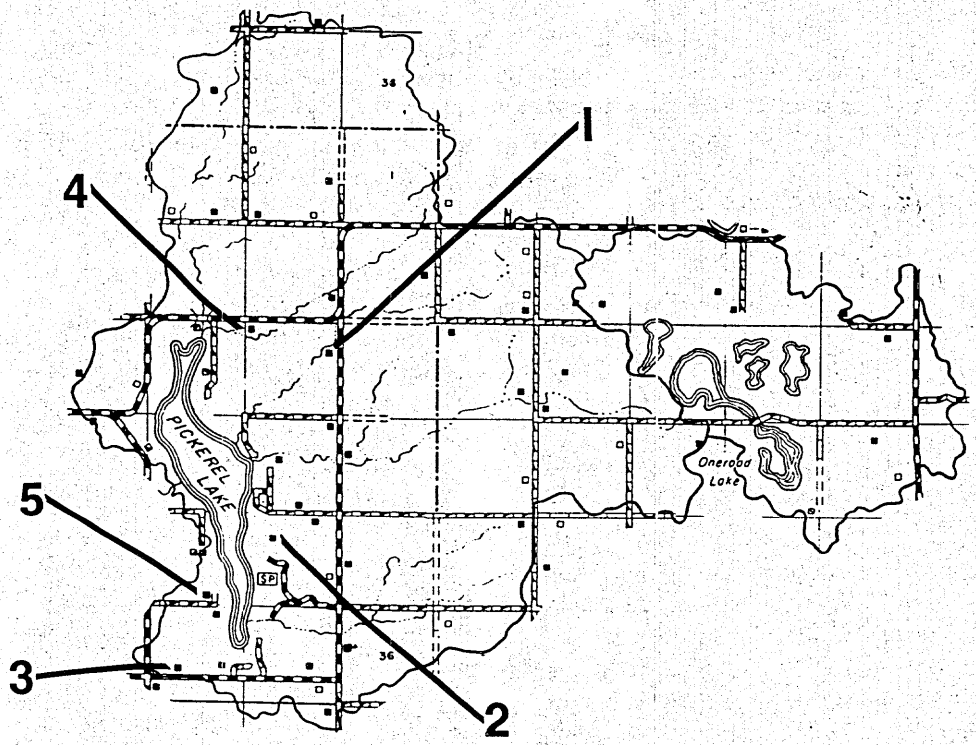
2) Winter Feedlot - 150 dairy hefers/calves & stock cows/calves, feedlot located approximately 500 feet from Pickerel Lake.

3) Dairy Operation - 140 Dairy cows/calves, feedlot located approximately 3/4 mile from Pickerel Lake.

AWMS were designed by NRCS engineers and let by competitive bid. Sites 1 & 2 were constructed during the fall of 1994. Site 3 was completed during the fall of 1995.

Animal Waste Management Systems collect runoff from feedlots, storing the contaminated water in evaporation ponds. These systems can reduce the amount of phosphate and bacterial contaminants to surface waters by ninety

Continued on next page.



Locations of Animal Waste Management Systems

Animal Waste Management Systems cont.

percent, and also greatly reduce the amount of nitrates. High levels of phosphates in a lake can increase growth of aquatic plants and eventually lead to blue-green algae blooms. The three evaporation ponds constructed by the Pickerel Lake Protection Project are designed to store up to 269,601 cubic feet of contaminated water, and are designed to handle a 25 year - 24 hour storm event. The evaporation ponds range in size from .75 to 1.5 acres.

Federal and state funds paid $76,810.00 of the total construction cost of $118,367.78 for these three systems. Owner operators of these systems paid $41,557.78 in cost share.

In addition to constructing AWMS, owner operators of these farms received incentive payments from the Farm Service Agency's - WQIP program, to manage solid animal waste. To qualify for these incentive payments, owner operators had to remove the manure from AWMS sediment basins, and spread on cropland in an environmentally acceptable manner. Owner operators cannot spread manure on frozen ground, or snow and ice covered soil. (Manure spread on top of snow is carried away during snowmelt, usually into a lake or other surface water body) Manure properly applied to cropland or hay fields provides beneficial nutrients without degrading the quality of nearby surface waters.

In most lake restoration and protection projects the Best Management Practices (BMPs) and pollution controls installed (such as AWMS) will provide the greatest benefit to society (lake property owners, fisherman, recreational users etc.) than to the individual landowner or operator. Thus, some type of incentive must be provided to ensure that BMPs and pollution controls are implemented. External incentives offer some type of reward to the landowner or operator in most cases - a cash incentive payment for implementing BMPs or cost-sharing construction of pollution controls. The incentive payment or cost share percentage rate must be high enough to compensate the landowner or operator for perceived and real risks associated with implementing BMPs and pollution controls. The owner operators of the three AWMS received $24,405.00 in WQIP incentive payments for constructing AWMS and practicing waste utilization BMPs in Pickerel Lake's watershed.

There are now five AWMS operating within Pickerel Lake's watershed - three constructed during the protection project, and two constructed prior to the projects start. One system (#4) was constructed in 1972. This site is used as a winter feedlot and calving lot. A fifth AWMS is located on a dairy farm near the lakes west shoreline (#5). This system was built in 1986. There are twelve farms in Pickerel Lake's watershed with livestock that do not have ag waste systems. Future construction of animal waste management systems at three of these sites would benefit the lake if additional funds and the owner operators cooperation could be obtained. The possibility also exists of new dairy operations and winter feedlots being established at existing or new farm sites. The table below classifies existing farm sites.

Classification of Farmsteads in Pickerel Lake's Watershed

Type	# of Farms
With Livestock & Residence	13
Livestock Only	1
Residence Only	8
Abandoned (no livestock or residence)	23
Total Farms	48

Best Management Practices

Funds for incentive payments made to owner operators who implemented BMPs were provided by the Farm Service Agency's - Water Quality Incentive Program, and a grant from the SD Department of Agriculture. Sign-up for the WQIP program was conducted between the 11-29 of January 1993. Highly erodible cropland in the watershed was given priority. Owner operators could receive up to $25 per acre for enrolling cropland into the WQIP program.

WQIP payments totaling $22,789.00 will be made during the 1994, 1995, & 1996 growing seasons to five owner operators who follow NRCS requirements. These requirements call for conservation cropping sequences in which low residue crops such as corn, sunflowers and soybeans, could be planted no more than once during the three growing seasons covered by the project. High residue crops such as small grains could be substituted for low residue crop. Small grains - rye, oats, wheat etc., and alfalfa could be planted anytime. The owner operator was required to implement tillage, grazing and haying practices to reduce soil erosion. A minimum of 30% residue cover was required on the soil surface after harvesting. No-till planting was required on fields if low residue crops were planted the previous growing season. 457 acres of cropland were enrolled under the WQIP program. 88 of these acres were planted to grass and alfalfa.

The Coordinated Soil & Water Conservation Fund Grant from the SD Dept. of Agriculture, provided an additional $30,500.00 in state funds for incentive payments to owner operators who implemented BMPs during the 1994, 1995 & 1996 growing seasons. Requirements for this program were identical to WQIP. Five owner operators received a total of $30,500.00 in incentive payments for 1093 acres of protected cropland.

Continued on next page.

Best Management Practices cont.

Priority was given to Pickerel Lake's watershed in the 13th Conservation Reserve Program (CRP) sign-up. Special notices were mailed to all watershed landowners and operators. Approximately 95 acres of cropland in Pickerel's watershed have been accepted for this sign-up. One watershed operator who's CRP contract expired in 1995 has chosen to keep this land in pasture. The majority of CRP contracts in Day County and Pickerel Lake's watershed expire in 1996. It is unclear whether this program will be extended or continued in the next farm bill. Major land use changes in Pickerel Lake's watershed could effect the lakes water quality.

Other Best Management Practices are being implemented in Pickerel Lake's watershed by landowners and operators participating in the U.S. Fish & Wildlife Services "Partners in Wildlife" program. To date, 64 wetlands totaling 110 acres have been restored in Pickerel's watershed by this program. These wetlands trap and filter nonpoint source pollutants and sediment carried by runoff - improving the quality of this water before it reaches larger bodies such as Pickerel Lake. Several landowners have implemented rotational grazing systems under this program, another BMP that is beneficial to Pickerel Lake's water quality.

Water Quality Monitoring

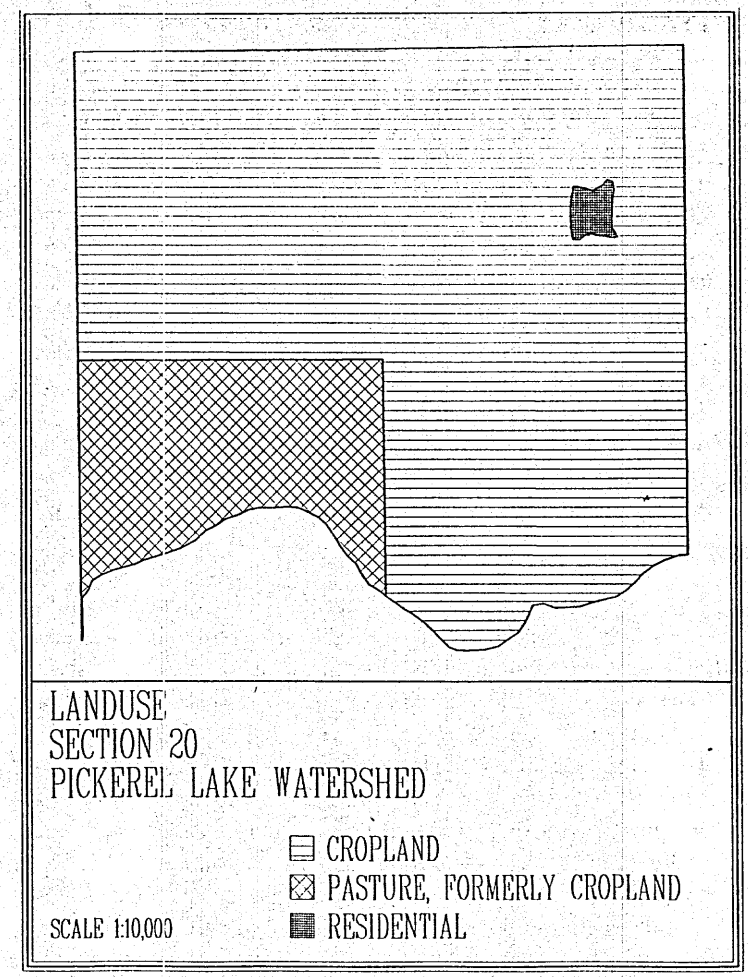
Funding for in-lake water quality monitoring was provided by the NonPoint Task Force's - SD Lake Protection Strategy. Monitoring began in 1991 and was conducted by personnel of the Water Resources Institute located on the campus of SDSU in Brookings, SD. Tests include the following; Total Phosphorus, Kjeldahl Nitrogen, Nitrate + Nitrite, Dissolved Oxygen, Total Dissolved Phosphorus, Ammonia, pH, Chlorophyll a, Air & Water Temperatures, and Secchi Transparency. Testing occurred once a month during the months of June, July, and August. Three monitoring sites were located on Pickerel Lake, Site 1) located near the lake's north end west of Bass Beach, Site 2) near Chekapa Bay at the lakes greatest depth of 43 ft., and Site 3) near the lakes south end west of Pickerel Lake State Recreation Area. Results of the first three years of monitoring - 1991 to 1993, were published by the Protection Project in January 1994. "A Summary Report of Water Quality in Pickerel Lake" was made available to Pickerel Lake watershed and lakeshore property owners at public meetings and through mail order.

Tributaries located near two Animal Waste Management Systems constructed by the Protection Project were tested prior to and after construction for phosphate, nitrate, dissolved solids, and fecal coliform. Samples were taken during spring snowmelt and summer rain events. The South Dakota Association of Conservation Districts paid for this testing. Data from in-lake and tributary monitoring will be included in the final report to be completed by June 1996.

Mapping

The 319 Work plan called for the preparation of maps to indicate where soil type, slope and proximity to water courses combine with current land use to constitute critical areas that contribute sediment and nutrients to Pickerel Lake. Maps and overlays were completed (one for each section of land in Pickerel Lake's watershed) to show these critical areas. NRCS and Water Resources Institute personnel then utilized these maps to locate and list cropland requiring conservation practices to reduce erosion. This list was used to prioritize cropland landowners signed-up to receive incentive payments for implementing Best Management Practices. These maps will be a valuable tool conservation planners can use in writing future conservation plans for watershed landowners and users.

Another accomplishment was the development of detailed watershed maps. Besides locating watershed boundaries, the project mapped current land use, drained wetlands, land ownership, and the location of shallow aquifers. These maps were generated using the GIS - Geographical Information System. The GIS system is the standard mapping method now being implemented by several governmental agencies including the NRCS, US Fish & Wildlife Service, and Sisseton-Wahpeton Dakota Nation. Below is an example of a GIS generated map for land located in Section 20 of One Road Township. This map shows current land use.



Matching Funds

The Day Conservation District was required to raise local cash and in-kind contributions to match a percentage of the State and Federal Grants obtained to fund the Protection Project. Local cash could come from local government agencies, lake associations, cost-share and costs incurred for implementing BMPs and constructing AWMS by watershed landowners and operators, costs incurred by lake property owners for stabilizing shoreline, and donations. In-kind contributions could be time volunteered working on project activities, and machinery and equipment donated for use on project activities. Required match for the EPA 319 grant is $79,915.00. Required match for the SD Coordinated Soil & Water Conservation Grant is $81,397.00. Below is an account of local match obtained through 31 December 1995.

AmeriCorp Volunteers	$1,099.00
Day Co Commission	$5,000.00
Day Conservation District	$9,542.98
Lake Property Owners	$14,802.05
SD Dept. Game, Fish & Parks	$12,620.65
Water Resources Institute	$8,138.10
Watershed Landowners	$46,614.49
Total:	**$97,817.27**

Match towards Federal EPA 319 Grant:	$97,817.27

Match towards SD Coordinated Soil & Water Conservation Fund Grant:	$77,058.52

The District is in need of approximately $4,000.00 more in local cash and in-kind contributions to match the SD Coordinated Soil & Water Conservation Fund Grant. If you completed shoreline stabilization on your own property between April 1992 and April 1996, please consider submitting the cost incurred for this work as local match towards this project. Send a statement or other proof of costs to the Project Coordinator. We thank those lake property owners who have submitted local cash and in-kind contributions.

Some Closing Thoughts

I believe the Pickerel Lake Protection Project was successful. All goals set by the original project workplan have been met. Have we corrected all the problems within the watershed? No. However, we hope the landowners living and farming within Pickerel Lake's watershed, and lakeshore property owners have a better understanding of the lake's value as a natural resource, and what they can do to preserve the exceptional water quality this lake currently has, and keep Pickerel one of the states ten cleanest lakes.

Efforts to protect Pickerel Lake will continue. The 1995 Farm Bill - as proposed by the Senate, will continue and improve programs designed to protect water quality. It is unclear what type of compromise will be made when this version of the Bill goes to the House. I hope lake property owners can form a lake association representing all lake developments, and encourage watershed landowner representation and participation. An active lake association will improve chances of receiving funding for future lake protection, and improve services from local government.

I was somewhat disappointed by the low attendance at meetings and public hearings promoting the project. Attendance increased somewhat when the proposed Sanitary Sewer District was to be discussed, people tend to show more interest in issues when their pocket books will be affected. However, lake property owners have the most to gain from a clean lake. There are six lake property owners for every one watershed land owner. In 1995, close to one million dollars in real estate sales were made along Pickerel Lake's shores. If Pickerel's water quality and scenic beauty were degraded, would these prices hold up? We need to thank all the watershed owners and operators who implemented Best Management Practices and constructed pollution controls in an effort to preserve this lake.

Watershed Study Approved for Blue Dog Lake.

The SD Dept. of Environment & Natural Resources has approved the Blue Dog Lake Watershed Study. The project was initiated by the Blue Dog Lake Association, who will jointly sponsor the project with the Day Conservation District.

A $70,000.00 grant from the Environmental Protection Agencies 319 Clean Lakes Program will pay for part of the $117,000.00 study. The Blue Dog Lake Association, and other local groups and agencies will provide $47,000.00 in local match and in-kind services to complete funding. The study was slated to begin on 1 April 1996, however the Federal Governments budget stalemate has delayed the start of this and several other South Dakota water projects.

The two year watershed study, will collect information on nonpoint source pollution by monitoring Blue Dog Lake's tributaries, in-lake water sampling, and bio-assessment of Owen's Creek - Blue Dogs main tributary. Information on current land-use in the lakes watershed will be collected and mapped. A shoreline survey will also be conducted to estimate past and present sediment loading from eroding shorelines around the lake.

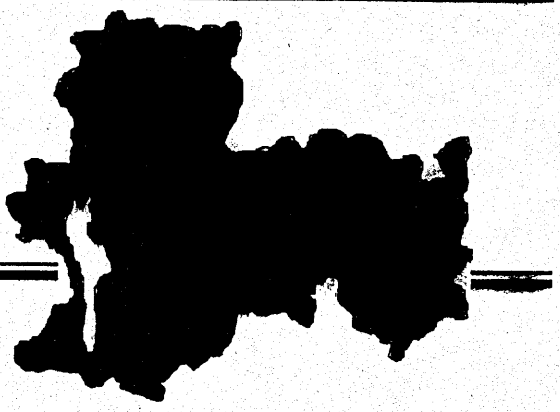
This study must be completed before the Blue Dog Lake Association and Day Conservation District can receive funds to implement a lake restoration project aimed at improving Blue Dog Lake's water quality.

Appendix L - Project Fact Sheets

- A Brief Geological History Of Pickerel Lake
- Pickerel Lake Water Levels 1928-1993
- Pickerel Lake Fisheries
- A Pictorial Key To Pickerel Lake Fish
- Lake Protection Tips
- Understanding & Maintaining Your On-Site Septic System
- Controlling Shoreline Erosion
- WaterWise Boating
- Wanted - A Clean Lake!
- Water - Get The Facts Vol. 1
- Water - Get The Facts Vol. 2
- Managing Lawns To Protect Water Quality

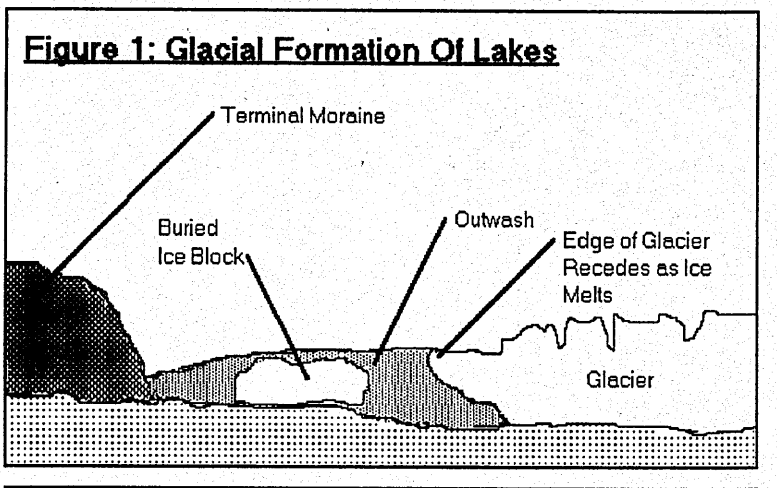
Pickerel Lake Protection Project

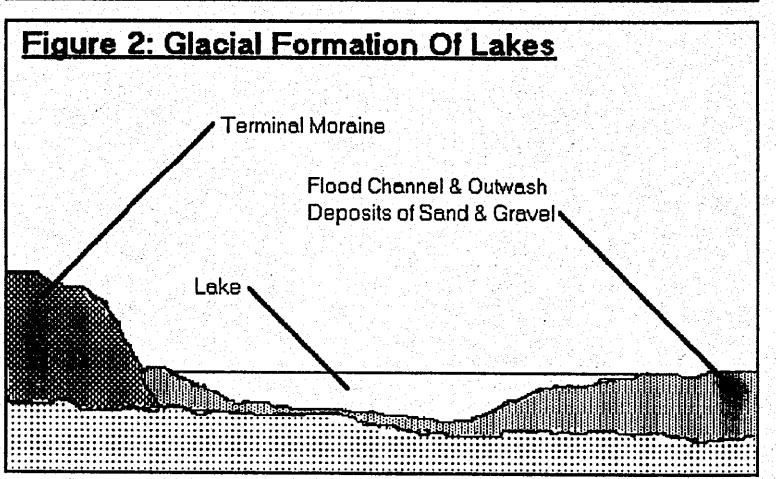
Day Co. Conservation District



A Brief Geological History of Pickerel Lake

Pickerel Lake was formed about 12,000 years ago during the late Wisconsin Glacial Period. This glacier, like many before, shaped and reshaped the Coteau des Prairie, forming terminal moraines where glacial ice piled debris. Terminal moraines surround Pickerel Lake on the south and west (Figure 3). The Pickerel Moraine begins in Roberts Co. extending west between Pickerel and Enemy Swim Lakes, then south along the eastern shore of Spring Lake, ending near the northwest shore of Blue Dog Lake. A smaller unnamed terminal moraine begins along the northwest shore of Pickerel Lake extending north into Marshall Co. The south end of Pickerel Lake is formed in a depression gouged into the Pickerel Moraine by glacial ice. The northern half of Pickerel Lake began as a large block of ice which broke from the main glacier as it was receding. This ice block was buried in the outwash plain, covered by sand and gravel carried by water flowing from the melting glacier (Figure 1). As this ice block melted a depression formed in the outwash plain filling with water to form Pickerel Lake (Figure 2). Sedimentation began once the lake level was established, following the retreat of the glacier. Coarse sediments from the lakes tributaries and decomposed organic material accumulated on the lakes bottom. This sediment provides an important record of the lake's history and is studied by paleolimnologists.





Studies of sediment cores taken from the bottom of Pickerel Lake reveal several major changes in climate and surrounding vegetation. Prior to 10,000 years ago the climate was cool and moist. The lakes shoreline was surrounded by boreal forest

comprised of spruce and larch trees.

Between 10,000 to 8000 years ago, the climate became warmer and mixed deciduous trees became the dominate shoreline vegetation. This mixed deciduous forest consisted of Oak, Elm, Birch, Alder, Maple, and Ash trees. Native stands of Canoe Birch and Sugar Maple, remnant species of this period, can still be found in northeastern South Dakota. On the upland, trees became scarce and open areas of grass and ferns developed.

The period from 8000 to 4000 years ago was considerably drier than today's climate. Continuous summer droughts led to the disapperance of the remaining upland deciduous forests. These forests were replaced by tallgrass prairie with trees, mainly Oak and Ash, surviving along the lake's shoreline.

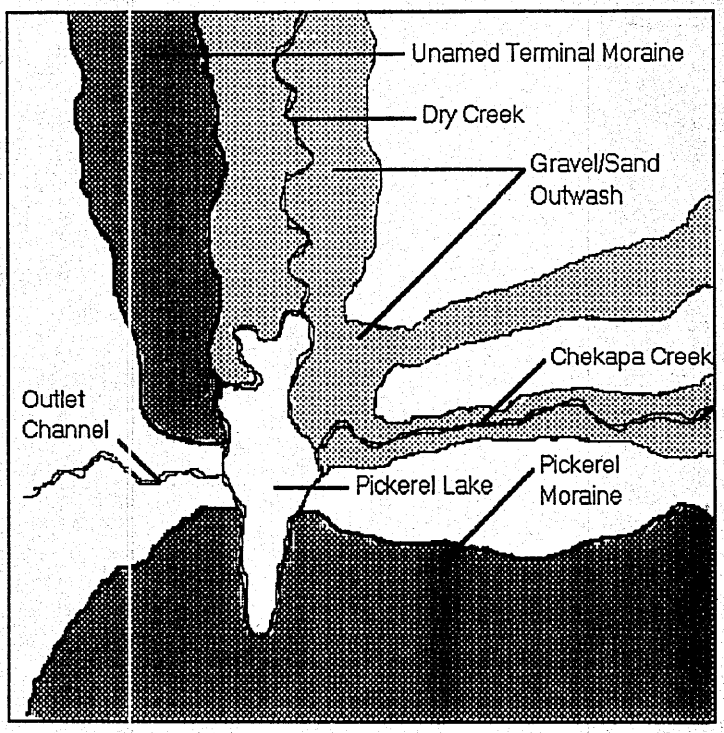


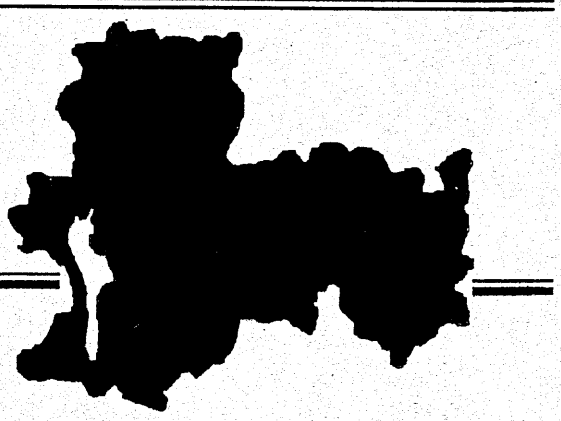
Figure 3

The climate during the last 4000 years was similar to what we see today. However, in the last 100 years much of the tallgrass prairie has been broken and converted to agricultural use, and the lake's shoreline developed for recreational use.

