SECTION 1: INTRODUCTION

PURPOSE

The purpose of this report is to present the results of the planning process, studies, alternatives analysis, decisions, and next steps for managing the Prior Lake levels, the outlet box and outlet channel. This outlet system, first used in 1983, is approaching 20 years of age. As discussed in more detail under the Existing Conditions subsection below, the channel in many places could be modified to operate more efficiently and in ways that take care of problems and enhance the environment. Likewise the outlet box located on Prior Lake has developed some cracks, and could be modified to be more efficient. More importantly, urban development has greatly accelerated within the Watershed District, City of Prior Lake, City of Savage, and City of Shakopee. Stormwater runoff from some of these developing areas drains directly to the outlet channel while other areas discharge first to upstream lakes before potentially discharging to the outlet channel. Left unmanaged, urban development can significantly increase runoff, making it more challenging to manage both the outlet channel and lake levels. This report not only assesses how to better manage the outlet system after 20 years of use, but also how to minimize and mitigate future runoff increases, and manage the system with increased runoff from anticipated future urban development. The report also integrates results of a study regarding floodproofing or buying out some of the lower most at risk homes around Prior Lake as an additional means for reducing flood damages.

PROJECT AREA

Because the Prior Lake outlet system receives runoff from upstream areas, the project area is essentially the entire Watershed District. Figure 1-1 shows the boundaries of the Prior Lake – Spring Lake Watershed District along with major hydrologic features, political subdivisions, and the outlet channel. The District includes approximately 42 square miles of area located entirely within Scott County, Minnesota. The District encompasses portions of five local units of government; the cities of Prior Lake, Savage, and Shakopee, as well as Sand Creek and Spring Lake Townships. Drainage generally flows from the south and southwestern portions of the District north and east through Spring Lake and Upper Prior Lake to Lower Prior Lake where the outlet box is located.

The outlet box is connected to a one-half mile long pipe which discharges to the outlet channel. Figure 1-2 shows the location of the outlet box and flow routes of both the outlet pipe and the outlet channel. The outlet channel flows north through Jeffers Ponds, the western lobe of Pike Lake, Deans Lake, and Blue Lake before discharging to the Minnesota River.

PROJECT HISTORY

The Watershed District was established on March 14, 1970 by order of the Minnesota Water Resources Board (MWRB) under the authority of the Minnesota Watershed Act (Minnesota Statutes, Chapter 112). The order was in response to a petition filed with the

Insert Figure 1-1 (Map 2-2 from 509 Report)

Insert Figure 1-2: Outlet Channel Location.
(Use Figure by Kestrel Design that shows outlet channel location on air photo base).

MWRB by resident freeholders within the Watershed on June 24, 1969. Lake levels for Upper and Lower Prior Lakes have historically been one of the most important issues in the District. Before construction of the outlet system, the Prior Lakes fluctuated widely depending upon rainfall patterns.

Much of the effort in the early years of the District focused on lake level issues and the development of an outlet system. The initial alternative for the outlet channel followed the existing alignment until the flow came down the bluff just north of County Road 16. At that point the initial alternative deviated from the existing alignment and was planned to flow northeast to Eagle Creek, which would then carry the discharge to the Minnesota River. This alternative, however, was abandoned when the City of Shakopee requested the flow be diverted to Dean's Lake. Dean's Lake was very shallow and appeared to be drying up.

In 1979 the Minnesota Department of Natural Resources (MDNR) issued a permit to the District for the Outlet Channel. The cities of Prior Lake and Shakopee and the Prior Lake-Spring Lake Watershed District entered into a Joint Powers Agreement in 1981 regarding the outlet channel (Appendix A). The outlet system was first used in 1983. In 1987 the District completed and adopted a Management Policy and Operating Procedures manual for the Outlet Control Structure (Appendix B). This document was accepted by the City of Shakopee and approved by the MDNR. This document sets management goals, management policy, operating procedures including allowable discharges; and review and amendment procedures. The document is still in effect and is used by the District.

RELATIONSHIP TO OTHER REPORTS AND PLANS

The District has completed two other reports/plans of recent origin that are related to this report. These include:

- The **Water Resources Management Plan for the Prior Lake-Spring Lake Watershed District** completed in 1999 which develops and presents goals, policies and implementation activities for District operations from 1999 through 2005. The plan proposed a number of studies/planning efforts to address issues with the outlet and lake levels. These issues as listed in Table 5-5 of the plan include:

  - Model calibration
  - Outlet