Pickerel Lake is classified as a seepage lake. This type of lake has either an inlet or outlet, and obtains water from groundwater, rain, and snow. Although Pickerel Lake does receive surface water from several creeks, the largest being Dry and Chekapa Creeks (Figure 3), it receives extensive groundwater discharge from parts of the Waubay Aquifer. The Waubay Aquifer is a superglacial outwash formed by the same glacial activity responsible for forming Pickerel Lake. An outwash is formed when glacial meltwater carries away fine materials leaving the heavier sand and gravel swept forward in a fan shape from the glaciers receding edge. A large outwash exists about the northern end of Pickerel Lake (Figure 3). Due to Pickerel Lakes extreme depth, parts of the Waubay Aquifer are intersected supplying the lake with high quality groundwater. Lakes extensively recharged by groundwater remain more permanent during periods of drought. During the 1930's, only six lakes in South Dakota, including Pickerel and Enemy Swim Lakes, maintained enough water to sustain fisheries. The lowest elevation recorded on Pickerel Lake during the 1930's was 1838.2, seven feet below normal lake level.

Pickerel Lake Protection Project

Day Co. Conservation District



Pickerel Lake Water Levels 1928-1993

Water levels listed prior to 1982 were taken from "Ordinary High Water Mark Investigation for Pickerel Lake," published by the South Dakota Department of Environment and Natural Resources (DENR), November 1984. The accuracy of these elevations is questionable since the elevation used to establish the measuring point was in error. Lake levels listed prior to 1982 have been adjusted in an attempt to correct this error. Water levels listed after 1976 were taken using a new bench mark established by the DENR.

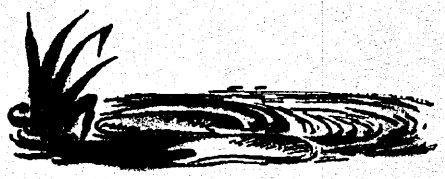
The DENR has established an ordinary high water mark (OHWM) of 1845.6 for Pickerel Lake. The spillway and weir elevations of Pickerel Lakes outlet are set at an elevation of 1844.9, 0.7 ft. lower than the OHWM. All water elevations are recorded as feet above mean sea level.

* Highest recorded water level
** Lowest recorded water level
***Highest level recorded during 1993 flooding

1928	1848.2*
1932	1843.4
1933	1841.9
1934 June	1841.2
1934 August	1840.5
1935 May	1841.1
1935 October	1840.3
1936 April	1841.0
1936 November	1838.2**
1937 May	1844.0
1937 October	1843.4
1938 June	1844.9
1938 October	1843.8
1939 May	1845.4
1939 November	1843.8
1940 May	1844.9
1940 October	1843.8
1941 June	1845.5
1941 November	1844.7
1942 May	1846.0
1942 November	1845.1
1943 June	1845.2
1943 November	1844.7
1944 July	1845.0
1944 November	1844.6
1945 October	1844.6
1946 May	1844.9
1946 October	1844.9
1947 May	1844.1
1948 May	1844.8
1949 May	1844.7
1949 November	1843.7

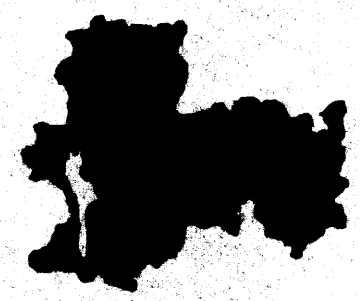
1950	May	1845.0
1951	January	1844.3
1951	May	1845.0
1952	May	1845.3
1953	November	1842.1
1954	April	1844.9
1954	September	1844.3
1955	May	1844.6
1956	May	1844.9
1956	November	1843.8
1957	September	1843.3
1959	April	1845.0
1960	April	1845.2
1961	June	1844.4
1961	December	1843.7
1962	June	1845.5
1962	December	1845.0
1963	May	1845.1
1964	May	1845.0
1964	October	1844.3
1966	May	1845.2
1966	November	1844.7
1967	May	1845.1
1968	May	1844.6
1968	November	1844.3
1969	May	1845.2
1969	September	1844.1
1970	May	1845.1
1970	December	1844.6
1976	Fall	1843.1
1982	June	1845.0
1982	October	1844.5
1983	May	1845.2
1983	October	1844.4
1984	June	1845.2
1984	September	1844.4
1985	May	1845.1
1985	October	1844.8
1986	May	1845.9
1986	September	1845.3
1987	April	1845.3
1987	October	1844.2
1988	April	1844.6
1988	September	1843.5
1989	April	1845.4
1989	October	1844.1
1990	May	1844.6
1990	September	1844.8
1991	May	1845.4
1991	October	1844.9
1992	April	1845.3
1992	September	1844.9
1993	May	1845.6
1993	July	1848.0***
1993	September	1845.3

Average Spring Elevation: 1844.8
Average Fall Elevation: 1843.9



Pickerel lake Protection Project

Day Conservation District



Pickerel Lake Fisheries

Pickerel is classified as a warm water permanent fisheries lake. Warm water lakes contain many species of fish whose populations vary considerably from year to year. Characteristic game fish found in warm water lakes include Largemouth Bass, sunfish, crappies, bullhead, White Bass, and Yellow Perch. Numerous species of shiners, minnows, and darters are also present in warm water lakes. A 1926 survey of Pickerel Lake by W.H. Over of the University of South Dakota found the following species; Walleye, Northern Pike, Yellow Perch, Black Crappie, Black (Largemouth) Bass, Bluegill, Silver (White) Bass, and Black (White) Sucker. A complete checklist of species currently found in Pickerel is provided in the column to the right.

In 1927, the South Dakota Game, Fish, and Parks built a new state fish hatchery on Pickerel Lake. The hatchery first attempted raising Steelhead Trout for release in northeastern SD lakes, but quickly switched to native species when this endeavor failed. The Pickerel Lake State Hatchery provided fry to restock hundreds of lakes which dried up during the 1930's drought. Pickerel was one of six lakes during the 1930's which maintained viable fish populations for the hatcheries use. This hatchery closed in 1982.

A Checklist of Fish Found in Pickerel Lake

Key
N - Native
I - Introduced
E - Exotic

Northern Pike (N)
Common Carp (E)
Spottail Shiner (N)
Fathead Minnow (N)
White Sucker (N)
Black Bullhead (N)
Brook Stickleback (N)
White Bass (N)
Largemouth Bass (N)
Smallmouth Bass (I)
Rock Bass (N)
Bluegill (N)
Black Crappie (N)
Walleye (N)
Yellow Perch (N)
Logperch (N)
Johnny Darter (N)
Iowa Darter (N)

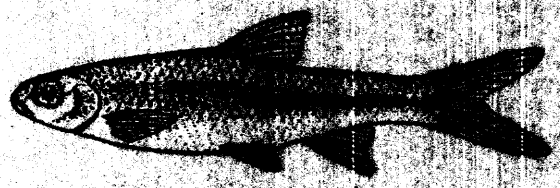
Hook & Line Fish Records From Pickerel Lake

Smallmouth Bass 5.5 Lbs.
Caught 9/16/91 by Barton Peterson
White Bass 4.3 Lbs.
Caught 8/30/82 by Dave Koslowski
Common Carp 33.0 Lbs.
Caught 6/5/82 by Jerome Haas
White Sucker 5.13 Lbs.
Caught 6/30/82 by David Green

Fish and Water Quality

Water quality can determine the type and diversity of a lake's fisheries. A lake with poor water quality will support larger populations of fish than a cleaner, less polluted lake. However, rough fish such as carp and bullheads are the dominate species. Rough fish can survive the lower oxygen levels found in polluted lakes and are adapted for finding food in murky turbid water.

As water quality improves game fish such as walleyes, northerns, and bass become more dominate. These predators feed primarily by sight, and as water clarity improves can more easily spot prey such as carp minnows. Oxygen levels also increase reducing game fish losses from winter and summer fish kills



Spottail Shiner

Fish as Indicators of Water Quality

Many species of fish cannot tolerate polluted water. These fish can be used as indicator species to determine the overall health and condition of a lake. One such fish found in abundance in Pickerel Lake is the Spottail shiner. The Spottail shiner, which can reach the length of 4 inches, is a silver colored minnow with a black spot located near the base of its tail fin.

The Brook stickleback is another species found in Pickerel Lake that indicates the presence of high quality spring fed water. The stickleback reaches a length of about 3 inches, has a mottled green appearance, and the distinct dorsal fins which given this fish its name.

The darters are an interesting group of small fish that require clean unpolluted waters. Three species are found in Pickerel Lake, the Iowa Darter, Johnny Darter, and Logperch. Logperch require clean sand

Brook Stickleback

and gravel substrate's to spawn. Darters and Logperch have poorly developed gas bladders, thus they are unable to remain buoyant in the water and can be seen darting to and fro along the lakes bottom.

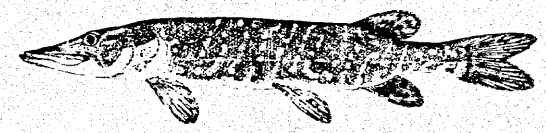
The Future?

Protection of Pickerel Lake's water quality will help ensure a viable sports fishery for future generations to enjoy. Implement Best Management Practices (BMPs) on your property, practice catch and release fishing, and follow all fishing laws and regulations.

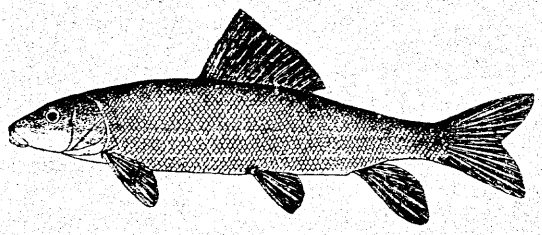
Pickerel Lake Protection Project

Day Conservation District

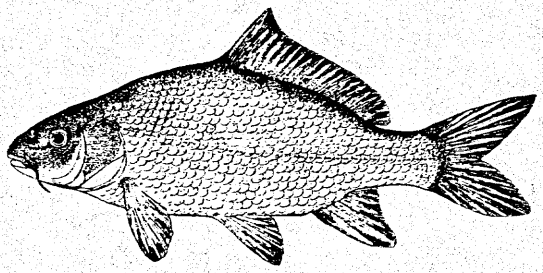
A Pictorial Key To Pickerel Lake Fish



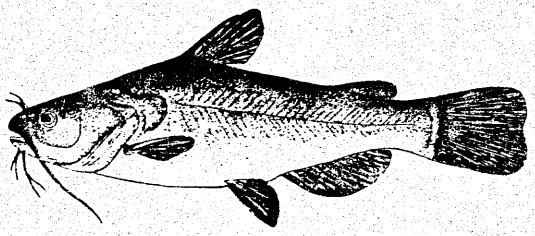
Northern Pike



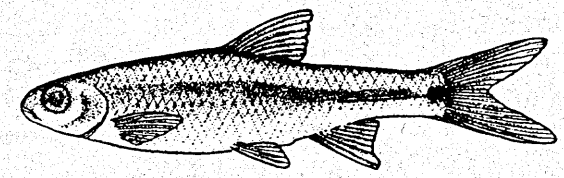
White Sucker



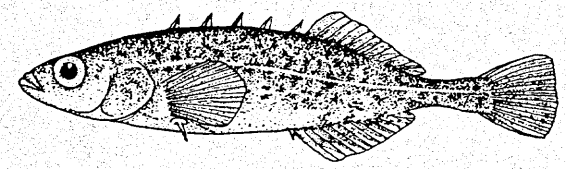
Common Carp



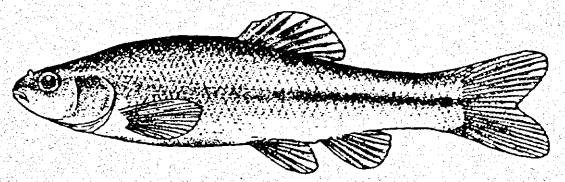
Black Bullhead



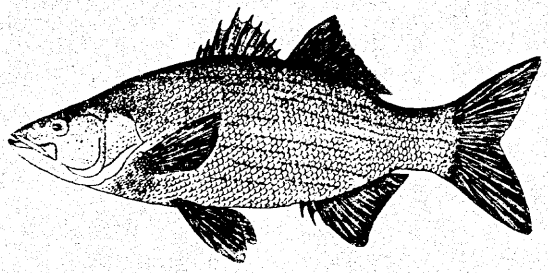
Spottail Shiner



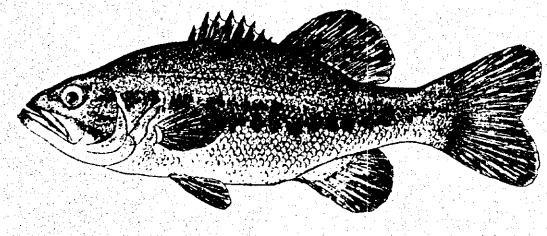
Brook Stickleback



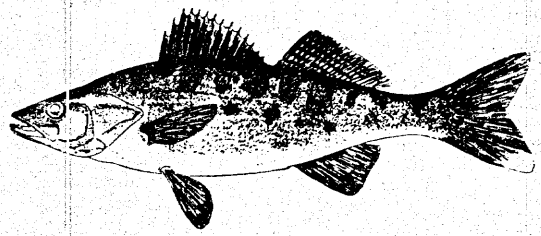
Fathead Minnow



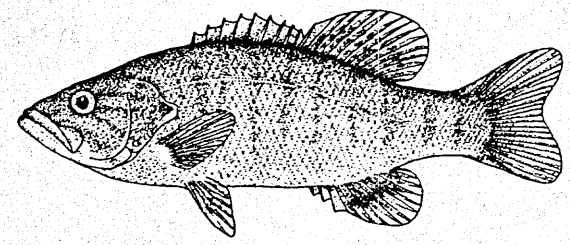
White Bass



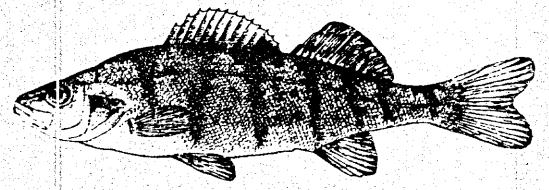
Largemouth Bass



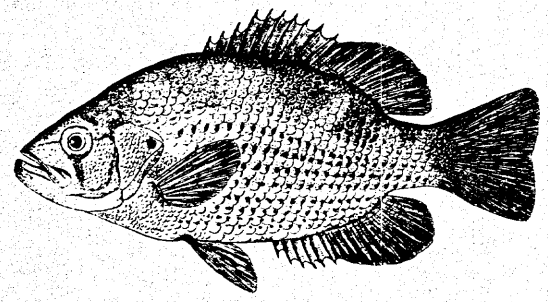
Walleye



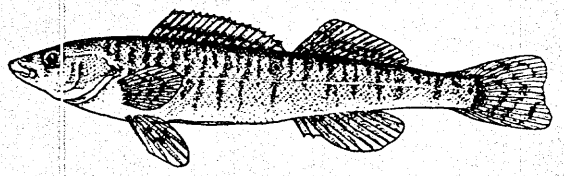
Smallmouth Bass



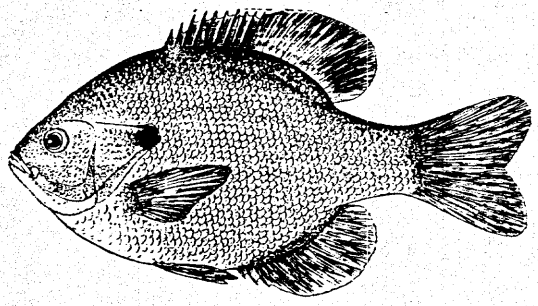
Yellow Perch



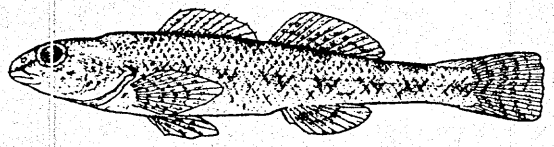
Rock Bass



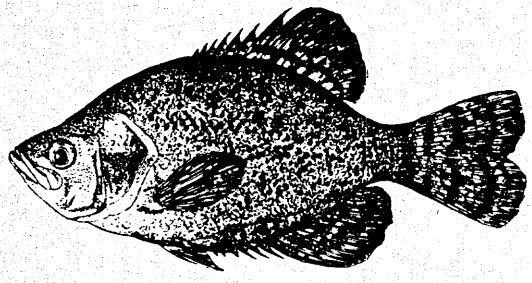
Logperch



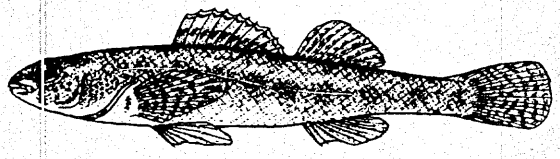
Bluegill



Johnny Darter



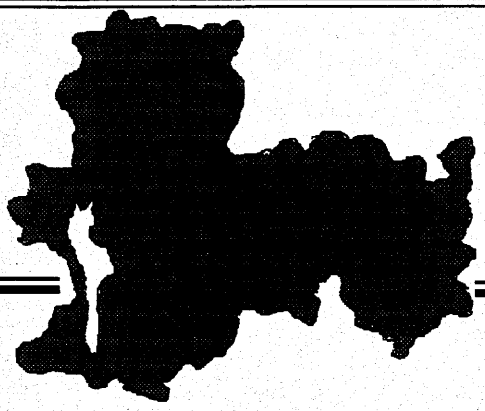
Black Crappie



Iowa Darter

Pickerel Lake Protection Project

Day Co. Conservation District



Lake Protection Tips

Nonpoint source pollution can come from agricultural land in the lake's watershed, and from developed property along the lake's shoreline. What you do with and on your lake property directly effects Pickerel Lake's water quality. Listed below are several Best Management Practices (BMPs) for lake property owners that you can implement to help improve and maintain Pickerel Lake's health.

1. Do not wash boats, pets, or other objects in the lake with soap or detergents containing phosphorus.

Consult the product label for information on phosphorus content.

2. Use low or non-phosphate detergents when washing clothes and dishes at your cabin.

3. Do not wash cars, lawn mowers or tractors where washwater can drain into the lake.

Washwater can contain gasoline, oil and grease removed by cleaning products. Even though some products say "biodegradable", they may contain chemicals harmful to the lake's fragile ecosystem. Grass clippings cleaned from lawnmowers can also place unwanted nutrients like phosphate into your lake. Never place used motor oil from cars or other machinery on gravel roads or dirt paths near the lake.

4. Before fertilizing your lawn, have the soil tested.

Apply the correct type, amount, and at the recommended rate by using a calibrated spreader. For more information on lake lawn care obtain the fact sheet " Managing Lawns to Protect Water Quality", available from your local County Extension Agent or from the Pickerel Lake Protection Project.

5. Do not burn leaves, brush or grass clippings on your shoreline.

The remaining ash contains nutrients detrimental to the lake. Try composting this material on the back of your lot where drainage to the lake is minimal. This compost makes an excellent mulch when worked into gardens and flower beds.

6. If you remove aquatic plants along your lake front by cutting, rake the plants to the shoreline and remove for composting.

Aquatic plants left in the water after cutting decompose providing nutrients for the next years growth.

7. Leave a 20 foot buffer strip of natural vegetation along your shoreline.

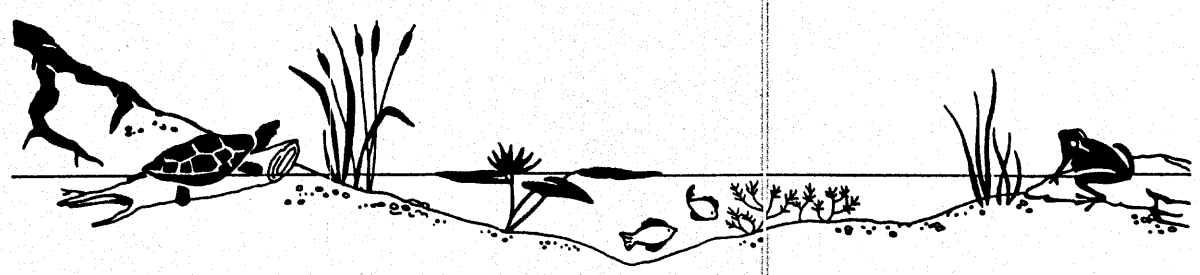
When vegetation (especially trees) is removed from shorelines, banks weaken, and erosion usually follows. Leave a 20 foot buffer strip of natural vegetation along your shoreline (rather than a well-manicured lawn) where native trees and shrubs, grasses and herbaceous plants can grow. Buffer strips retain excess nutrients and trap sediments before they reach the lake. Careful pruning of shoreline trees and shrubs can leave open areas to view the lake. Instead of a dirt path, build a ramp or steps to the waters edge to prevent shoreline erosion from human traffic..

8. Avoid dumping sand to create beaches on your lake front property.

Sandy beaches are nice, however dumping sand along your shoreline can cause problems. Adding sand to beaches or shorelines increases the rate of sedimentation to the lake. Dumping sand along your shore can damage or destroy natural spawning and nesting sites for fish, and smother bottom dwelling algae and invertebrates that young fish depend on for food. Sand from gravel pits may contain contaminants such as iron and phosphorus, or clay which increases the waters turbidity. If your property has a nice natural beach, consider yourself lucky.

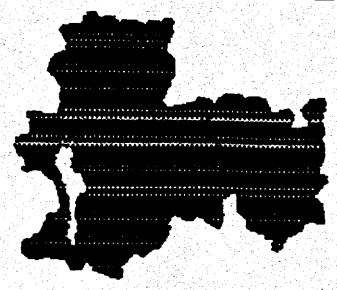
9. Reduce the speed of motorboats and jet skis near shorelines.

The wakes of these craft can cause shoreline erosion. A speed that produces no wake should be observed when operating your boat or jet ski within 150 feet of the shoreline.



Pickerel Lake Protection Project

Day Conservation District

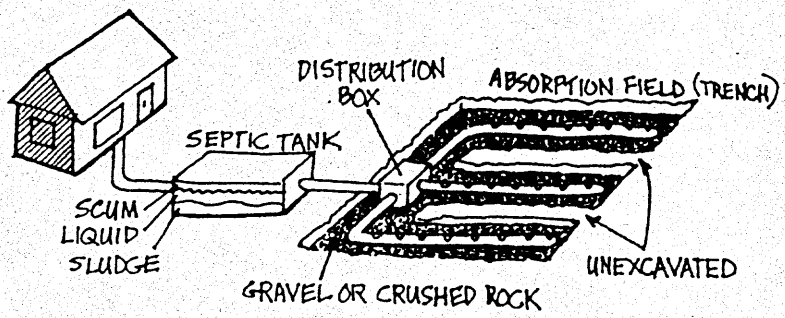


Understanding & Maintaining Your On-site Septic System

A septic tank and drain (or absorption) field is the most common system for "on-site" treatment and disposal of sewage from private rural homes. Since septic systems are hidden underground, many homeowners forget about their existence. This fact sheet will help you understand how your septic system operates and secondly, provide tips on the proper use and maintenance of on-site septic systems.

How does an on-site septic system work?

An on-site septic system is designed to biologically treat wastewater. The system is comprised of two primary components, a septic tank and a drain field. (See drawing below) The septic tank functions as a collection basin for solid materials carried with wastewater (called influent). There are three distinct levels in a septic tank. The bottom level consists of solids that do not float called sludge. Grease and lightweight materials that float, make up the top layer called scum. The middle layer consists of water, dissolved materials (such as detergents), and suspended solids. The sludge and scum are digested (or decomposed) by bacteria present in the tank. Approximately 50 percent of these solids are converted to a gas or liquid form by these bacteria. Undigested sludge and scum will remain in the septic tank as solids and must be removed from the tank every two to five years by pumping. If these solids are not removed they will enter and clog a drain field causing system failure. Each time influent enters a septic tank, an equal amount of liquid called effluent is forced out of the septic tank and into the drain field. The effluent then trickles through a gravel layer placed under the drain pipes and into the underlying soil where microorganisms further breakdown and absorb disease causing organisms, and nutrients.



Is your on-site septic system failing?

A properly designed, installed and maintained system will minimize the effect treated sewage has on nearby groundwater and surface water. However, septic systems can fail due to improper maintenance, poor soil conditions, high water tables, or the systems age and location. Common signs of septic system failure are described in the highlighted column to the right. A failing septic system is a threat to human health and water quality. If you suspect system failure have a certified plumber inspect your septic tank and drain field. State and local codes specify how on-site systems are to be installed and maintained. SD administrative rules Chapter 74:03:01, administered by the SD Dept. of Enivironment and Natural Resources, sets the minimum standards for on-site septic systems. Consideration should be given to designing and maintaining systems beyond the minimum site conditions to insure sufficient protection of groundwater and surface water.

Signs of On-Site Septic System Failure:

*** toilets that back-up or flush slowly**

*** floor and sink drains that back-up**

*** sewer gas odors around the septic tank or drain field**

*** lush vegetation or plants associated with wetlands growing over the drain field**

*** foul smelling water surfacing near the septic tank or drain field**

*** water rising to the surface of the drain field during heavy use periods, washing clothes etc. or during heavy rains**

*** the system is over 20 years old - soils under drain fields may loose the capacity to absorb and treat waste water after this period of time**

What can you do to maintain your septic system?

* Pump out the septic tank every 2 to 5 years or whenever the sludge and scum combine to exceed one-third of the tanks capacity.

* Do not deposit or flush coffee grounds, paper towels & facial tissues, sanitary napkins & tampons, cigarette butts, or disposable diapers down drains or toilets. These materials do not decompose reducing the capacity of the septic tank and clogging the drain field.

* Do not flush or drain cooking fats or grease into the system. Grease can build up and plug the tank inlet and sewer pipes.

* Use a white biodegradable toilet paper. Colored toilet paper does not break down as quickly as white paper.

* Do not flush or drain toxic materials into the septic system. Paint thinner, gasoline, pesticides, chlorine, and other toxic or caustic materials can kill the naturally-occurring bacteria that decompose septic tank waste. Dispose of household cleaners and chemicals properly per label instructions. Use household cleaning products that are biodegradable, non phosphate, or are natural cleaning substitutes.

* Do not add enzymes, commercial additives or starters to the septic system. There is enough bacteria present to properly decompose waste. Do not use septic system products that are advertised as making cleaning or pumping of the septic tank unnecessary. These products could possibly harm the system by causing scum and sludge to be flushed into the drain field.

* Eliminate the use of in-sink garbage disposals that grind up food. Use of disposal units contribute unnecessary solids and grease to the system that may necessitate more frequent pumping of the septic tank. It is better to compost this garbage or dispose of it with the regular household trash.

* Do not use the area directly over the drain field as a roadway or parking lot. The weight of a car can compact the soil around the drain field preventing proper drainage. The added weight may also crush or break drain field pipes.

* Do not cover the surface of the drain field with cement, patios, storage sheds or other objects. This prevents the soil from breathing, impairing the drain fields function.

* Keep a record of your septic systems location, size, and design, and dates when the system was inspected and pumped.

* Reduce the volume of waste water to your system by conserving water. Several water conservation methods are listed to the right.

Note: The proceeding maintenance and water conservation measures can also be applied to gray water sanitary sewer systems.

Water Conservation Practices

* Install flow control devices in shower heads.

* Turn off shower water while soaping body, lathering hair, and massaging scalp - turn water back on to rinse.

* Turn off the water while brushing your teeth.

* Reduce the volume of water in the toilet flush tank with a quart plastic bottle filled with water.

* Accumulate a full laundry load before washing, or use a lower water level setting.

* Wash only full loads of dishes. A dishwasher uses about 9 to 13 gallons of water per cycle.

* When washing dishes by hand, use one sink or pan of soapy water for washing and a second sink or pan of hot water for rinsing. Rinsing in a pan or sink requires less water than rinsing under a running faucet.

* Insulate hot water pipes to avoid having to clear the "hot" line of cold water during use.

* To get warm water, turn hot water on first; then add cold water as needed. This is a quicker way and saves water, too.

* Bottle and refrigerate water to avoid running excess water from the lines to get cold water for drinking. Shake bottle before serving to incorporate air in the water so that it doesn't taste flat.

* Inspect the plumbing system for leaks. Check all faucets for drips. Make repairs promptly.

Information for this fact sheet came from the following brochures and booklets:

* Understanding Your Septic System. 1986. The Freshwater Foundation, Wayzata, MN.
* Water Quality Guide, Recommended Pollution Control Practices for Homeowners and Small Farm Operators. 1991. Washington State Dept. of Health.
* Answers to Common Lake Questions. 1992. New Hampshire Dept. of Environmental Services.
* Handle With Care, Your Guide to Preventing Water Pollution. 1991. The Terrene Institute. Washington, D.C.
* The Lake and Reservoir Restoration Guidance Manual. 1990. US Environmental Protection Agency.

Pickerel Lake Protection Project

Day Conservation District

Controlling Shoreline Erosion

Sediment is the number one source of nonpoint pollution threatening South Dakota lakes. Sediment is defined as; The bottom material in a lake that has been deposited after the formation of a lake basin. Sedimentation occurs when erosion is taking place in a lakes watershed and along its shoreline. Pickerel Lake has been naturally losing depth from sedimentation since its birth during the last glacial period. However, poor land management practices can speed up this natural process causing a lake to lose depth at an accelerated pace. Sediment also carries nutrients that can fertilize algae and rooted aquatic plants, further degrading a lakes water quality. Agricultural landowners and operators in Pickerel Lake's watershed have implemented Best Management Practices (BMPs) to reduce soil erosion from cropland, pastures, and riparian corridors along streams and drainages. However, these efforts can be undermined if erosion of Pickerel Lake's shoreline is not controlled. Designing shoreline protection is complex and involves analysis of shoreline slope, wave height and wave runup, soil types, and existing vegetation. Improperly designed and constructed shoreline erosion controls often fail within a few years. This fact sheet will provide information on the types of shoreline erosion control methods commonly used, where to get help in designing shoreline protection, and information on obtaining the proper permits required before constructing shoreline erosion controls.

Nonstructural Controls

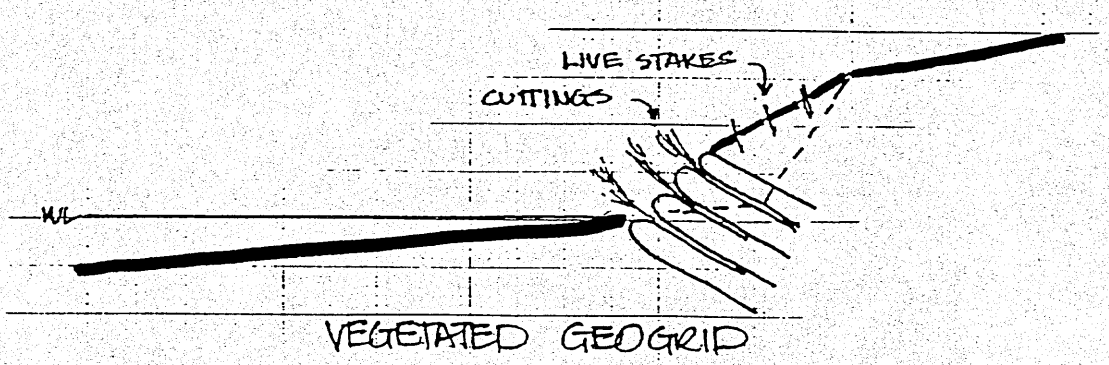
Nonstructural controls employ the use of plants to stabilize shorelines. Several species of trees, shrubs, grasses, and herbaceous plants can be used. Contact your local County Extension Agent, Conservation District or nursery for help in choosing species adapted to the local clime. Pickerel lake property owners have successfully used Crown vetch to stabilize high banks with extremely steep slopes that are typical of this lakes shoreline. Crown vetch is slow growing and is best planted with a nurse crop of oats or fescue. On some slopes it will be necessary to use erosion control mats made of straw, coconut fiber or plastic mesh to hold the soil in place until the cover crop of grass or plants becomes established.

Aquascaping

Aquascaping involves the placement of emergent aquatic plants such as cattail and submerged plants like coontail along the shoreline where waves break to stabilize sediment on the shoreline. Upland plants are used to stabilize soil on the banks above the ordinary high water line. Aquascaping enhances wildlife and fish habitat and [illegible]dscape. However, aquascaping works only in protected areas where wave energy is relatively low. Unfortunately, Pickerel Lake has little shoreline suitable for this method of erosion control.

Soil Bioengineering

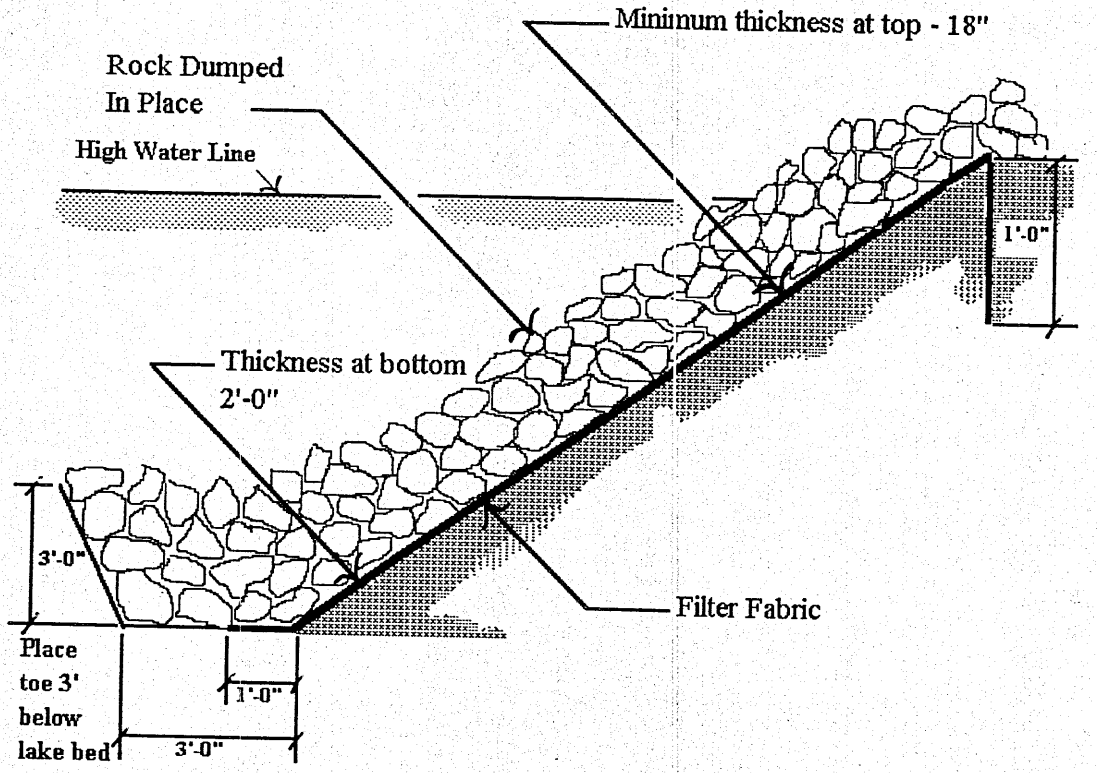
Soil bioengineering is a nontraditional approach to shoreline protection that employs a combination of nonstructural and structural methods. Trees and shrubs are incorporated with structural systems like gabions, rock rip rap, and fiber rolls, geogrids and filter cloth. As the trees and shrubs mature their root systems further reinforce the shoreline and provide a natural looking landscape.



Structural Controls

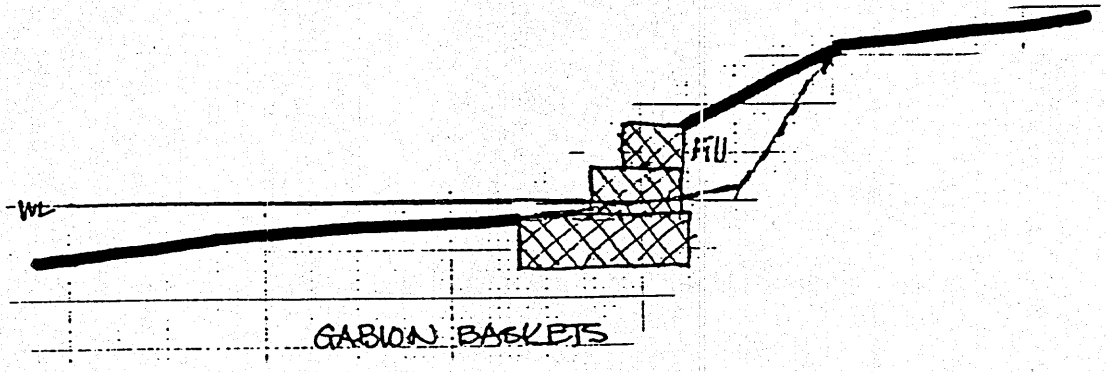
Riprap

Rock riprap is the most popular and widespread method of shoreline erosion control. Fieldstone is readily available in northeastern SD, and the equipment needed to haul and place the rock can be rented at a reasonably low cost. However, due to the seemingly uncomplicated ease and simplicity of this method, several factors are overlooked that will eventually cause failure and further shoreline erosion. Most often overlooked is the use of filter cloth. Properly installed filter cloth (see drawing below) controls the loss of soil from underneath the rock thus preventing the riprap from settling or slumping. Filter cloth also allows moisture to pass through the shoreline. The size of the riprap is very important. The minimum thickness of the rock used should be no less than ten inches in diameter in most cases. Rocks larger than this should be used to anchor the toe of the riprap below the lake bed (see drawing below). Riprap should extend on the shore the wave runup distance plus 1/2 foot above the ordinary high water level. (See page 3 to determine wave runup)



Gabions

Gabions are rectangular wire mesh baskets that are filled with four to eight-inch rock. (See drawing below) Empty gabions are placed along the shoreline than filled with rock. Filter cloth is recommended being placed behind gabions before backfilling. Large riprap is often placed at the bottom of the gabion for toe protection.



Design Considerations for Shoreline Protection

* Determine the Ordinary High Water Mark (OHWM) along your shoreline. (Prior lake levels listed in Pickerel Lake Protection Project fact sheet: Pickerel Lake Water Levels 1928-1993) The OHWM for Pickerel Lake is 1845.6 feet above mean sea level.

* Determine design wave height. Wave height is a function of wind speed and lake fetch - the uninterrupted open area of the lake perpendicular to your shoreline. Lake fetch can be determined by using a map of Pickerel Lake (available from the project coordinator or the SD Dept. of Game, Fish, and Parks) and measuring the longest length of uninterrupted water in front of your shoreline. Use Table 1 to determine the wave height at a design wind of 50 mph.

Table 1. Wave Height at 50 mph wind.

Fetch Distance (Ft)	Wave Height (Ft)
500	0.7
1,000	1.0
1,500	1.2
2,000	1.4
3,000	1.7
4,000	1.9
5,000	2.1
7,500	2.6
10,000	3.0

* Calculate wave runup. When a wave crashes onto the shoreline, the wave will run up the shoreline or revetment until all its energy is dissipated. Table 2 gives the ratio of runup for use with riprap revetments. The following formula is used to determine wave runup: WR = R X H where Runup Ratio = R, Design Wave Height = H, Wave Runup = WR. If the design wave height of your shoreline is 1.4 (2,000 feet of lake fetch), and your shore slope is 3:1, wave runup will be 1.9 X 1.4 or 2.7 feet above the still water level. Wave runup can be reduced by flattening the slope.

Table 2. Wave Runup Ratio

Shore Slope Horizontal : Vertical	Ratio
2:1	2.3
3:1	1.9
4:1	1.5
6:1	0.9
10:1	0.5

* Check shoreline for slope and stability. Slope is a very important factor to consider. If the slope is to steep, the shoreline may need to be reshaped. If shoreline soils are loose and unstable they should be compacted before revetments are put in place.

* Obtain the proper permits for constructing revetments.

Permits can be obtained from:

US Army Corps of Engineers
Pierre Regulatory Office
Oahe Dam Admin Building
PO Box 1117
Pierre, SD 57501
Phone: 605/224-8531 FAX: 605/224-5945

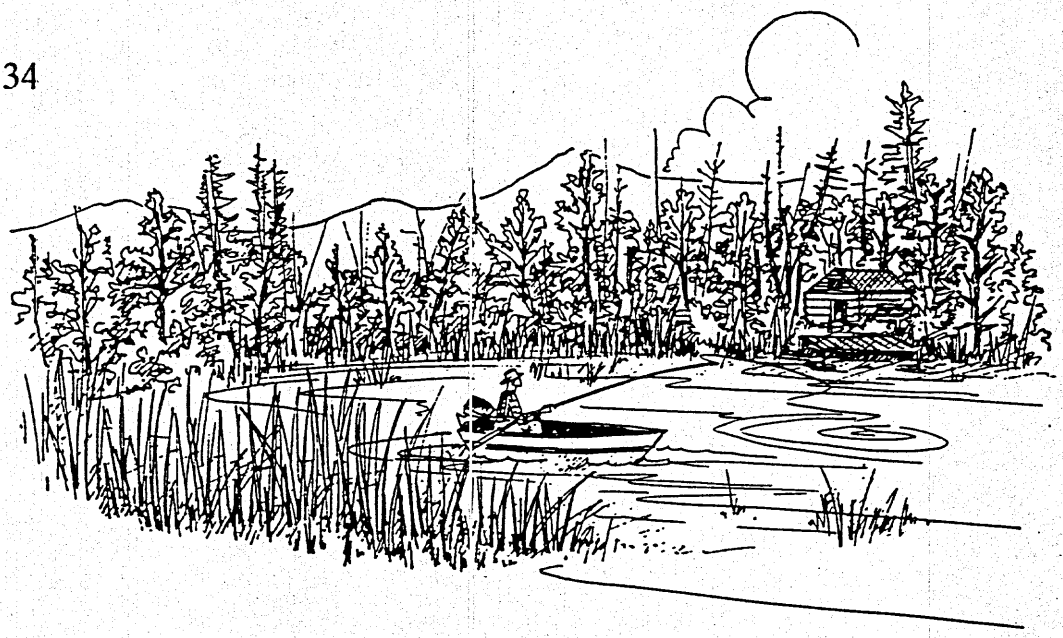
Information used in Table 1 and 2 taken from the publication; "LakeSmarts" published by the Terrene Institute, 1993.

Need More Information?

The following agencies can provide technical assistance for designing shoreline erosion control revetments:

National Resources Conservation Service
Day Conservation District
710 Main Street
Webster, SD 57274
Phone: 605/345-4661

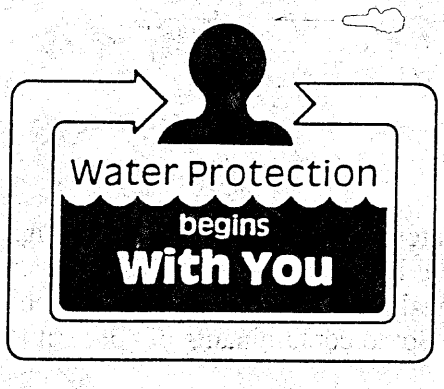
SD Dept. of Environment & Natural Resources
Northeast Lakes Regional Office
913 5th St SE
Watertown, SD 57201-5134
Phone: 605/882-5111



Publications:

LakeSmarts, the first lake maintenance handbook.
by Steve McComas
1993. Terrene Institute, Washington, D.C.

For copies contact:
Terrene Institute
1717 K Street, NW, Suite 801
Washington, D.C. 2006



get the facts...

Volume 1

What is in Water?

Water (H_2O) is never just pure hydrogen and oxygen. Water naturally contains minerals and microorganisms from the rocks, soil and air with which it comes in contact. Human activities add many more substances to water. Some, such as bacteria, come from waste products of people and animals. Others, such as gasoline and industrial solvents, are synthetic chemicals made and used for special purposes. Still other materials, such as nitrate and salt, occur naturally. Human activities can greatly increase nitrate and salt concentrations in the environment.

Where does my water come from?

Often we don't think about the source of our water as long as it continues to flow from the tap. It must come from somewhere, though, to get to our tap. Your water can be surface or ground water. Surface water, as its name implies, lies on the earth's surface, such as a dam, lake, stream or river. Groundwater comes from below the earth's surface where it lies in aquifers. These aquifers can be shallow, lying less than 100 feet below the surface (for example, the Big Sioux Aquifer) or deep, lying thousands of feet down (such as the Sundance, Dakota, and Madison formations common in western South Dakota).

What is water quality?

It is the chemical, biological and physical characteristics of water.

How does water quality and quantity affect me?

Water is the "indispensable nutrient" for humans, animals and plants. Nothing can live long without it. Therefore, a reliable, safe source of water is important to everyone and everything. Point and nonpoint source pollution must be carefully monitored and controlled.

What is point and nonpoint source pollution?

Point source pollution is commonly defined as water pollution that can be traced to a specific source of discharge such as a pipe. Nonpoint source (NPS) pollution is more difficult to define. A simplified definition would be water pollution that does not discharge from a pipe. Examples include, but are not limited to, runoff from construction sites and agriculture, silviculture, mining and urban areas. Nonpoint sources of pollution can come from any area, and most do not discharge at a specific, single location. In general, nonpoint source pollutants are carried over and through the ground by rainfall, runoff and snowmelt. Legal distinctions complicate the definition, however. When runoff is collected and discharged through a pipe (such as combined storm and sanitary sewers, or in cases of runoff from active mines), it is usually considered to be a point source. The Clean Water Act defines irrigation return flows as nonpoint source, however, despite the fact the water is collected and returned to the stream through a channel or pipe. Remember, though, water movement alone is not pollution unless the water is carrying contaminants.

What are contaminants?

Contaminants are minerals or microorganisms occurring in water that may pose a risk through the use of the water. They are regulated by the US Environmental Protection Agency (EPA) when they occur in drinking water supplies and can threaten public health. Such contaminants must be detectable in drinking water using current laboratory methods. Some contaminants of concern to EPA are:

» Bacteria - Health officials agree the most direct health threat associated with drinking water is from bacterial contamination. Bacteria from human or livestock wastes can cause serious health problems, such as dysentery, hepatitis, and typhoid fever.

» Nitrates - Nitrate levels in ground water have been rising in many areas. Common sources of nitrates include septic systems, livestock wastes, and use of nitrogen fertilizer on farm fields and lawns.

» Minerals - Some of the minerals found in ground water, iron and sulfur for example, can give water an unpleasant odor or color without making it unsafe. Occasionally, metals such as chromium or lead leach into water from surrounding rock in sufficient concentrations to present a health risk.

» Synthetic Chemicals - Public health officials understand the health effects of bacteria, nitrate, and some minerals. But the health effects of certain synthetic chemicals are not so clear. Determining the health effects of such contaminants is difficult, since researchers are still learning how these chemicals react in the body.

Is my water safe?

The Environmental Protection Agency has set standards for determining safe drinking water. To learn how your community water supply ranks on these standards, you may contact the SD Office of Drinking Water in Pierre, 773-3754. If you have a private water supply, you must take the initiative to have your water tested periodically. For more information on correctly testing your water supply, contact the SD Office of Drinking Water in Pierre, 773-3754.

How can I protect my water?

Water protection begins with YOU. Through the coming months, similar fact sheets will provide basic, usable information on protecting the waters of South Dakota. Please read this information and put it to work.

Published by the South Dakota Association of Conservation Districts in cooperation with the Nonpoint Source Task Force and Groundwater Research and Advisory Group. Funded by the US Environmental Protection Agency and the South Dakota Board of Water & Natural Resources.

Water Protection begins With You

get the facts...

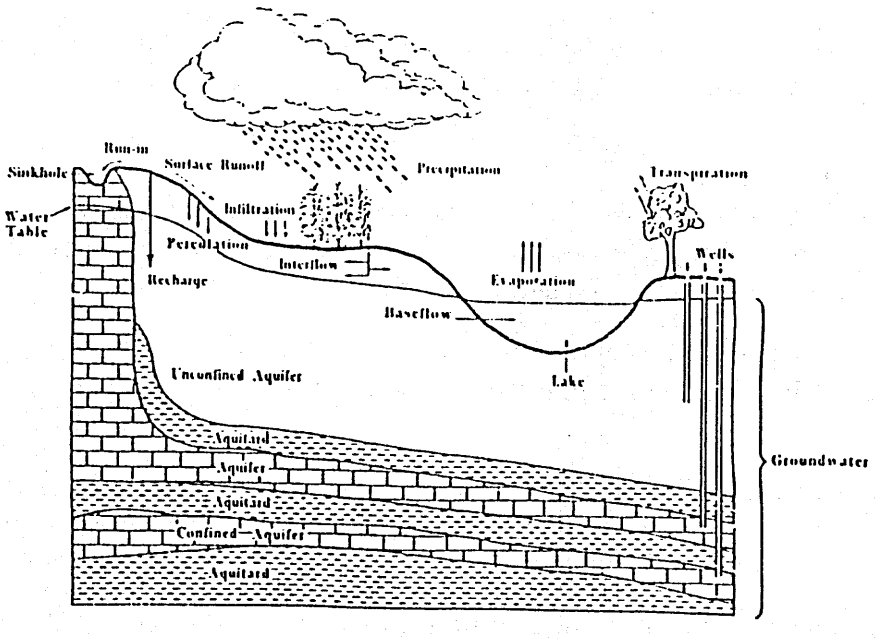
Volume 2

Water in Action

All of us have had firsthand experience with water in its many forms - rain, hail, snow, ice, steam, fog, dew. Yet, in spite of our daily use of it, water is probably the natural resource we least understand. Today there is much concern over the contamination of this resource.

To understand how water becomes contaminated, it is necessary to understand the hydrologic cycle (water cycle) - the endless circulation of water between the ocean, atmosphere and land. By understanding how water moves on and through the soil, it becomes clear how contaminants can move with it.

The water cycle begins with *precipitation* in the form of rain, snow, sleet or hail falling on the surface of the earth. As precipitation falls, some of it may evaporate directly into the atmosphere from bodies of water, and a portion may fall on vegetation. The remainder reaches the ground where it can enter the soil by a process called *infiltration.*



Some of the infiltrating water stays near the soil surface and evaporates into the atmosphere. Another portion is taken up by plant roots and transported to leaves where it is lost to the atmosphere as a vapor. The process is called *transpiration.*

Still another portion of water that enters the soil can move out of the plant root range. Significant lateral movement of water through soil is called *throughflow* or *interflow.* Downward movement of water through the soil is referred to as *percolation.*

Percolating water eventually makes its way to a *saturated zone*, where all spaces between rock and soil are filled with water. The water filling the spaces between soil particles and rock in the saturated zone is called *groundwater.*

Gravity causes water to move within the saturated zone from areas where the water table is high toward areas where the water table is lower. As it moves groundwater may flow into surface water, such as a lake or river. In fact, this process, known as *baseflow*, accounts for most of the water that recharges rivers, lakes, and perennial streams (streams which flow all year.

Water will soak into the soil until precipitation comes down faster than it can be absorbed by the soil. The excess water builds up on the soil surface and moves by overland flow called *surface runoff*. If surface runoff is excessive or concentrated, erosion can occur.

Groundwater Flow

Recharge is the process in which water percolating through the soil replenishes groundwater. Because the amount of precipitation and evaporation varies seasonally, the rate at which groundwater is recharged will vary seasonally as well.

In turn, the depth of the *water table* will vary. The water table is the upper boundary or top of the groundwater.

One common misperception, however, is that groundwater moves somewhat rapidly. In reality, groundwater moves much more slowly than water in a river or stream. This is because groundwater must overcome friction to move through the small spaces between soil particles and rocks. While water in a stream may move several inches or feet per second, groundwater generally moves several inches or feet per month.

Because groundwater flows slowly, most wells draw on the groundwater that lies close to the point where it is withdrawn. This is why activities taking place on the land surface closest to the well have the greatest impact on water quality.

Aquifers and Aquitards

An *aquifer* is defined as permeable, geologic material through which significant quantities of water can move. Geological materials that serve as aquifers include sand and gravel; permeable bedrock, such as sandstone, limestone and dolomite; and fractured crystalline bedrock.

Geologic material through which significant materials of water cannot move is called an *aquitard* or *aquiclude*. Clays, shales, dense bedrock and other very slowly permeable materials are common aquitards.

Aquifers and aquitards vary in their depth, thickness and continuity. A *confined aquifer* is bounded on the top and bottom by aquitards. *Unconfined aquifers* have a permeable layer above them, and they are generally found close to the land surface.

Although the total amount of water circulating in the hydrologic cycle remains constant, the amount of clean water available to us is not constant. We tend to return water to the cycle dirtier than it was when we received it. Knowledge of the water cycle's processes (transpiration, throughflow, surface runoff, etc.) gives us a better understanding of how water becomes contaminated and how we can reduce this contamination.

Printed on recycled paper.

Published by the South Dakota Association of Conservation Districts in cooperation with the Nonpoint Source Task Force and Groundwater Research and Advisory Group. Funded by the US Environmental Protection Agency and the South Dakota Board of Water & Natural Resources

COOPERATIVE EXTENSION SERVICE SDSU

Extension Extra

ExEx 1016
October 1992
Ag Eng/Hort/WQ

Furnished by: Day County Extension Office
Courthouse, Box 540
Webster SD 345-4641

SOUTH DAKOTA STATE UNIVERSITY / U.S. DEPARTMENT OF AGRICULTURE

Managing Lawns to Protect Water Quality

Watering, Fertilizing, and Applying Pesticides

by Charles B. Johnson, Extension associate -- water and natural resources;
James Gerwing, Extension agronomist -- soils;
David F. Graper, Extension horticulture specialist;
and James A. Wilson, Extension pesticide applicator trainer

Maintaining a quality lawn requires that you use intensive lawn care practices like watering, fertilizing, and/or applying pesticides. A number of best management practices (BMPs) provide safe-guards for preventing the contamination of surface water and groundwater supplies with lawn fertilizer and/or pesticides.

Lawn Watering Management

How and when you water your lawn affects its ability to resist the invasion of weeds, insects, and diseases as well as the effects of drought, wind, and excessive heat. While the water requirements of a lawn vary with changing weather conditions and lawn maintenance level, the frequency and rate of watering depend on soil type and slope of the lawn.

Best Management Practice

To water your lawn properly, replenish just the soil moisture used by the grass plus that lost directly to evaporation.

This management practice will provide a healthy lawn and minimize water supply pollution from surface runoff or leaching. Application of the required amount of water also minimizes any effects of poor quality water (i.e. water with a high sodium or salt content).

Water requirements

High-maintenance lawns can require up to two inches of water per week during peak use periods. Each time you water your lawn, you need to replace the lost soil moisture. The idea is to keep the top six inches of soil moist. Soaking, to a depth of four to six inches per watering, encourages the grass to develop deeper roots. It also allows for an adequate drying period between watering to assure proper aeration of the roots.

Watering too frequently makes grass susceptible to stresses from pathogens and other pests; it also fosters the development of shallow root systems and the buildup of thatch. Wet soil makes grass susceptible to fungal diseases of the roots, while continual moisture on the leaves increases their chances for developing fungal diseases. Generally, watering early in the day is a better practice than watering in late evening.

Excessive watering also increases the potential for water supply contamination from runoff or the leaching of plant nutrients and/or pesticides.

Too little water, indicated by wilted grass, makes a lawn vulnerable to weeds and undesirable grasses. Drought conditions also can stunt grass plants and make them vulnerable to disease. Lack of moisture during the fall interferes with the grass plant's ability to store enough food to survive the winter.

For best water management, you need to know the operational characteristics of your watering equipment. Calibrate lawn sprinkling equipment to determine its application rate. For automated watering systems activated by time clocks, rainfall must be accounted for or the automation tends to cause over watering.

Sandy soils

Sandy and sandy loam soils have low water-holding ability. Water applied to a lawn in an amount greater than the water-holding capacity of the soil in the root zone, moves below the root zone carrying with it dissolved plant nutrients and pesticides. This downward percolation of excess water greatly increases the potential for groundwater contamination from dissolved plant nutrients and pesticides.

Best Management Practice

If your lawn is on a sandy soil, reduce the quantity of water applied per watering, and water more often.

Be sure you still supply the amount of water required for a given period. For example, to supply one inch per week, you could water your lawn twice a week, one-half inch each time.

Clayey soils

These soils have high, water-holding abilities, but their water infiltration rates are low. The water up-take rate ranges from approximately 0.05 to 0.30 inches per hour. The low infiltration rate increases the chances of surface runoff before a required quantity of water can enter the soil profile. This increases the potential for surface water pollution from nutrient- and/or pesticide-contaminated runoff.

Best Management Practice

To soak a lawn on a clayey soil, especially a sloping lawn, apply the required amount of water using short watering cycles; allow enough time between cycles for the water to soak in.

OR

Water slowly so the required amount of water soaks into the soil before runoff can occur.

Lawn Fertilizing Management

A primary consideration in lawn maintenance is to match site conditions with a fertilization program that will produce the desired quality of lawn. Proper fertilization management requires that fertilizer applications be based on accurate, soil fertility tests. Soil sampling techniques for lawns are explained in the lawn and garden soil sampling information sheet available through county Extension offices.

Nitrogen(N)

The nitrogen needs of a lawn depend on the type of grass and the quality of lawn you desire. A high-maintenance, cool-season grass lawn usually is a seeding mixture of the more vigorous varieties of Kentucky bluegrass that require more fertilizer and water. A low-maintenance, cool-season grass lawn usually is a mixture of the more common varieties of Kentucky bluegrass and other turf grass varieties that grow less vigorously but do well with reduced water and fertilizer.

Nitrogen fertilizer recommendations from a soil test can range from two to four pounds of actual nitrogen per 1000 square feet of lawn per year for a high-maintenance, cool-season grass lawn. Limit the application of nitrogen fertilizer to not more than one pound of actual nitrogen per 1000 square feet of lawn per application.

Best Management Practice

For general lawn care, make available for plant use the nitrogen contained in the grass clippings.

Allowing the clippings to decompose on the lawn will give it one pound of available nitrogen per 1000 square feet of lawn per year. Timely mowings that produce grass clippings not more than one-half inch in length will further decomposition. Do not remove more than a third of the total plant height with any mowing.

Best Management Practice

To supply the required nitrogen for a high-maintenance, cool-season grass lawn on a clayey soil, make two or three applications of fertilizer during the year.

This reduces the potential for nitrate-contaminated, surface runoff to pollute either surface water or groundwater supplies.

Nitrogen fertilizers are categorized as quick-release or slow-release sources of nitrogen. Quick-release sources of nitrogen are water soluble and release nitrogen for plant use as soon as they are dissolved by soil moisture, rain, or irrigation water. Slow-release sources of nitrogen depend on soil microbial and/or chemical action for the release of nitrogen that is usable as a plant nutrient.

If you're making three applications of nitrogen annually, apply a third of the recommended nitrogen in a slow-release form by May 1. Apply the second one-third by Aug. 1, but use a half-and-half mixture of slow-release and quick-release fertilizer. Apply the remaining third of the recommended nitrogen in a quick-release form by Sept. 15.

If you're making two applications of nitrogen per year, make one by May 1, and the other by September 15. Use a slow-release fertilizer for the spring application and a half-and-half mixture of slow-release and quick-release fertilizer for the fall application.

Best Management Practice

For a high-maintenance, cool-season grass lawn growing in a porous, sandy soil: apply a slow-release form of nitrogen fertilizer.

OR

Apply smaller amounts of quick-release nitrogen fertilizer, but fertilize more frequently.

This BMP will reduce the potential for nitrates to be carried into a groundwater supply by excess irrigation water or rainfall.

Giving a lawn a one-half-inch watering immediately after applying a quick-release form of nitrogen fertilizer helps

move the nutrient into the soil where the grass can use it quickly. This also reduces the volatilization loss of nitrogen from urea fertilizer.

Minimum-maintenance lawns of cool-season grasses, using no watering, require from one to two pounds of actual nitrogen per 1000 square feet of lawn per year. Make single or split fertilizer applications using a slow-release form of nitrogen.

Phosphorus(P)

Phosphorous is an essential nutrient for grass, but it generally is required in significantly smaller quantities than nitrogen. Quite often, lawns do not need supplemental phosphorous. Once in the soil, phosphorous quickly becomes bonded to a soil particle; this greatly reduces the potential for groundwater pollution from leaching. However, the potential for surface water pollution by phosphorous is higher because sources of phosphorus such as grass clippings, other organic matter, and soil particles can be carried into surface water supplies.

Phosphorous often is the least plentiful nutrient in surface water supplies. Consequently, when even small amounts of phosphorous enter a surface water supply, the undesirable growth of aquatic plants (algae bloom) can be accelerated.

Best Management Practice

The application of phosphorous fertilizer on a lawn or garden located near a shoreline should always be based on a current soil test.

Monitor the application closely to prevent phosphorous from entering the surface water supply. Do not spread phosphorus fertilizer on a driveway, sidewalk, patio, or other hard surfaced area from where it could wash into a surface water supply.

Potassium(K)

South Dakota soils are considered to have high levels of available potassium with the exception of the extreme eastern counties and some sandy-soil areas. Potassium requirements of a lawn could range from nothing to four and one-half pounds of K_2O per 1000 square feet of lawn per year. Base your lawn applications of potassium on current soil test information.

Applying Fertilizers

There are two types of spreaders for applying granular fertilizer: a drop-type spreader which has a more precise application pattern and a rotary-type spreader which broadcasts.

Best Management Practice

Set the spreader for one-half the recommended rate. When spreading, overlap the previous pass by one-half the swath or make the required two passes over the lawn at right angles to one another.

This gives a more uniform application of fertilizer and reduces the chances of streaks appearing in a lawn.

Best Management Practices

Use a drop-type spreader on small areas to eliminate over fertilization and on the borders of lawns to assure that fertilizer is not spread on adjoining hard surfaces or surface waters.

Fill or empty a granular fertilizer spreader on a clean, dry, hard surface.

This makes it easier to clean up spilled fertilizer. NEVER wash spilled fertilizer onto a street or road or into a sewer or ditch where it can be carried to a surface water supply.

Best Management Practices

Fill or empty a liquid fertilizer applicator on a grassy area other than the lawn, or on a hard-surfaced area, to prevent spilled fertilizer from being carried to a surface water supply by runoff.

To prepare fertilizer spreaders for storage, rinse them on a grassy area to prevent the contaminated rinse water from polluting surface water supplies.

If a liquid spreader is filled, or any spreader is rinsed, on a hard surface, any spilled fertilizer or rinsate must be contained and disposed of on a grassy area. Do not exceed the recommended fertilization rate of an area when disposing of spilled fertilizer or rinsate.

Best Management Practice

Shut off fertilizer spreaders when crossing a pathway, sidewalk, driveway, or other hard-surfaced area, and avoid fertilizing drainage areas in a lawn.

These practices reduce the potential for the concentration of nutrients which then can be carried to a surface water supply.

Best Management Practices

Calibrate a fertilizer spreader to assure the proper rate of application.

Fertilizer applications must NEVER result in fertilizer being deposited directly into a surface water supply.

For lakeside or streamside lawns, a buffer zone of natural vegetation along the shoreline area can capture eroding soil and runoff and help prevent pollution of the surface water supply.

Lawn Pesticide Management

In this publication, the term pesticide includes all herbicides, insecticides, and fungicides.

Best Management Practice

READ and FOLLOW the label instructions exactly as written on the pesticide container.

This is the most important BMP when using pesticides. The label for a pesticide provides the legal requirements for use of that pesticide.

Best Management Practice

Use the safety equipment recommended on the label when preparing and applying a pesticide.

The recommendations may include chemical resistant gloves and footware, a long-sleeved shirt, long trousers, and eye protection.

When through applying a pesticide, remove contaminated clothing and shower or wash thoroughly using soap. Launder contaminated clothing separately from family laundry.

Best Management Practice

Before applying pesticides, be sure lawn damage is being caused by pests and is not the result of neglected cultural practices.

Environmentally sound lawn care practices reduce the need for pesticides by using alternative management practices, either natural or mechanical.

Best Management Practices

Calibrate the application equipment to assure that the prescribed amount of a given pesticide will be applied to a given area.

Prepare only the amount of mixture required to treat a given area when a pesticide is applied in a diluted form.

Spot treat problem areas rather than the whole lawn.

Consider the population density and maturity of lawn pests, the time of day, the season of the year, the weather, and/or the physical condition of the lawn to obtain the most effective results from using a pesticide.

Apply pesticides during calm weather to minimize the potential for drift of the spray. Herbicide spray drift can harm ornamental and garden plants while insecticide and fungicide spray drift can contaminate garden crops.

Applying herbicides for broadleaf weed control after a frost can minimize herbicide damage to vegetables and ornamental plants.

High temperatures can enhance the vaporization of some pesticides; this increases the potential for damage to nearby susceptible plants from pesticide vapor drift.

Best Management Practices

Assure that no pesticide is deposited directly into a surface water supply or that any spray drift be allowed to settle on a surface water supply.

Prevent pesticide spills by staying with the application equipment during filling.

Keep the filler hose out of the pesticide-water mixture, preventing its contamination and any possibility of back-siphoning.

Triple rinse empty pesticide containers and use the rinsate to help fill the applicator tank. Dispose of empty containers in accordance with label instructions and local and state regulations.

Dispose of excess pesticide mixture on an untreated lawn area, at not more than the label rate.

Clean and rinse spray equipment on an untreated grassy area, away from wells and surface water supplies, spraying or spreading the rinse water on the untreated area.

This publication was funded by the South Dakota Nonpoint Runoff Taskforce and the Richmond Lake Hydrologic Unit Area Project, under 91-EHLIA -1-0033

COOPERATIVE EXTENSION SERVICE SDSU

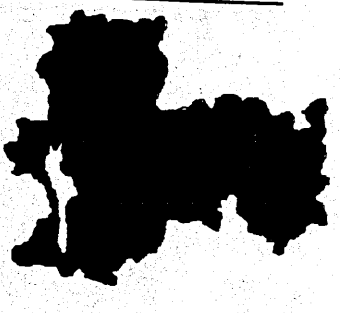
Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the USDA. Myio A. Hellickson, Director of CES, SDSU, Brookings. Educational programs and materials offered without regard to age, race, color, religion, sex, handicap, or national origin. An Equal Opportunity Employer.

150 copies printed by CES at a cost of 15.5 cents each. October 1992.

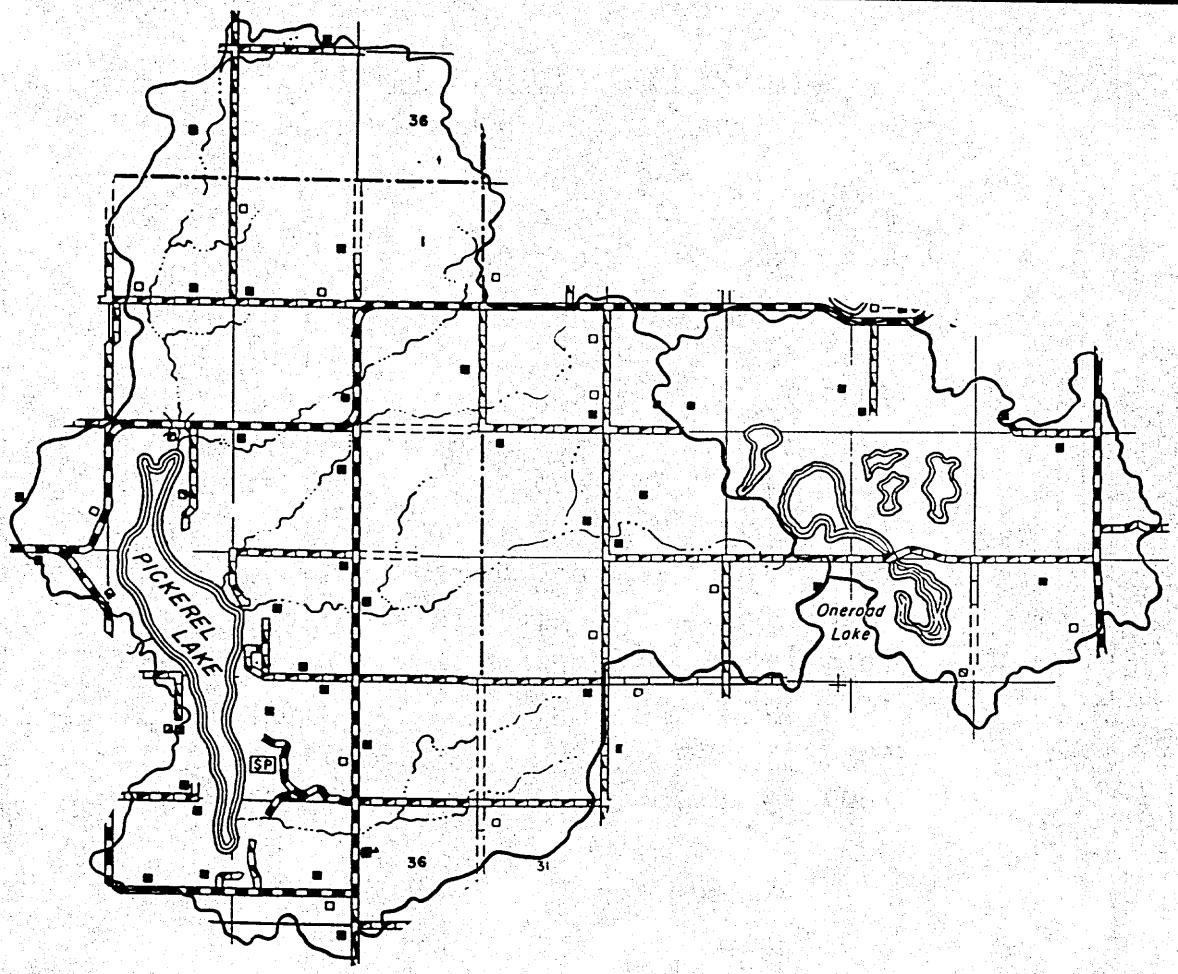
Appendix M - A Self-Guided Tour Of Pickerel Lake's Watershed

Pickerel Lake Protection Project

Day Conservation District



A Self-Guided Tour of Pickerel Lake's Watershed



A lake is a reflection of its watershed!

Definition:

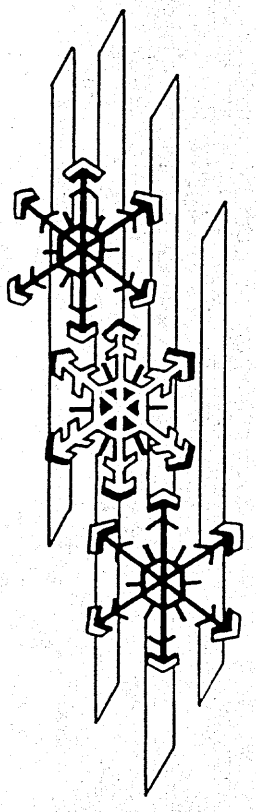
Watershed: A geographical area that supplies water to a stream, lake, or river.

Pickerel Lake Watershed: 15,015 acres
(One Road Lake Watershed: 2,481 acres)

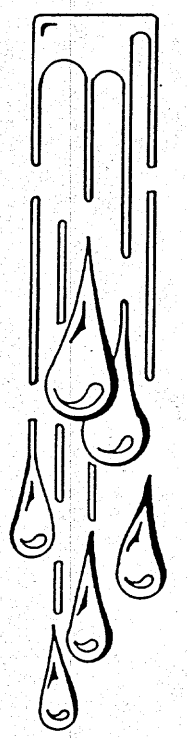
Precipitation in the form of rain and snow travels over the watershed's surface, or seeps into the soil and travels as groundwater through the aquifer. Due to Pickerel Lake's depth of 43 feet, the underlying aquifer is intersected supplying the lake with high quality groundwater, the main source of water to the lake. Two major and three minor drainages provide surface water to Pickerel Lake. Chekepa Creek enters the lake from the east, draining the largest section of the lakes watershed. Dry Creek drains the second largest area and enters Pickerel Lake from the north.

Annual Precipitation Totals: 1953 - 1994

(Data from the Waubay Reporting Station)



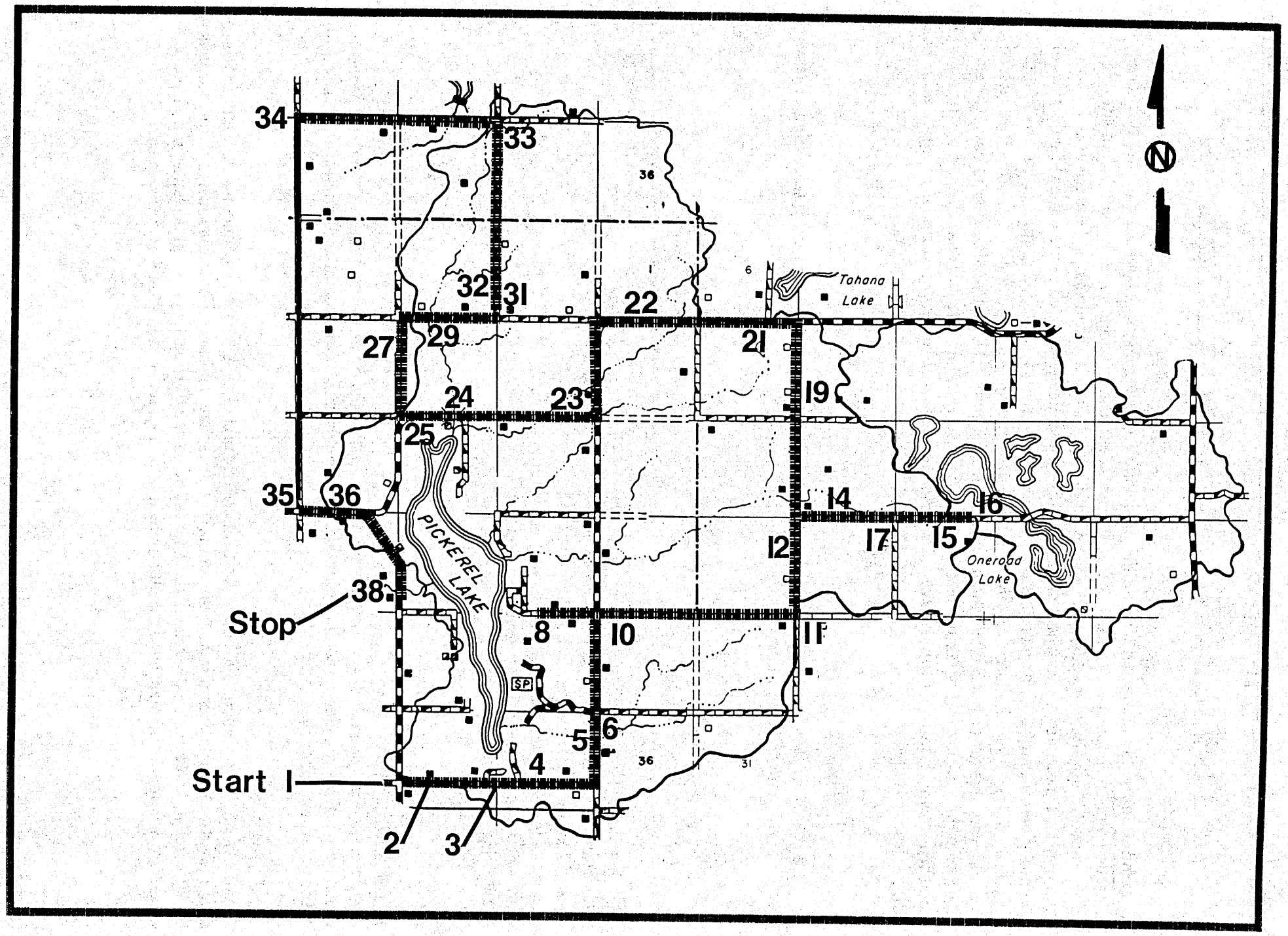
1953 23.32	1954 20.25	1955 19.30
1956 19.85	1957 24.01	1958 11.61
1959 16.45	1960 19.95	1961 22.75
1962 32.21**	1963 23.07	1964 19.45
1965 26.45	1966 21.91	1967 15.43
1968 21.07	1969 19.61	1970 20.23
1971 25.56	1972 22.13	1973 16.57
1974 12.33	1975 17.79	1976 7.02*
1977 28.06	1978 22.07	1979 19.00
1980 16.22	1981 17.14	1982 19.42
1983 19.01	1984 23.16	1985 19.57
1986 30.74	1987 13.33	1988 18.26
1989 20.00	1990 21.55	1991 28.93
1992 16.64	1993 26.75	1994 22.47



* Driest Year

** Wettest Year

Wettest month on record: July 1993 - 9.06"

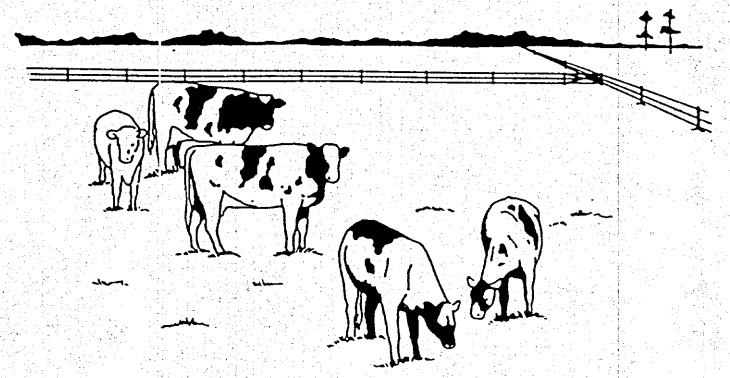

34
33
36
32
31
22
6
Tahana
Lake
27
29
21
24
23
19
25
35
36
14
16
12
17
15
Oneroad
Lake
PICKEREL LAKE
38
Stop
8
10
11
SP
6
5
4
36
31
Start 1
2
3
N

A Self-Guided Tour of Pickerel Lake's Watershed

Introduction: The numbered map on the preceding page denotes stops along the tour route. These include points of interest - historical and geological, demonstration and project construction sites. Familiarize yourself with the tour route, location of county highways and tour stops before you start. All tour route roads are passable by two wheel drive vehicles. The mileage denoted in the left hand column is given as cumulative miles for each stop on the tour. Remember to reset your vehicles mileage counter at the starting point - # 1. The tour route is 30 miles long and should take about 1.5 hours to complete. However, time may vary due to your speed and the time spent at each stop. The best time of year to complete the tour is late May through June. Try taking the tour again during the fall to note seasonal changes occurring in the watershed. ***Note: The Day Conservation District is not responsible for any accident or injuries incurred along this tour route.***

0.0 # 1. Begin the tour by heading east on Day County Hwy 6, at the intersection of Day county Hwy 1 and Hwy 6.

0.2 # 2. Dairy Farm



This dairy farm feedlot is one of three Animal Waste Management Systems constructed by the Pickerel Lake Protection Project. Animal waste from feedlots is a major source of ***nonpoint pollution*** degrading water quality in South Dakota rivers, lakes, and streams.

Definition:

Nonpoint source pollution - a diffuse source of pollutants that washes off the land or seeps into groundwater that includes agricultural runoff from fields and feedlots, leakage from septic tanks, and nutrients from drained wetlands.

Animal Waste Management Systems collect runoff from feedlots, storing the contaminated water in evaporation ponds. These systems reduce the amount of phosphate and bacterial contaminates to surface waters by 90 percent, and also greatly reduce the amount of nitrates. High levels of phosphates in a lake can increase growth of aquatic plants and eventually lead to blue-green algae blooms. **Continue east.**

1.1 # 3. Riparian Areas

To the right is a ***riparian zone*** bordering a small creek.

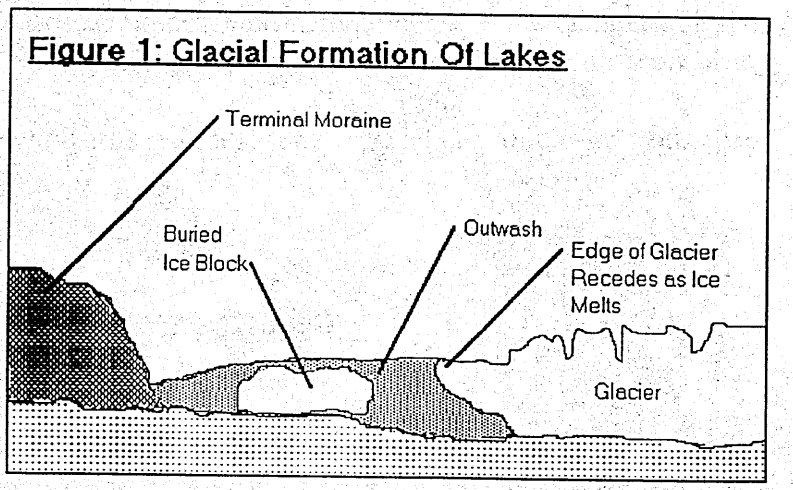
Definition:

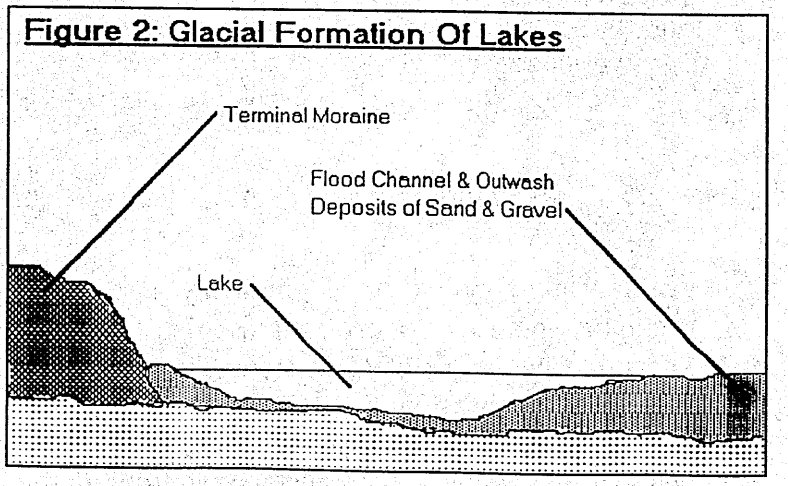
Riparian Zone - The zone of vegetation that occurs on the banks adjacent to a natural watercourse or lakeshore.

If the vegetation in a riparian zone is overgrazed by cattle or sheep erosion may occur. Snowmelt and rainfall then carry sediment into the adjacent stream or lake. Landowners have agreed to implement a rotational grazing system along this riparian zone and the adjoining pasture. Rotation grazing divides a pasture into three or more fenced areas in which cattle are allowed to graze for a short period of time. The grazed area is then given a rest period as cattle are moved to the next area. By preventing soil erosion in riparian zones and pastures, nonpoint source pollution from sediments and nutrients can be controlled. **Continue to the east.**

1.4 #4. Pickerel Moraine

This is a terminal moraine composed of earth and stones deposited along the sides and end of a glacier as it retreated. The Pickerel moraine was formed approximately 12,000 years ago during the late Wisconsin Glacial Period. The south end of Pickerel Lake is formed in a depression gouged into this moraine by glacial ice. The northern half of Pickerel Lake began as a large block of ice which broke from the main glacier as it was receding. This ice block was buried in outwash, sand and gravel carried by water flowing from the melting glacier (Figure. 1). As the ice block melted, a depression formed in the outwash which later filled with water to form Pickerel Lake (Figure 2)





In 1839, explorer and mapmaker Joseph N. Nicollet camped near this stop. Nicollet described the area as *"bejeweled with lakes and dotted with beautiful stands of trees."* From this vantage point much of Pickerel Lake's watershed can be viewed to the north and east. How has the land changed since Nicollet's time?

Continue east on Day Co. Hwy 6

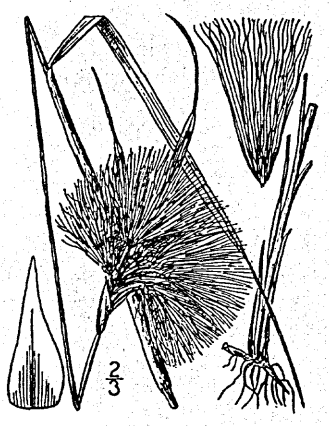
2.4 #5. Wetlands

Note the large wetlands on both sides of the highway. These wetlands drain to the west, eventually entering Pickerel Lake at the old hatchery site. Wetlands have many benefits and desirable functions. Wetlands control flooding by storing and slowly releasing flood waters. Wetlands, because they are often found between agricultural lands and larger water bodies like Pickerel Lake, intercept runoff capturing harmful nutrients such as nitrates and phosphates, and trapping suspended sediments. Excess nutrients and sediments cause a lake to age at an accelerated pace, called cultural ***eutrophication.***

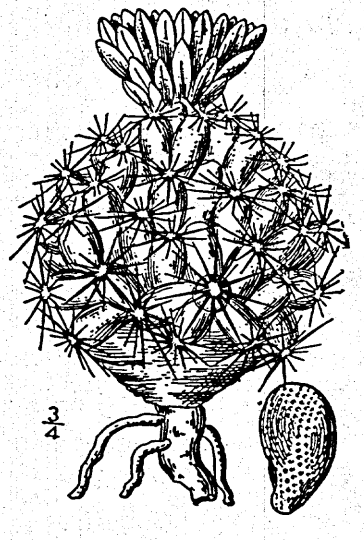
Definition:

Eutrophication - The process of physical, chemical, and biological changes associated with nutrient, organic matter, and stilt enrichment and sedimentation of a lake. If the process is accelerated by human influences (poor land management practices, failing septic systems etc.) it is called cultural eutrophication.

Stop the cars engine and listen. What other benefits do wetlands provide? **Continue to the north.**



Cottongrass



Pincushion Cactus

2.6 #6 Native Prairie

On the right-hand side of the highway, just east of the state park entrance, is a small tract of native tallgrass prairie. Named tallgrass due to the height of the native grasses such as Big Blue Stem (which can reach a height of 10 feet), tallgrass prairie once covered much of eastern South Dakota prior to settlement. In northeastern South Dakota, native tallgrass prairie now exists mainly on land too rocky or steep to plow, along the edges of wetlands, or land protected by State Parks and Game Production Areas, National Wildlife Refuges and Federal Waterfowl Production Areas. Many interesting and unusual native prairie plants can be observed including, Pincushion Cactus, Cottongrass, Yellow Star Grass, and Ground--Plum. These and other native plants once common, are now scarce due to the invasion of tame cold-season grasses, overgrazing, and conversion of native prairie to cropland. As you drive through Pickerel Lake's watershed look for other tracts of native prairie. **Continue to the north.**

3.7 #7. Turn left on gravel road (by Ed's Bait Shop sign) and proceed west.

4.3. #8. Stop at Kulesa mailbox

Visible on the right-hand side of the driveway running to the south is an evaporation pond, part of a Animal Waste Management System built by the Pickerel Lake Protection Project. Funding for the construction of this system came from federal and state grants, and the landowner/operator.

A federal Environmental Protection Agency (EPA) 319 Grant awarded to the Day Conservation District by the SD Dept. of Environment and Natural Resources provided thirty-five thousand dollars for the construction of three Animal Waste Management Systems. The 319 grant is part of EPA's Clean Lakes Program which is funded by an appropriation from congress. This grant cannot pay for more than seventy percent of total construction costs.

A state grant from the SD Consolidated Water Facilities Construction Program provided forty thousand dollars for constructing animal waste management systems. Funds for this state grant are generated from state lotteries other than video lottery. This grant cannot pay for more the forty percent of total construction costs.

The landowner/operator of these farms must also pay a share of the total construction costs. Many choose to provide the labor and materials to fence and seed lagoon dikes, borrow pits etc. The cost of this labor and materials is in-kind or match towards both federal and state grants.

Without cost-share funds, very few systems such as this would be built. This is a unique example of state and federal agencies working with landowners on a voluntary basis to solve environmental problems. Federal and state grants are competitive, with many municipalities, conservation districts and water development districts applying for these funds. Evidence of local support is very important when sponsors such as the Day Conservation District apply for these grants and testify at grant hearings. Pickerel Lake watershed and lake property owners were very supportive of this project as evidenced by the two state and one federal grant awarded to the District to improve the water quality of Pickerel Lake. **Turn around in driveway and continue to the east.**

4.9 #9. From stop sign, continue east on gravel road.

5.1 #10. Conservation Tillage

Conservation tillage practices are used on the cropland located on the right-hand side of the road.

Definition:

Conservation Tillage - any tillage method that leaves at least 30 percent of the soil surface covered with crop residue after planting, effectively protecting the soil from wind and water erosion.

For the 1995 growing season, wheat was planted in this field using a no-till drill, one method of conservation tillage. No-till can reduce soil erosion by 50-95%.

Conservation tillage reduces soil erosion thus preventing the loss of nutrients and pesticides that are attached to soil particles, eliminating a source of nonpoint pollution to Pickerel Lake. In addition to controlling soil erosion, conservation tillage saves an operator time, fuel, labor, and soil moisture.

The field on the left-hand side of the road is currently enrolled in the Conservation Reserve Program (CRP) until 1997. The CRP program was created by the Conservation Title of the 1985 farm bill - The Food Security Act. Farmers were given the opportunity to enroll highly erodible cropland in the CRP program for a period of 10 years. For an annual rental payment from the government, farmers were obligated to establish a permanent soil-conserving vegetative cover - in this field, native grasses. The CRP programs primary goal was to take highly erodible cropland out of production. Other objectives of the program which have benefited Pickerel Lake include; reducing sedimentation of lakes, rivers, and streams; improving water quality; and enhancement of fish and wildlife habitat. This program is being reconsidered for inclusion in the 1995 Farm Bill.

Continue to the east.

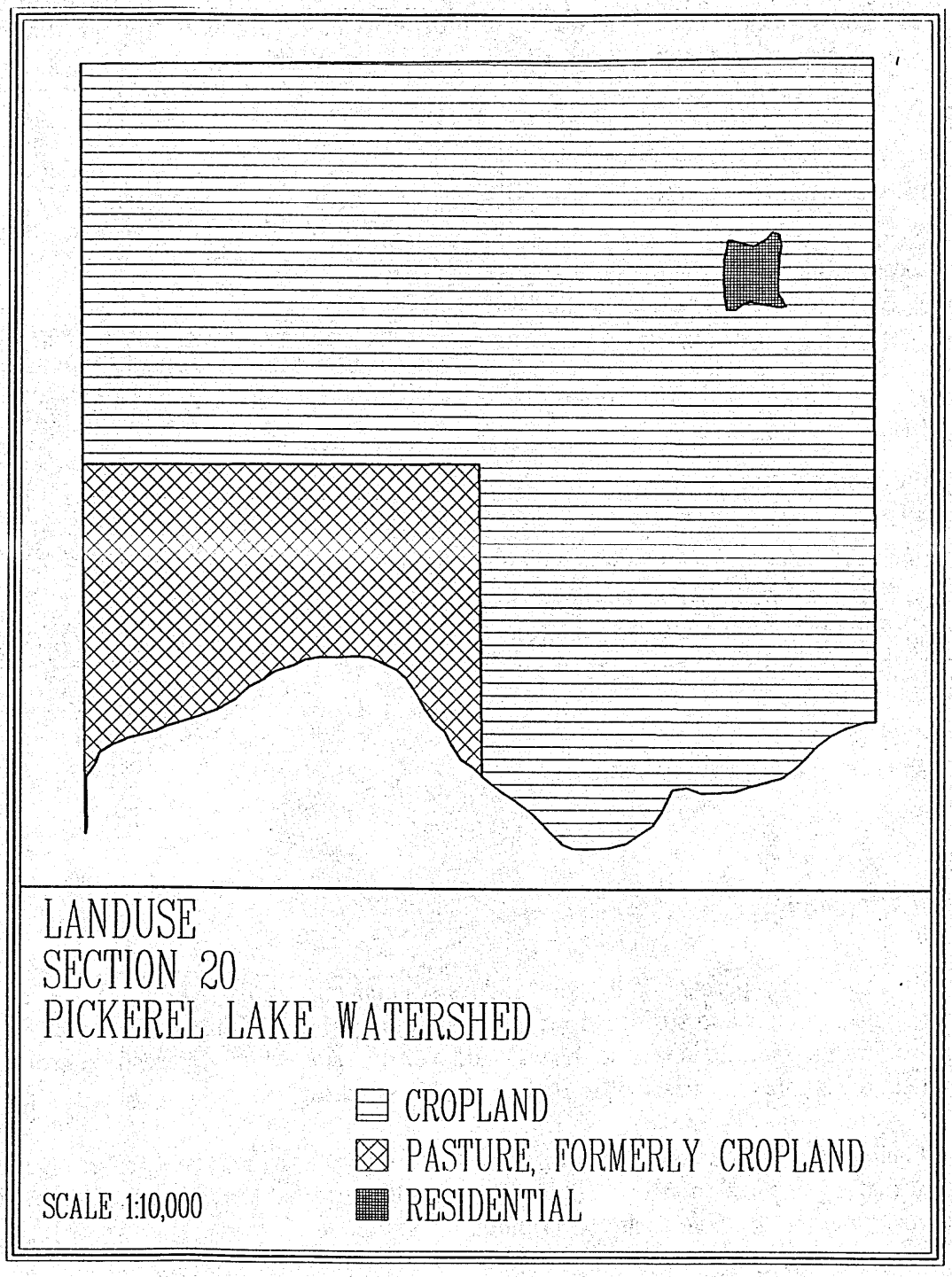
6.9 #11. Stop Sign

Looking southeast from this stop, is a view of Enemy Swim Lake's watershed. The watershed break runs along the east side of the gravel road running to the south (see map).

Turn left at stop sign and proceed north on gravel road.

7.5 #12. GIS - Geographical Information System

One of the main objectives of the Pickerel Lake Protection Project was to develope detailed maps of the lakes watershed. These maps will denote locations of highly erodable land, wetlands, aquifers, feedlots, and document current land use and ownership at the time of the project. These maps are computer generated using the GIS or Geographical Information System. The GIS system is the standard mapping method now being used by several government agencies including the Natural Resources Conservation Service, US Fish and Wildlife Service, and the Sisseton-Wahpeton Dakota Nation. Below is an example of a GIS generated map for the land located on the right-hand side of the road. **Continue to the north.**



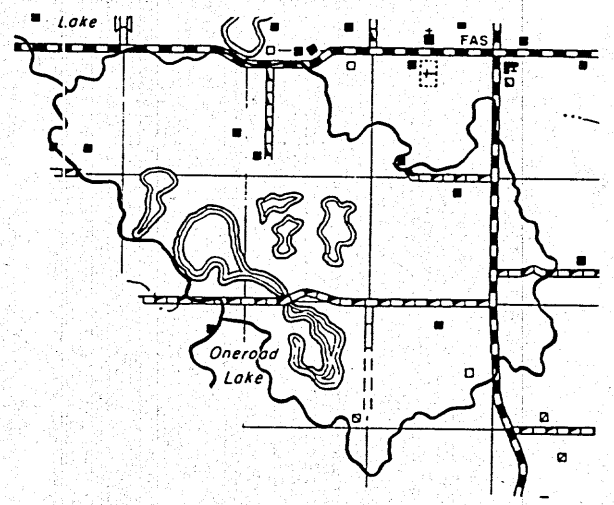
7.9 #13. Turn right and proceed east on gravel road.

8.5 #14. Chekapa Creek

On the left-hand side of the road you can view a portion of Chekapa Creek. Is it flowing? Overflow from One Road Lake and several springs, feed this creek which eventually enters Chekapa Bay on Pickerel Lake's east side. This portion of Chekapa Creek flows mainly during spring snowmelt, and periodically year-round during wet years. Note the condition of the land adjacent to the stream. Formerly cropland, this area is now categorized as pasture. No erosion is occurring along this portion of Chekapa Creek however, a change in land practices or overgrazing could degrade this riparian zone. **Continue east.**

9.4 #15. One Road Lake Outlet

The culvert passing under this road is the outlet of One Road Lake. Pickerel Lake's watershed begins on the south side of the road. **Continue east.**



9.7 #16. Wike Mailbox

From this vantage point, a good view is available of One Road Lake and its 2,481 acre watershed. At an elevation of 1959 feet above sea level, One Road Lake is one of the highest lakes in the Waubay Lake Watershed.

Turn around at driveway and return west.

10.6 #17 Cropland

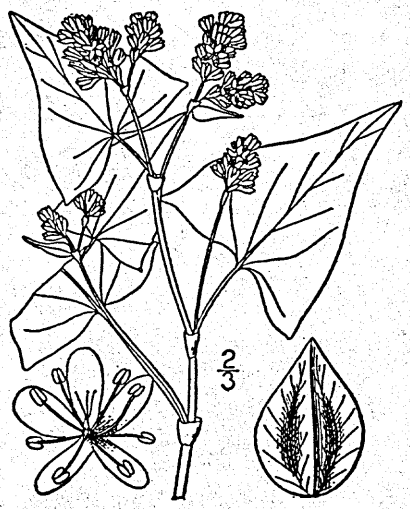
Currently only about forty percent of Pickerel Lake's watershed is utilized as cropland. Small grains which include oats, winter and spring wheat, make up the majority of the crops planted in the watershed. Other crops grown include corn, soybeans, and sunflowers. Two interesting crops grown in Pickerel's watershed are Canola - a variety of Rapeseed, and Buckwheat.

The seeds of the Canola plant (look for fields of yellow flowering plants) are used for producing a high--quality cooking oil that is very low in saturated fat. The Canola meal that remains after the oil is extracted is used as a protein supplement for livestock. (Continued on next page)

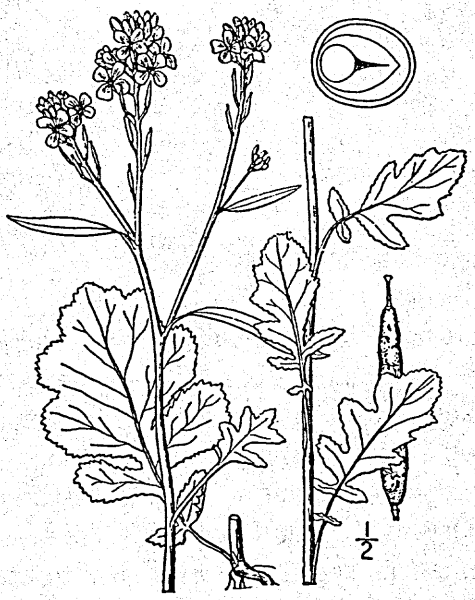
#17.Cropland cont.

The Rapeseeds are cool-season annuals belonging to the mustard family that are very sensitive to hot - dry weather. Due to this fact, spring varieties of Canola - which mature in early June, are planted mainly in northeastern SD.

Buckwheat, because of its unique flavor, is not readily accepted as a food in the American diet outside of its use for Buckwheat pancakes. However, new markets for this grain have been found in Japan where Buckwheat is used for noodles. An increased interest in high fiber - high protein foods in this country may boost growers interest in producing this crop. Look for fields of white flowered plants standing 2-3 feet tall. Buckwheat is very sensitive to frost, thus it is planted later in the season than most crops. Can you identify the crop growing in the field to the left? **Continue west.**



Buckwheat



Canola

11.5 #18. At stop sign, turn right and proceed north on gravel road

12.8 #19. Abandoned Farm

In 1892, the Sisseton-Wahpeton Indian Reservation was opened for settlement. Families or adults over 21 were allowed to homestead 160 acres of land for $2.50. To gain ownership, the homesteader had to live on the land for five years and pay an additional $2.50 an acre to obtain title to the land.

Walking across the prairie one occasionally stumbles across a depression outlined with fieldstone, the only evidence that remains of the many homesteads once claimed on practically every section of land in Pickerel Lake's watershed. (Continued on next page)

#19. Abandoned Farm cont.

Currently, only 13 active farms (with a residence and livestock) remain in the watershed. (See survey results to the right)

Continue to the north.

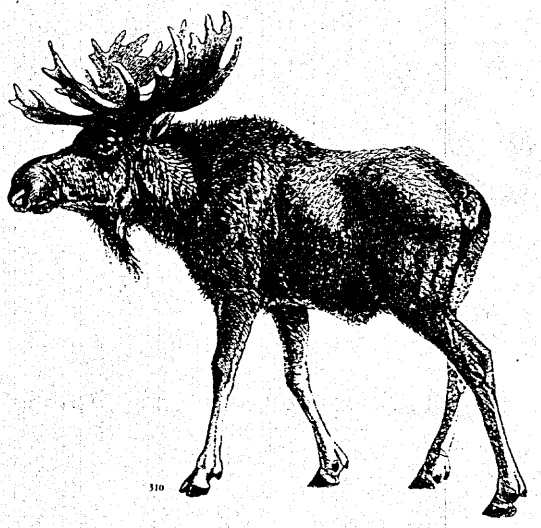
13.5 #20. At stop sign, turn left and proceed west on Day Co. Hwy. #4.

Drive-By Survey of Farmsteads in Pickerel Lake's Watershed

Type	# of Farms
With Livestock & Residence	13
Livestock Only	4
Residence Only	8
Abandoned (no livestock or residence)	23
Total farms observed	**48**

13.9 #21. Drywood Lake Watershed

On the left-hand side of the road is Pickerel Lake's Watershed. On the right-hand side of the road is the Drywood Lake watershed. The Drywood Lakes are composed of North Drywood - 914 acres, Middle Drywood - 2133 acres, and South Drywood - 192 acres. The lake seen to the northeast is South Drywood. The Drywood Lake system does not support a permanent sports fisheries due to frequent winterkills however, these lakes provide habitat for a number of wildlife. Drywood Lakes are a major nesting and staging area for waterfowl. During fall migration, hundreds of Tundra Swans feed and rest on Middle Drywood. An island on North Drywood supports one of five American White Pelican nesting rookeries remaining in the state of South Dakota. Over one-thousand pelicans nest and raise their young on this island each year. Several years ago local landowners reported a cow and calf Moose were living along the shores of Middle Drywood. If true, this would represent the first wild breeding of this species in the state of South Dakota. Moose usually are found in the boreal forests of Canada and extreme northern Minnesota however, adults have been know to wander as far south as Iowa and Missouri and are occasionally seen in northeastern South Dakota.



Continue west on Day Co. Hwy. #4.

15.2 #22. Wist

The buildings straight ahead are all that remain of Wist. In 1883, M.L. Satern built a small country store (the large beige building) on this site. The next year Martin Wist, Sr. established a Post Office in his home just east of the store, which was later moved to the Wist Store. The store was later bought by P.C. Johnson who developed a fur trading business with local Native Americans. As the area was homesteaded by farmers - almost all having milk cows, the need for a local creamery became evident. In 1902, Johnson opened a creamery east of the store. The two story building provided living quarters on the second floor for hired hands, and provided shelter for travelers slowed by stormy weather or in need of a short overnight rest. Farmers from miles around brought milk to Wist to be separated into milk and cream. The milk was hauled back to their farms, the cream remained to be made into butter that was shipped from Waubay to places as far away as New York and Boston.

In later years a blacksmith shop was added southeast of the store, and other trades were practiced at the site including shoe and harness repair, and a woodworking shop to repair wagons. An ice house was constructed adjacent to the creamery. Huge blocks of ice cut from Pickerel Lake were hauled by sled and stored in sawdust providing ice for the modern day refrigerators predecessor, the ice box. A school was built 1/2 mile south of the store, and in 1904 the Zoar Lutheran Church was built. The church, no longer in use, still stands along Day County highway #4 just east of this stop. The creamery and post office closed in 1914 when traffic was diverted to nearby towns built adjacent to the Soo Line railroad tracks. The country store remained open until 1963. The building that housed the store, seen northeast of the house, is the only original structure remaining.

Continue south on Day Co. Hwy #4.

16.2 #23. Dairy Farm

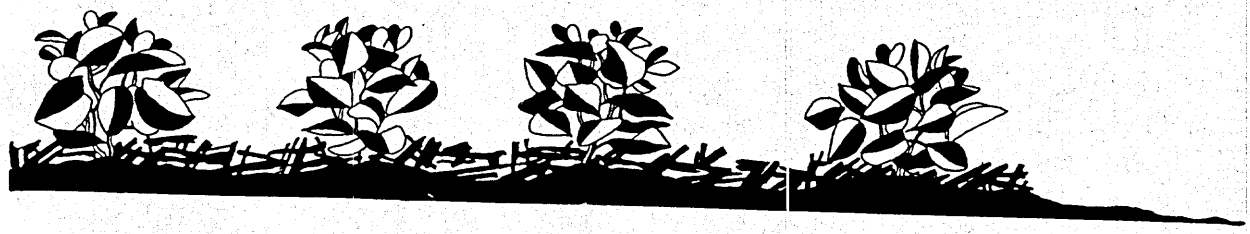
The farm to the south is one of the largest dairy operations in Pickerel Lake's watershed. This is the site of the third Animal Waste Management System constructed during the Pickerel Lake Protection Project. In the past, the creek running adjacent to this feedlot carried animal waste directly to Pickerel Lake. To date, five AWMSs have been constructed in Pickerel's watershed, containing the largest sources of animal waste to the lake.

Continue west on Day Co. Hwy #4.

17.7 #24. Dry Creek

This is Dry Creek, which drains the northern portion of Pickerel Lake's watershed. Notice the wide valley running to the north. This is a spillway formed over 12,000 years ago by the melting Wisconsin Glacier. Gravel and sand carried by the glacial meltwater called outwash, buried a large ice block which later melted to form Pickerel Lake (see page 2). Later sediment carried into the lake by Dry Creek, has given us a record of prior climates and landscapes since the last glacier retreated. Paleolimnologists studying sediment cores from Pickerel lake have noted four distinct climatic and vegetative periods as follows; before 10,670 years ago the climate was cool and moist, the surrounding land was covered by a spruce forest; 10,670 - 8,000 years ago deciduous trees became dominant interspersed with prairie like openings of grasses and ferns; 8,000 - 4,000 years ago the climate became warm and dry with recurring drought, lake levels fluctuated; 4,000 years to present, tallgrass prairie with deciduous trees persisting along lake shores, river and creek bottoms. In a shorter period, 100 years, man has converted almost all of the tallgrass prairie to cropland.

Continue west on Day Co. Hwy #4.



18.2 #25. No-Till Field

To the north is another field where no-till has been practiced. Several landowners and operators in Pickerel Lake's watershed were given incentive payments to implement Best Management Practices such as conservation tillage. Incentive payments are direct cash payments made to landowners and operators who implement and follow a specific conservation plan designed for their land.

Why incentive payments? In most lake restoration and protection projects the BMPs and pollution controls installed (such as Animal Waste Management Systems) will provide a greater benefit to society (lake property owners, recreational users, fisherman etc.) than to the individual landowner or operator. Thus, some type of incentive must be provided to ensure that BMPs are implemented. There are two types of incentives, external and internal.

External incentives offer some type of reward to the landowner or operator - in most cases a cash incentive payment for implementing BMPs or cost-sharing the construction of pollution controls. The incentive payment or cost-share percentage rate must be high enough to compensate the landowner or operator for perceived and real risks associated with implementing BMPs and pollution controls. External incentives however are short term and once the incentive is removed many landowners and operators will revert to their old ways. (Continued on next page)

#25 No-Till Field cont.

Internal incentives require that the landowner/operator is self-motivated and will implement BMPs without external incentives. Internal incentives are most likely to provide the long term behavioral changes needed to reduce nonpoint pollution however, prompting individuals to become self-motivited and implement BMPs and pollution controls because "It's the right thing to do" is a difficult task. Extensive information and education programs and technical assistance from conservation agencies are required to provide the landowner/operator with the "what to do" and "how to do it", which builds the confidence needed to become self-motivated. One example is the Farm-A-Syst (Farm Assessment System) program which gives the landowner the information and technical assistance needed to determine on their own, the effects their farmstead has on ground water. The Day Conservation District along with other state and federal agencies, will continue to develop programs which promote internal incentives. **Leave Day Co. Hwy #4, and proceed west on gravel road**

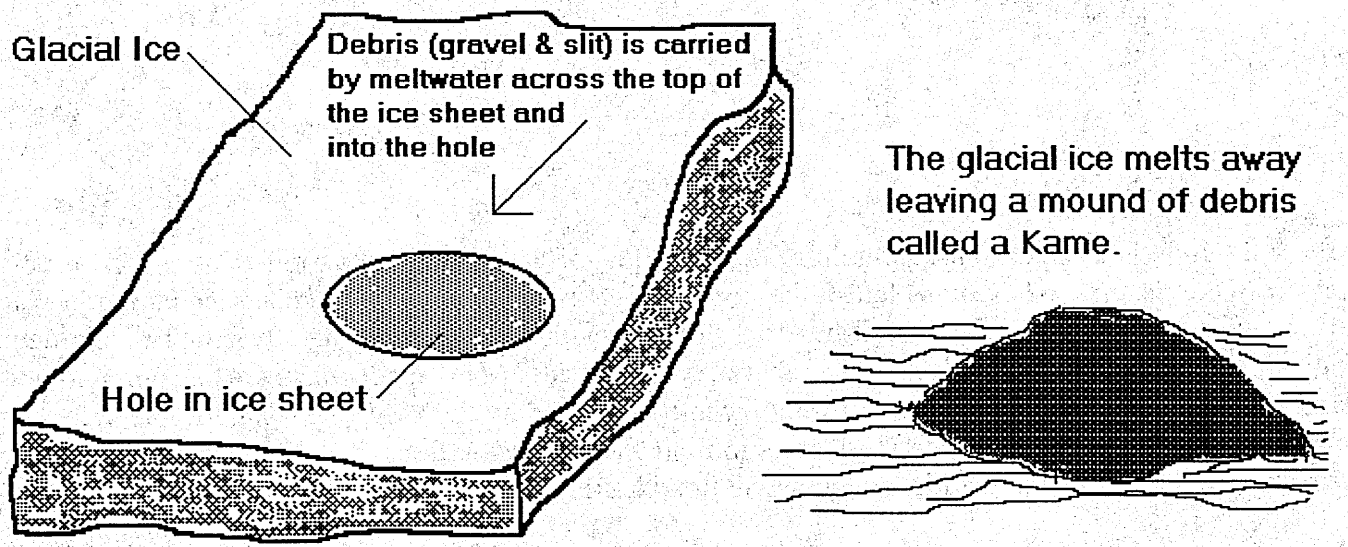
18.4 #26. Turn right and proceed north on gravel road.

18.9 #27. Glacial Kame

To the left is a glacial Kame. A Kame is a mound of material, usually gravel and sand but frequently silt and clay, that formed from debris flowing across the top of a stagnant melting glacier and into a hole formed in the ice sheet. As the ice sheet melted, the remaining debris formed a mound called a Kame. Their are many such Kames found in Day County.

Continue north on gravel road

Formation of Glacial Kames

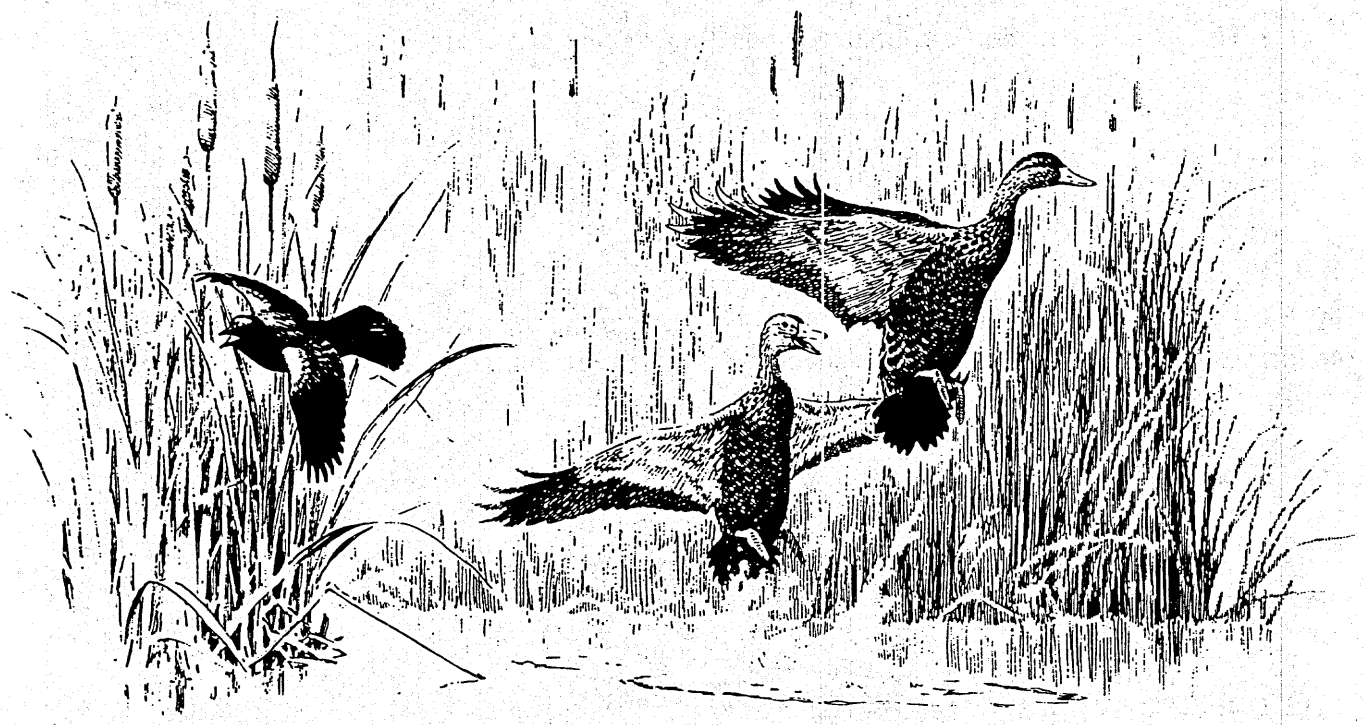


19.3 #28. Turn right and proceed east on gravel road.

19.6 #29. Glacial Spillway/Dry Creek

To the north and south of this stop, is a continuation of the glacial spillway first noted at stop #24. Note the erosion occurring on the hillside to the northeast. Could this soil reach Pickerel Lake? **Continue east on gravel road.**

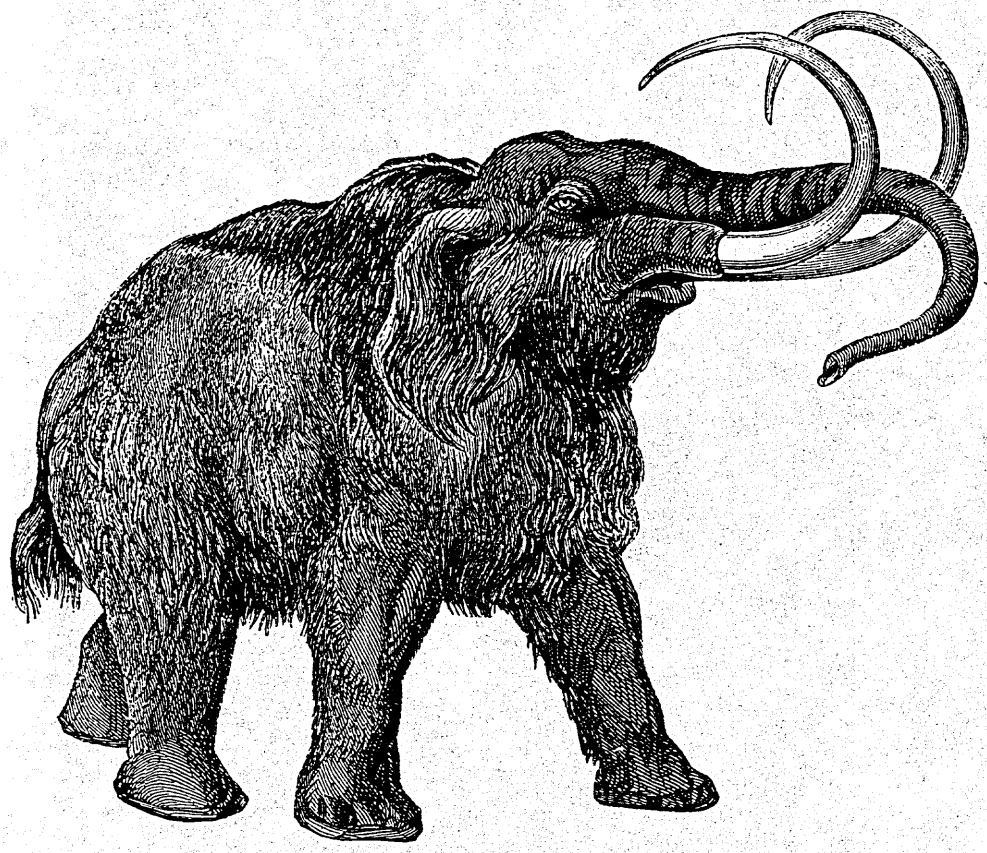
20.2 #30. Turn left and proceed north on gravel road.



20.3 # 31. Prairie Potholes

To the right is a small prairie pothole, another product of the last glacial period. These potholes occupy kettleholes, depressions left in the ground after isolated blocks of stagnant ice buried in glacial till or outwash melted, usually several hundred years after the glaciers retreat. Over half of the nations original wetlands have been drained, filled, altered or destroyed. Many landowners are beginning to understand the value of wetlands. Their are several incentives offered by the US Fish & Wildlife Service, Ducks Unlimited, and other state and federal agencies to fund wetland restoration. To date, 61 wetlands (over 100 acres) have been restored in the Pickerel and One Road Lake watersheds. **Continue to the north.**

20.6 #32. The Past.



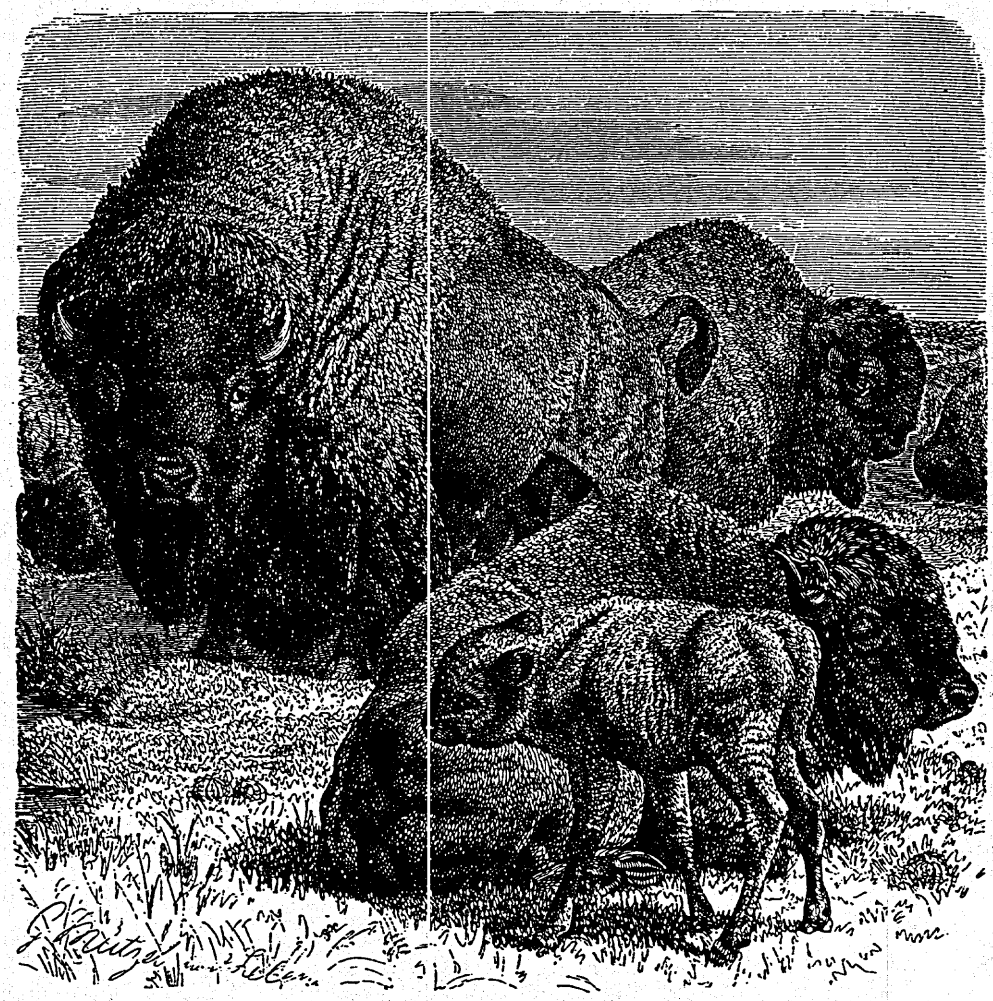
Woolly Mammoth

The people, cultures, fauna and flora of northeast South Dakota have changed greatly since the last glacier, 12,000 years ago. The earliest evidence of human inhabitants in this area dates to approximately 8500 years ago. This date is based on the discovery in 1933 of a single paleoindian skull and projectile points found near Browns Valley, Minnesota. Paleoindians were nomadic big game hunters that hunted the large - now extinct mammals once found in the Northern Great Plains such as the Woolly Mammoth, Shasta Ground Sloth, and Camel. These first human inhabitants moved into the area as plants and animals returned to the landscape as the glacier retreated.

The first inhabitants of this area to leave abundant archaeological evidence of their presence over a thousand years ago, was the Woodland Culture. These people were the first in this area to use ceramics, the bow and arrow, and practice rudimentary horticulture; planting corn, squash, and beans to supplement their primary source of food, the Bison. Woodland Indians are known to have inhabited sites at the Waubay National Wildlife Refuge, and along the shores of Big Stone Lake. Woodland Indians buried their dead in mounds, and are occasionally referred to as "Mound Builders." These burial mounds occur along the shores of Waubay, Big Stone, and Traverse Lakes.

Found on the hilltops to the west are tipi rings, circles of stones used to anchor the hides which covered tipis, shelters used by the early Sioux Indians. The first Sioux reached northeastern South Dakota over five hundred years ago, migrating west from Minnesota. The Dakota Sioux have kept their history alive through stories and winter counts, and are an important part of northeastern South Dakota's cultural heritage. (Continued on next page)

#32. The Past cont.



These cultures depended on the land and its diverse resources for food, medicine, tools, clothing, and shelter. The paleoindians no doubt witnessed the end of the reign of large mammals such as the Woolly Mammoth. Between 12,000 and 9,000 years ago, approximately 40 species of large mammals became extinct. These included herbivores such as the Giant Beaver, Shasta Ground Sloth, and Shrub--ox, and impressive carnivores like the Dire Wolf, American Lion, Giant Short-faced Bear, and Sabertooth Tiger. There are several theories as to what caused their extinction. Many believe these animals were hunted to extinction by paleoindians, others believe the extreme changes in climate after the retreat of the Wisconsin Glacier caused their demise. The smaller surviving herbivores and carnivores, namely black bear, buffalo, elk, and deer, would became major sources of food for these native cultures. Unfortunately many of these species, all once common to this area, would be extirpated as a result of overhunting and loss of native habitat as white settlers migrated west and converted the tallgrass prairie to farmland.

Native American cultures were the first to practice resource conservation. They understood the intricate relationships between plants, animals, and the land. Their very survival depended on this understanding! Many landowners and operators also understand the necessity to care for the land, water, and air. If lake property owners, and watershed landowners & operators continue to improve land management through implementation of Best Management Practices, our lakes will not be added to the list of plants, animals, and entire ecosystems that have become extirpated or extinct.

Continue to the north.

22.3 **#33. Buffalo Lake**

You are now on the northern border of Pickerel Lake's watershed. On the other side of the hills to the north is Buffalo Lake's watershed. We will now leave Pickerel Lake's watershed for a few miles.

Turn left and proceed west on gravel road.

24.3. **#34. At stop sign, turn left and proceed south, 4 miles on hard surface road to Day Co. Hwy #4.**

28.3 **#35. At stop sign, turn left and proceed east on Day Co. Hwy #4.**

28.7 **#36. Hilltop.**

You are now re-entering Pickerel Lake's watershed. Does the condition of Pickerel's watershed reflect how you care for our natural resources. If not, what can you do to improve the environment?

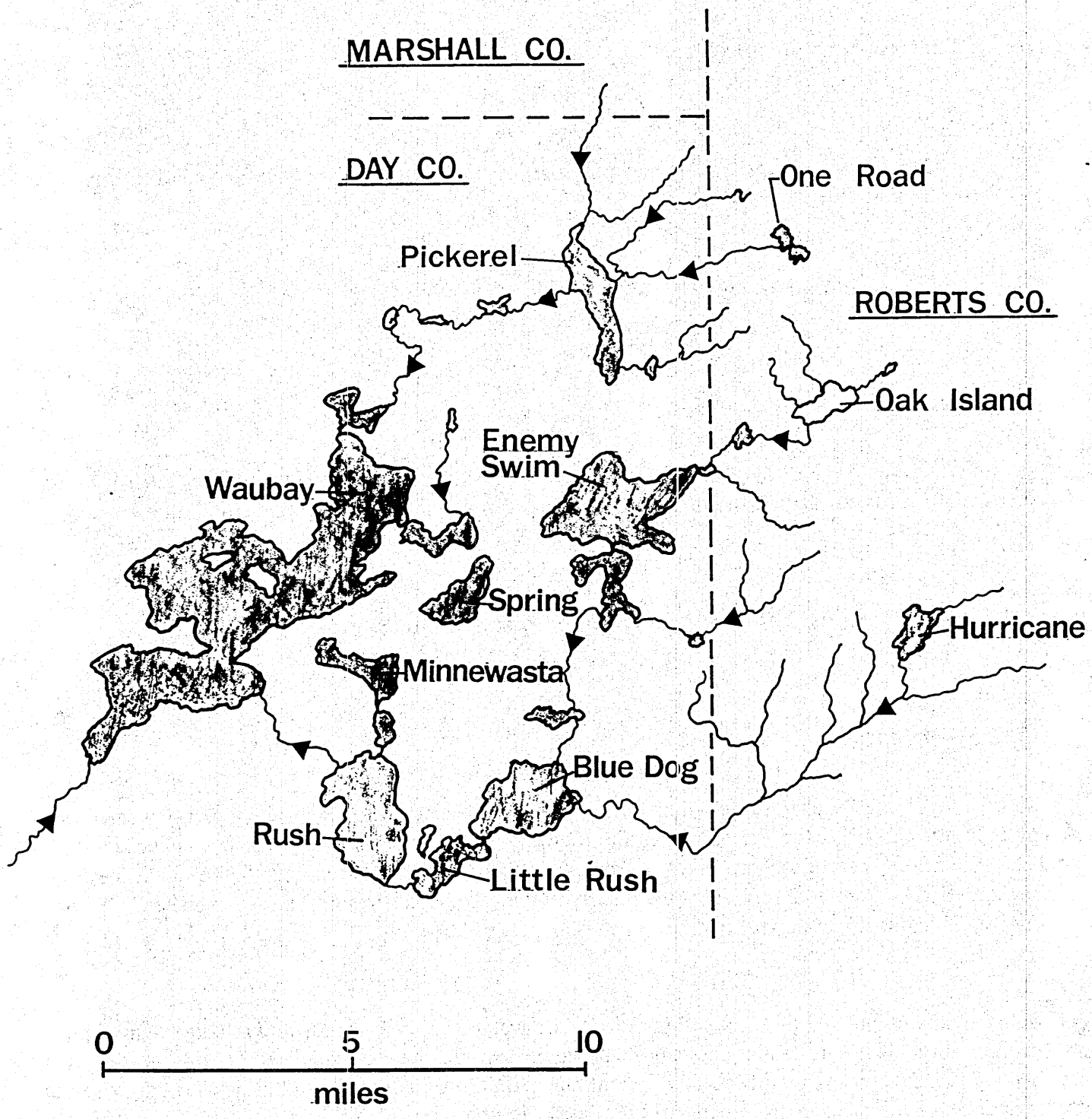
29.0 **#37. Turn right at intersection, and proceed south on Day Co. Hwy #1.**

29.9 **#38. Pickerel Lake Outlet.**

You are now in the Waubay Lake Watershed. Pickerel Lake and One Road Lake are only a small part of a larger watershed that encompasses the majority of eastern Day County's land mass (see map page 17). Overflow from these two lakes is carried by this creek, which enters Waubay Lake near the southeast corner of Grenville, SD. What is the quality of water leaving Pickerel Lake's watershed? How do your actions and habits affect downstream users?

You have now completed this tour of Pickerel Lake's watershed. We hope you will take the tour again in the future. Note in the margins, any negative or positive changes you see occurring in Pickerel's watershed. The Day Conservation District will continue to find programs and fund projects to improve our natural resources, but it is a shared responsibility. Please do your part!

Waubay Lake Watershed



Arrows denote direction of surface water flow.

Want to know more?

Below is a list of books and reports with more information on Pickerel Lake and the areas natural resources!

Best Management Practices

McComas, Steve. 1993. LakeSmarts, The First Lake Maintenance Handbook. Terrene Institute. Washington, D.C.

North American Lake Management Society. 1990. The Lake and Reservoir Restoration Guidance Manual. 2nd Ed. US Environmental Protection Agency. Washington, D.C.

Cultural Heritage/Historical

Bradley, L.E. and William Ranney. 1985. Archaeological Survey and Testing of a Proposed Construction Site at Waubay Wildlife Refuge. DIS Incorporated. Vermillion, SD.

Hassrick, Royal B. 1989. The Sioux. University of Oklahoma Press. Norman, OK.

Johnson, Elden. 1969. The Prehistoric Peoples of Minnesota. Minnesota Historical Society. St. Paul.

Johnson, Norma. Wagon Wheels: A collection of stories about people, places and events in Northeastern SD. (several volumes) Courier Publishing Co. Sisseton, SD.

Morris, H.S. Historical Stories, Legends and Traditions. Roberts County and Northeastern SD. Sisseton Courier. Sisseton, SD.

Zimmerman, Larry J. 1985. Peoples of Prehistoric South Dakota. University of Nebraska Press. Lincoln, NE.

Geology and Hydrology

Leap, Darrell. 1988. Geology and Hydrology of Day County, South Dakota. Dept. of Environment and Natural Resources. Division of Geological Survey. Vermillion, SD.

Rothrock, E. P. 1935. Geology and Water Resources of Day County, South Dakota. SD State Geological Survey. University of SD. Vermillion, SD.

Limnology

Monson, Bruce. 1992. A primer on Limnology. 2nd Ed. Water Resources Research Center, University of Minnesota. St. Paul, MN.

Limnology cont.

State Lake's Committee. 1977. A Plan for the Classification, Preservation, Restoration of Lakes in Northeastern SD. State of South Dakota, Pierre.

Stewart, Bill and Eugene Stueven. 1994. 1993 South Dakota Lakes Assessment Final Report. SD Dept. Environment and Natural Resources, Division of Water Resources Management. Pierre, SD.

Natural History

Jones, J. Knox, Jr., David M. Armstrong, Robert S. Hoffmann, and Clyde Jones. 1983. Mammals of the Northern Great Plains. University of Nebraska Press. Lincoln, NE.

Madson, John. 1982. Where the Sky Began, Land of the Tallgrass Prairie. Houghton Mifflin Co. Boston.

Oldfield, B. and J.J. Moriarty. 1994. Amphibians and Reptiles Native to Minnesota. Unversity of Minnesota Press. Minneapolis, MN.

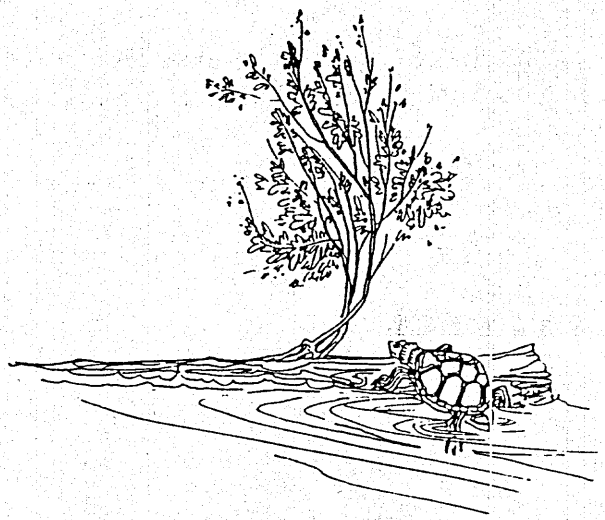
Phillips, Gary L., William D. Schmid, and James C. Underhill. 1982. Fishes of the Minnesota Region. University of Minnesota Press. Minneapolis, MN.

Pielou, E.C. 1991. After the Ice Age, the Return of Life to Glaciated North America. University of Chicago Press. Chicago, Ill.

SD Ornithologists Union. 1991. The Birds of South Dakota. Northern State University Press. Aberdeen, SD.

Tomelleri, Joseph R. and Mark E. Eberle. Fishes of the Central United States. University Press of Kansas. Lawrence, KS.

Vance, F.R., J.R. Jowsey, and J.S. McLean. 1984. Wildflowers of the Northern Great Plains. University of Minnesota Press. Minneapolis, MN.



Appendix N - A Summary Report Of Water Quality In Pickerel Lake - Study Years 1991-1993

A Summary Report of Water Quality in Pickerel Lake

Day County, South Dakota for Study Years 1991-1993

by
David German
Water Resources Institute
South Dakota State University

January 1994

Introduction

Water quality monitoring began in 1991 at Pickerel Lake as part of the Non-Point Source Task Force's Lake protection strategy. A surface composite and a bottom composite sample were collected (formed from 3 locations on the lake) in mid June, July and August in 1991, 1992 and 1993. This summary is based on the results of that sampling effort.

Pickerel Lake has been assigned the following beneficial uses according to the South Dakota Board of Water and Natural Resources. Reference to these standards will be made where applicable.

* Warm water permanent fish life propagation
* Immersion recreation
* Limited contact recreation
* Wildlife propagation and stock watering

Trophic State

Several parameters are commonly used to describe how productive or enriched a lake is when compared to other lakes. Lakes range from nutrient poor (oligotrophic) to moderately rich (mesotrophic) to highly enriched (eutrophic) to excessively enriched (hypereutrophic). As lakes age or become more eutrophic they tend to support more frequent algal blooms and weed growth which limits recreational use and enjoyment of the lake resource. While enriched lakes can support more fish production they can also become unstable. Hypereutrophic lakes for example lose oxygen at certain times of the year causing fish kills. Frequently lakes become dominated by bullheads and other hardy species when oxygen concentrations fall below levels that support walleye and other game fish that require more oxygen.

Dissolved Oxygen

Oxygen and temperature profiles for site 2 (the deepest) in 1991, 1992 and 1993 are presented in Figure 1. To maintain a permanent warm water fishery a standard of not less than 5.0 mg/l has been established.

Oxygen concentrations below 5.0 mg/l were not observed in waters near the surface of Pickerel Lake during any of the sampling dates. Thermal stratification and depression of oxygen concentrations at depth was observed on several dates. The most pronounced stratification was observed in August 1991 and 1993. Water below the 15 ft. depth in August 1991 contained less than 5.0 mg/l oxygen. In 1993 less than 5.0 mg/l oxygen was observed below 33 feet. Near the bottom on both dates, oxygen concentrations were near zero.

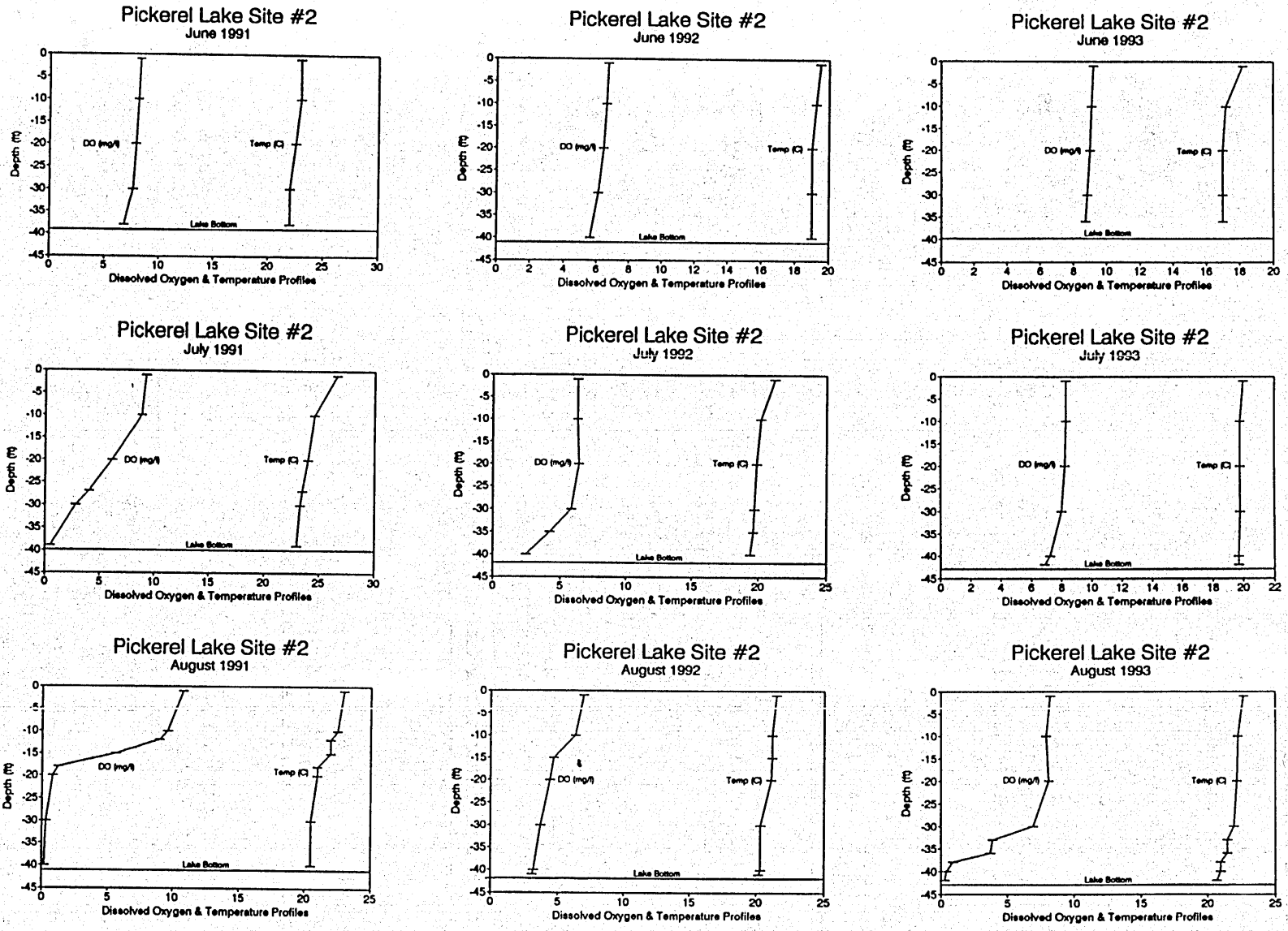


Figure 1. Dissolved oxygen and temperature profiles for site 2 at Pickerel Lake.

pH

Immersion recreation has the most restrictive criteria for pH (between 6.5 and 8.3 units). Observed pH in Pickerel Lake slightly exceeded the criteria in July and August 1991. High pH on these dates is probably due to high algal productivity. As carbon dioxide is consumed by the algae during photosynthesis, pH rises. The greatest observed accumulated algal biomass as indicated by chlorophyll occurred on 8/18/91. An increase in biomass from July to August 1991 is consistent with high productivity.

Transparency

Transparency as measured by secchi disk are presented in figure 2. Overall transparency was better in 1992 and 1993 than in 1991. The highest transparency was observed in June 1993. By August 1993 transparency had been reduced to the range seen in 1991. Transparencies in this range are common in mesotrophic to eutrophic lakes.

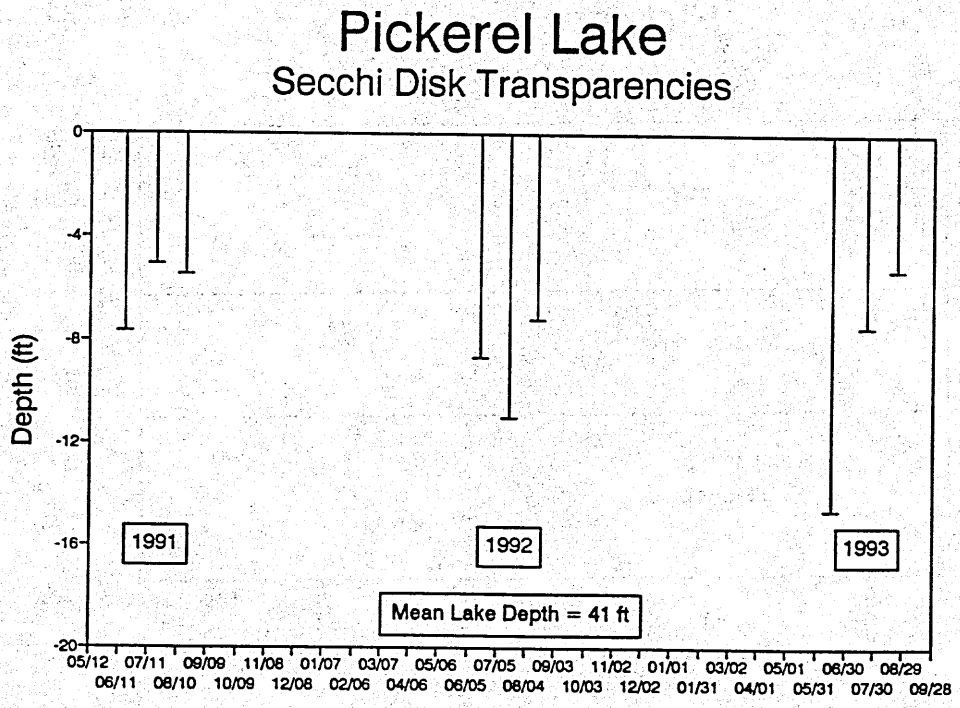


Figure 2. Secchi disc transparency for Pickerel lake in 1991, 1992 and 1993.

Nitrogen

Nitrogen is present in lakes in several forms, both inorganic and organic. The inorganic forms (ammonia, nitrite and nitrate) are important indicators of nutrients available for plant growth. Organic nitrogen is an indicator of how eutrophic lakes are. Organic nitrogen represents nitrogen incorporated into living (or once living) material and is an indirect measure of how much algae (and other plants) the lake may be able to support.

Organic Nitrogen

Organic nitrogen concentrations observed in Pickerel Lake (Figure 3) are typical of those found in mesotrophic to eutrophic lakes (Wetzel, 1983). Little difference was observed between surface and bottom samples. Concentrations tended to increase slightly from early to late summer in all three years. Higher concentrations of organic nitrogen were exhibited in 1991 than either 1992 or 1993.

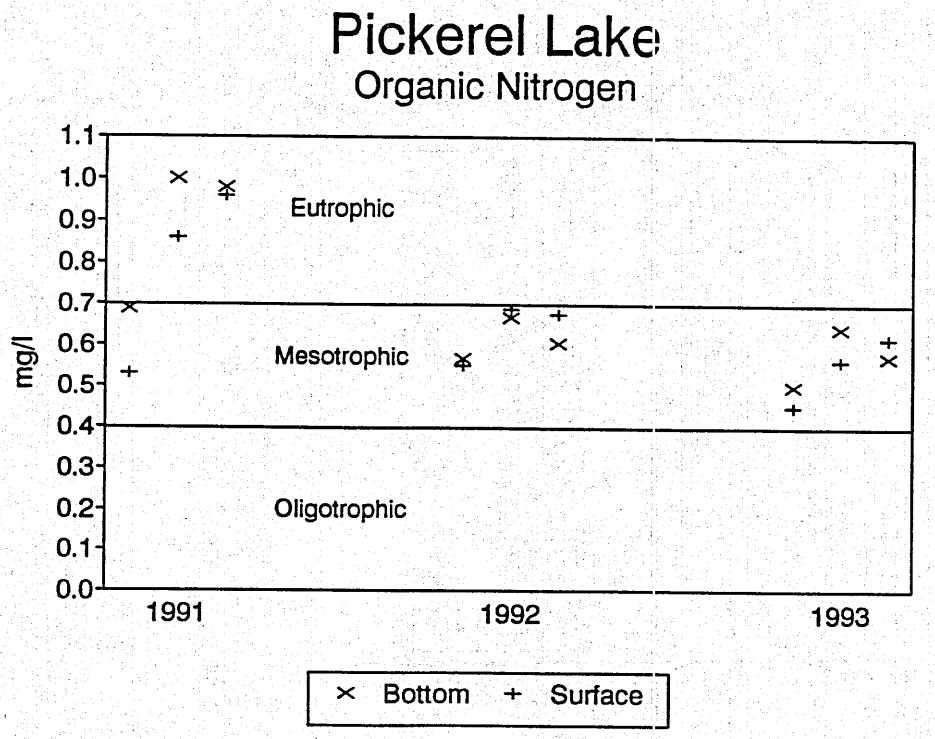


Figure 3. Organic nitrogen concentrations for Pickerel lake in 1991, 1992 and 1993.

Ammonia as Nitrogen

Ammonia is generated as an end product of bacterial decomposition. It is a major excretory product of aquatic animals, but this is a minor source compared to bacterial decomposition. Ammonia is directly available for plant growth and is the most easily used form of nitrogen. It can support the rapid development of algal blooms if other nutrients are present.

In the upper areas of lakes where light is available, ammonia is rapidly assimilated by algae and is usually low in lakes with low algal productivity. Ammonia concentrations in Pickerel were quite low except for some bottom composites (Figure 4). Ammonia concentrations were usually higher in the bottom composite than in the surface composite in all three years of study. Ammonia is released from sediments under anoxic conditions and can accumulate in the deeper areas of the lake where algae cannot make use of it. This probably accounts for the higher concentrations of ammonia in bottom samples especially during periods of extreme oxygen stratification.

Ammonia concentrations in the surface composite were highest in the June sample and lowest in the August sample for all three years. This indicates that there is keen competition for nitrogen during the latter part of the summer at the surface and probably to the depth of light penetration. Ammonia accumulating in the deeper waters during the summer becomes available at the surface after colder weather and wind causes the lake to become fully mixed (turnover). This probably contributes to the Fall algal blooms that have been reported by local residents. A bloom of Microcystis was observed in October of 1993 during shoreline survey work.

The state standard for ammonia (0.04 mg/l) is based on un-ionized ammonia, which is toxic to fish. Un-ionized ammonia is calculated based on total ammonia concentrations, pH and temperature. This standard was not exceeded on any of the sampling dates. The highest observed surface ammonia occurred on 6/18/92 at 0.152 mg/l. This concentration did not exceed state standards at the temperature (19° C) and pH (8.28) observed that day. Warmer water or higher pH would cause un-ionized ammonia to exceed the standard.

Nitrate plus Nitrite

Nitrate and Nitrite are also directly available for algal growth. Low concentrations were observed on most sampling dates in both surface and bottom waters (Figure 5). The highest concentrations were observed in July of 1992 at 0.045 mg/l. There appears to be strong competition for nitrate and nitrite in Pickerel Lake most of the time.

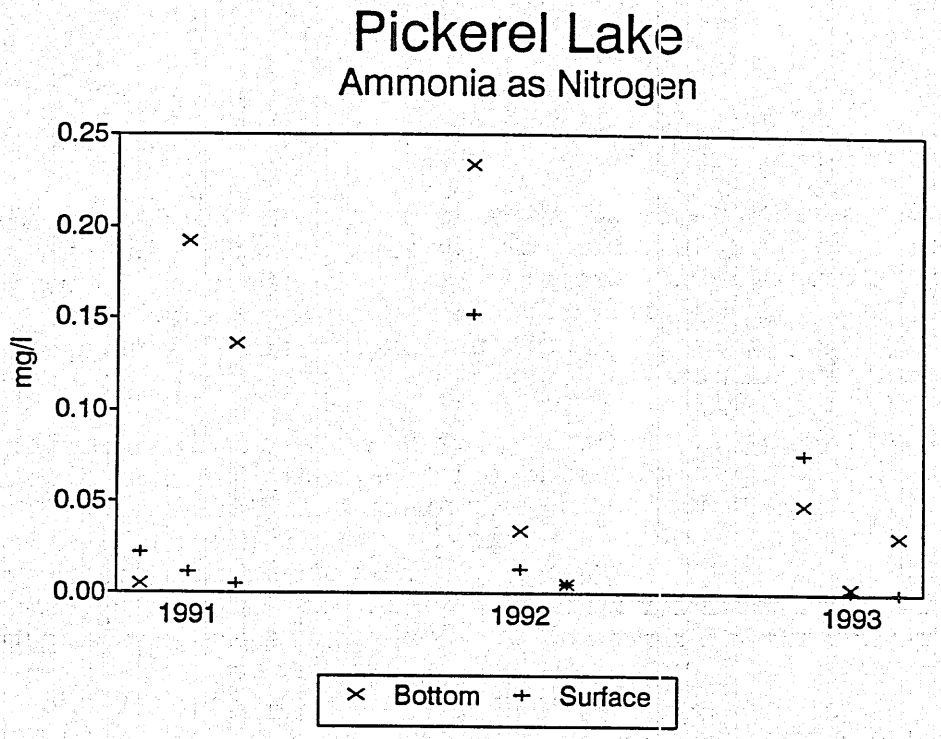


Figure 4. Ammonia as nitrogen concentrations for Pickerel lake in 1991, 1992 and 1993.

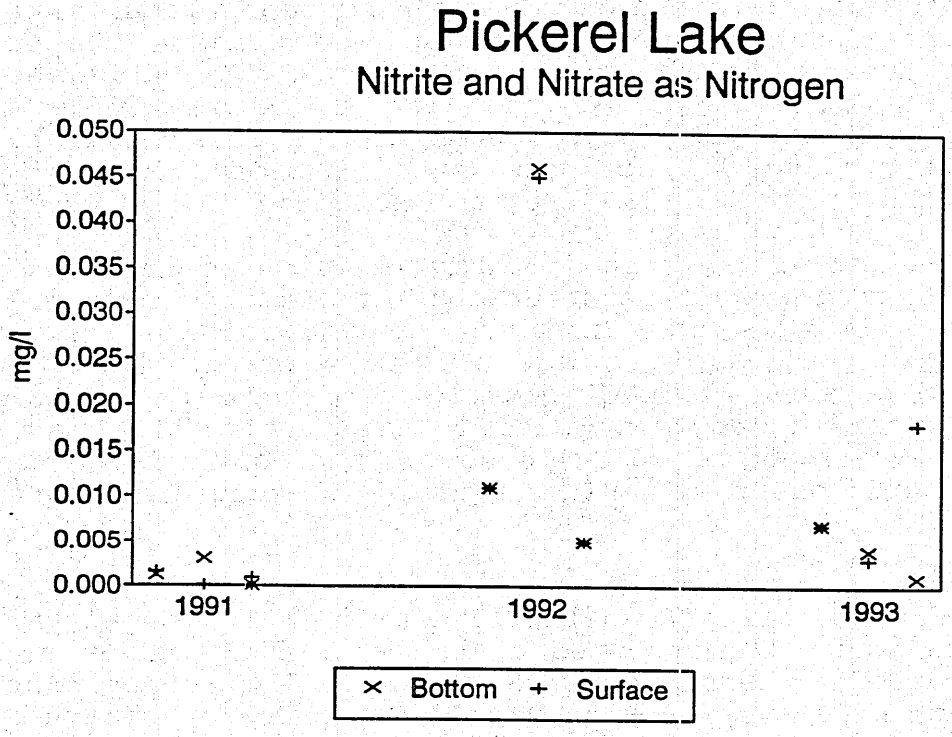


Figure 5. Nitrate and Nitrite as nitrogen concentrations for Pickerel lake in 1991, 1992 and 1993.

Total Phosphorus

Trophic state is commonly described by concentrations of phosphorus. Using phosphorus as an index, a concentration of 0.03 to 0.1 mg/l would be classified as eutrophic (Wetzel, 1983). Pickerel Lake generally ranges from mesotrophic to eutrophic (Figure 6).

Total phosphorus concentrations for Pickerel Lake in 1991, 1992 and 1993 are presented in Figure 6. In July and August 1991 and August 1993 when the most pronounced oxygen stratification was observed (Figure 1), the largest differences between surface and bottom concentrations of phosphorus was also present (Figure 6). Phosphorus is released from sediments and becomes dissolved in the water under anoxic conditions. This probably accounts for difference between surface and bottom concentrations.

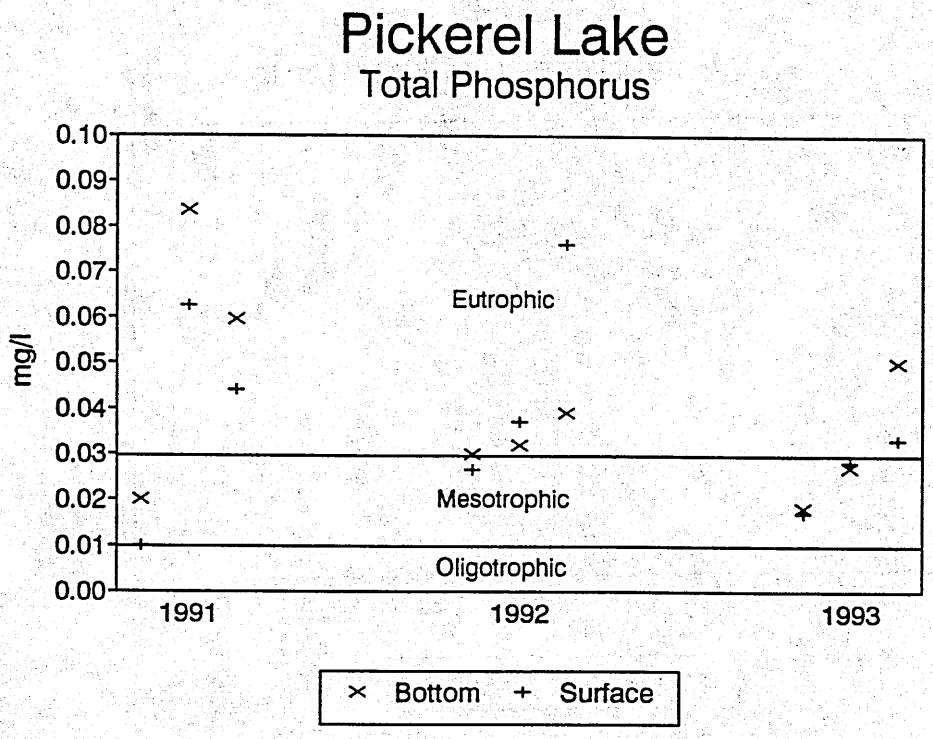


Figure 6. Total phosphorus concentrations for Pickerel lake in 1991, 1992 and 1993.

Total Dissolved Phosphorus

Dissolved phosphorus is frequently used as an indicator of the amount of phosphorus available for use by algae and other plants. Dissolved phosphorus is rapidly consumed by algae and seldom reaches high concentrations unless other factors are limiting algal growth. In can accumulate in the deeper waters of stratified lakes where it is unavailable to the algae.

High concentrations of dissolved phosphorus especially in bottom waters was observed in 1991 (Figure 7). There was less dissolved phosphorus present in 1992 and in June and July 1993. In August 1993 higher dissolved phosphorus concentrations were again observed in bottom waters. Dissolved phosphorus is an important plant nutrient that often limits growth if it is not present. The dissolved phosphorus accumulating in Pickerel Lake's bottom waters in the summer would become available at the surface after Fall turnover and would, along with the nitrogen available, encourage fall algal blooms.

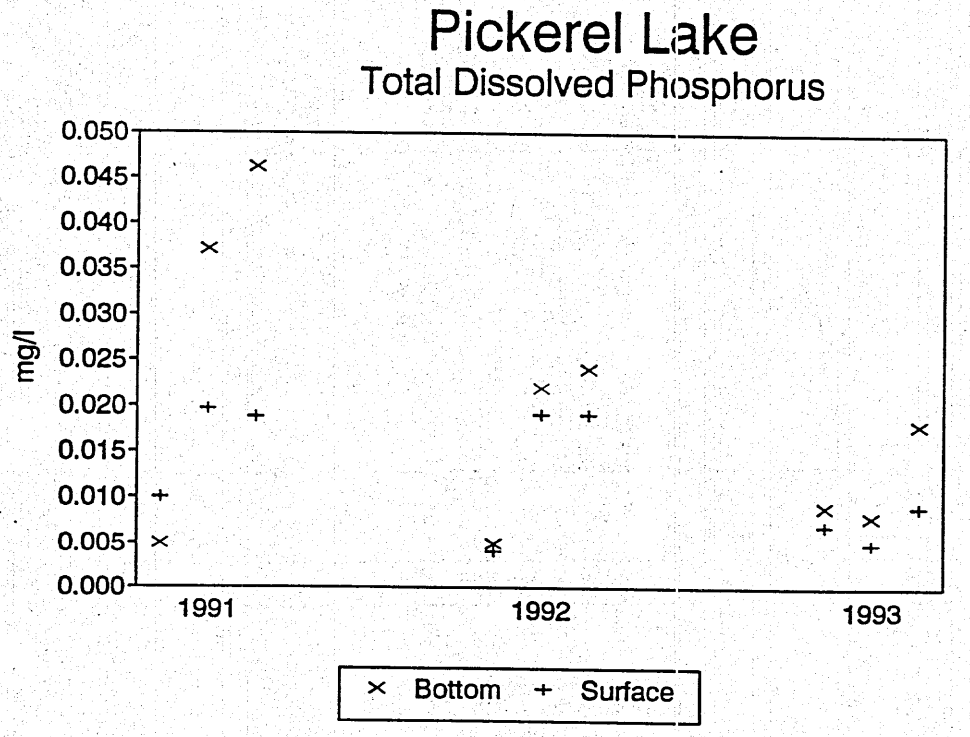


Figure 7. Total dissolved phosphorus concentrations for Pickerel lake in 1991, 1992 and 1993.

Chlorophyll

Measuring chlorophyll levels in a lake provides a means to assess algal abundance, since almost all chlorophyll that occurs in open water is due to phytoplankton growing within the lake. It does have limitations, however, since chlorophyll content of phytoplankton cells can vary seasonally (Nicholls and Dillion 1978). It is best used as an indicator rather than a direct measure of algal biomass.

Chlorophyll a concentrations observed in Pickerel Lake in 1991-1993 are presented in Figure 8. Highest concentrations of chlorophyll occurred in August of all three years of study. Lowest concentrations were observed in June. Concentrations of chlorophyll a observed in Pickerel Lake are typical of mesotrophic to eutrophic lakes (Wetzel 1983).

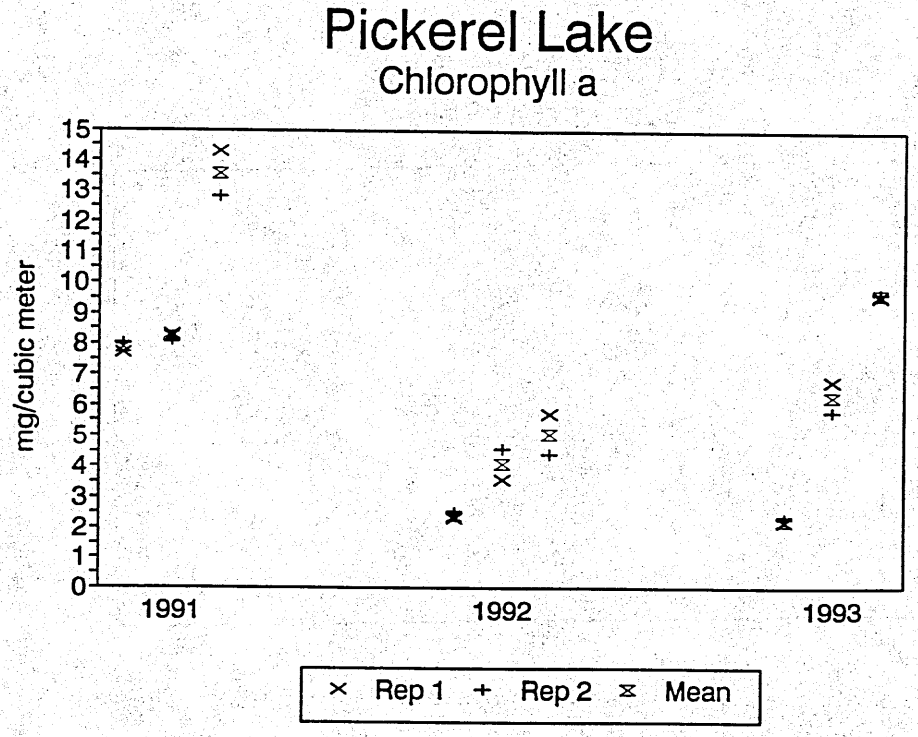


Figure 8. Chlorophyll a concentrations for Pickerel lake in 1991, 1992 and 1993.

Suspended Solids

Low suspended solids concentrations are desirable in lakes for aesthetic reasons and for maintenance of a heathy fishery. Fish populations can be affected by high suspended solids in several ways. Fish can be killed directly or their growth, resistance to disease and reproduction success may be reduced. Migrations can also be affected (EPA, 1976). High suspended solids concentrations result in reduced aesthetic value of a lake which can limit recreational use.

The state standard for maintaining a warm water permanent fishery is 90 mg/l. This standard was not exceeded on any of the sampling dates reported (Figure 9). Suspended solids concentrations were below 12 mg/l on all of the sampling dates. Recreational use of the lake and ability to support a healthy fishery are apparently not limited by high suspended solid at this time.

In Pickerel Lake suspended solids is primarily a reflection of the small plants and animals that live in the open water (plankton) rather than the suspended sediment that is often present in shallower lakes. Pickerel Lake's depth prevents the wind from stirring bottom sediment to any large degree.

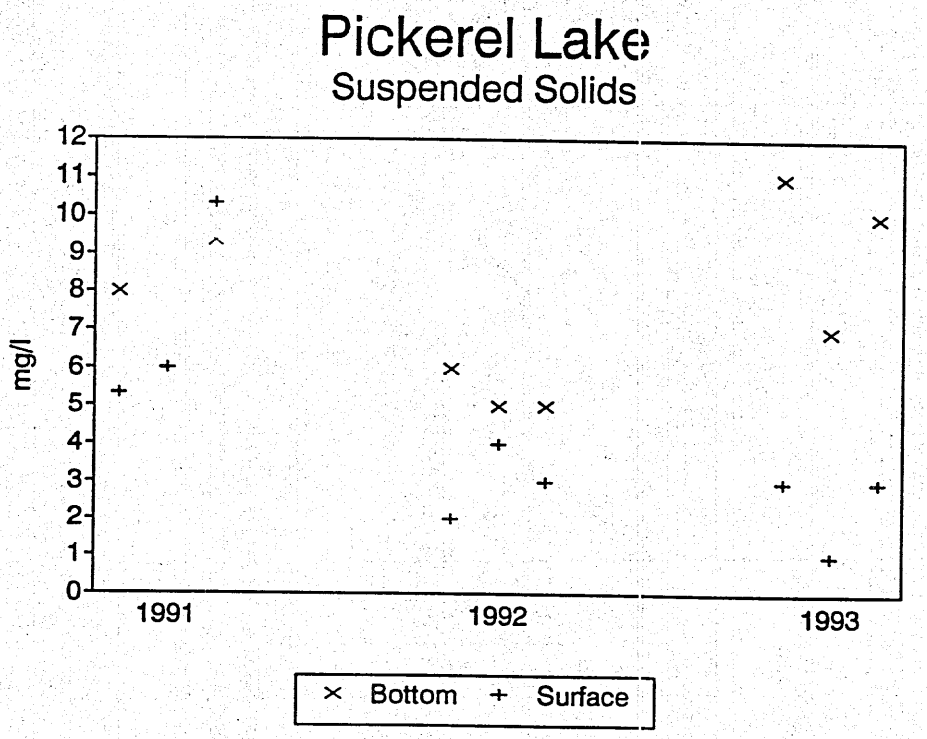


Figure 9. Suspended solids concentrations for Pickerel lake in 1991, 1992 and 1993.

The Flood of '93

The large rainfall that occurred on July 24, 1993 at Pickerel Lake did not appear to have a large impact on lake water quality based on the August sampling date. The August sampling occurred approximately one month after the event. Although the lake was stratified and exhibited higher dissolved phosphorus and nitrogen concentration, trends for most parameters followed the same pattern in 1993 as in the two previous years. August data did not exhibit any unusual trends.

It is likely that higher than normal suspended solids were present after the flood. Most of the material apparently settled out of the water column by the August sampling date. The nutrients and sediment carried into the lake during the flood may cause increased demand for oxygen at the bottom next year. If weather conditions allow stratification to occur the effects of the flood of '93 may be seen in 1994 in the form of reduced oxygen concentrations in the deeper waters.

References

Environmental Protection Agency, 1976. Quality Criteria for Water.

Lille, R.A. and J.W. Mason 1983. Limnological Characteristics of Wisconsin Lakes. Dept of Natural Resources Tech. Bull. No. 138, 116 pp.

Nicholls, K.H. and P.J. Dillon 1978. An Evaluation of Phosphorus-Chlorophyll-Phytoplankton Relationships for Lakes. Int. Rev. Hydrobiol. 63(2):141-54.

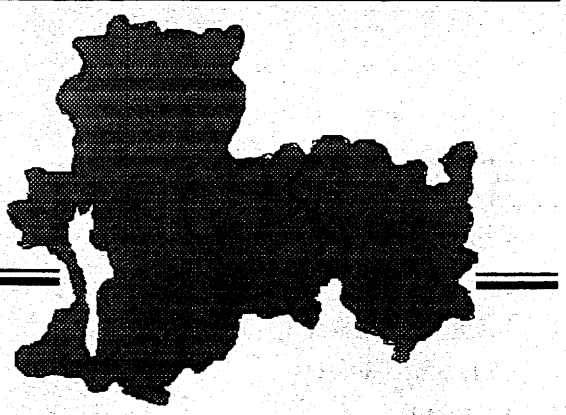
Trussel, R.P. 1972. The Percent Un-ionized ammonia in aqueous ammonia solutions at different pH levels and temperatures. J. Fish. Res. Bd. Can. 20:1505-1507.

Wetzel, R.G. 1983. Limnology 2nd. Ed. Saunders College Publishing. 753 pp.

Appendix O - Lake Property Owners Survey

Pickerel Lake Protection Project

Day Co. Conservation District



Lake Property Owners Survey

Introduction

Pickerel Lake is an important natural resource. How important, you tell us! Please take a few minutes and answer the following questions. By completing this survey you will help us determine first, the economic impact Pickerel Lake has on northeastern South Dakota and secondly, the information and educational needs of lake and watershed property owners and thirdly, future project activities.

Return completed forms to:

Dennis Skadsen
Project Coordinator
RR 1 Box 113
Grenville, SD 57239

(Name & Address optional)

Your Name:_____

Address:_____

_____

1. Check the appropriate choices below:

( ) Own undeveloped lakeshore property
( ) Own developed lakeshore property w/cottage
( ) Own cottage/lease land
( ) Rent lake cottage
( ) Own agricultural land in the lake's watershed

2. How many years have you owned lake property or a cottage? _____

3. How do you use your lake cottage?

( ) As a permanent residence
( ) As a semipermanent residence (6 months or less)
( ) Only on weekends and/or family vacations
How many weekends a year?_____

4. Do you plan in the future to live year-round in your lake cottage? Yes ( ) No ( )

5. Do you plan on making any major improvements to your lake property or additions to your lake cottage in the future? Yes ( ) No ( )

6. How many visitors stay at your cabin during a single year? _____

7. Check the products and services you purchase or utilize from businesses located within a **30** mile radius of Pickerel Lake.

( ) Boat repairs/servicing
( ) Discount/Department Store
( ) Electrician
( ) Fish Bait
( ) Fishing License
( ) Fishing Tackle
( ) Fuel Oil
( ) Gasoline
( ) General Contractor
( ) Greenhouse
( ) Groceries
( ) Hardware/Lumber
( ) Hospital
( ) Home Furnishings
( ) Hunting License
( ) Physician (Practice:_____)
( ) Plumber
( ) Propane
( ) Restaurant
( ) State Park Entrance License

8. Estimate the amount of money per month you spend in the area on the above items while staying at your lake cottage.

$_____

9. Check the locations where you purchase the majority of the items or services checked in question 7.

( ) Grenville ( ) Sisseton ( ) Roslyn

( ) Waubay ( ) Webster

10. Do you employ local people to care for your lake property (yard care, house cleaning etc.)?

( ) Yes ( ) No

If yes, how many? _____

Estimate how much you pay for these services during a years time. _____

11. In the last five years, have you purchased any of the following recreational equipment that you use at Pickerel Lake.

( ) Boat/trailer ( ) Jet Ski ( ) Snowmobile

12. Check points of interest you have recently visited while staying at your lake cottage.

( ) Blue Dog State Fish Hatchery
( ) Golf Course (Location:_____)
( ) Fort Sisseton Festival
( ) Museum of Wildlife & Science-Webster
( ) Nicollet Tower
( ) Pickerel Lake State Recreation Area
( ) Sica Hollow State Park
( ) Waubay National Wildlife Refuge

13. Check the activities below that you participate in while staying at your lake cottage.

Boating (Check types of boats you use)
( ) Powerboat ( ) Sailboat ( ) Jet Ski

Fishing:
( ) From shore ( ) From a boat ( ) Ice fishing

Hunting:
( ) Big Game ( ) Upland Game ( ) Waterfowl

( ) Snowmobiling
( ) Swimming
( ) Bird/Wildlife Watching
( ) Walking/Hiking
( ) X-Country Skiing

14. Do you fish other area lakes?

( ) Yes ( ) No

List other lakes:_____

15. What are the most important reasons to protect Pickerel Lake's water quality? (Rank in importance from 1- 4)

____ Save for future generation's use.
____ It's a rare natural resource.
____ Northeastern South Dakota's economic health.
____ Protecting the value of my lake property.
____ Other: _____

16. What are the most important beneficial uses of Pickerel Lake? (Rank in importance from 1-5)

____ Fish propagation
____ Livestock watering
____ Recreational boating/waterskiing
____ Sport fishing
____ Wildlife propagation (waterfowl etc.)
Other:_____

17. Check all problems that in your opinion apply to Pickerel Lake.

( ) Algae blooms
( ) Aquatic plants
( ) Carp/roughfish
( ) Cloudy/murky water
( ) Deadfall/Trash/Garbage
( ) Decline in good fishing
( ) Winter/summer fish kills
( ) Over fishing
( ) Sedimentation/Decrease in depth
Other: _____

18. Check all those you feel are sources of nonpoint source pollution to Pickerel Lake.

( ) Cropland erosion
( ) Feedlot runoff
( ) Fertilizer/Pesticide runoff
( ) Livestock on shore
( ) Overgazing pasture in lake's watershed
( ) Septic system failure
( ) Shoreline erosion
Other:_____

19. In your opinion, what poses the greatest threat to Pickerel Lake's water quality?_____

_____
_____
_____

20. In your opinion, what poses the least threat to Pickerel Lake's water quality? _____

_____
_____
_____

21. What type of future developments do you feel will benefit the lake and it's residents.

_____
_____
_____
_____
_____

22. What type of future development will be detrimental to the lake and it's residents?

_____
_____
_____
_____
_____

23. In your opinion, are the following government agencies and groups doing all they can to protect the water quality of Pickerel lake? Mark Y for yes, N for no.

____ Agricultural Stabilization & Conservation Service (ASCS)
____ Day Conservation District
____ Day County
____ Environmental Protection Agency (EPA)
____ Lake Residents/Property Owners
____ SD Dept. of Agriculture
____ SD Dept. of Environment & Natural Resources (DENR)
____ SD Dept of Game, Fish & Parks
____ Sisseton-Wahpeton Dakota Nation
____ Soil Conservation Service (SCS)
____ US Fish & Wildlife Service
____ Watershed Farm/Ranch Operators

24. What local government services do you feel need improving at Pickerel Lake?

_____
_____
_____
_____
_____
_____

25. What type of information or data would you like to see available about Pickerel Lake?

_____
_____
_____
_____
_____

Pickerel Lake Protection Project
Day Conservation District
710 Main Street
Webster, SD 57274

Phone: 605/345-4661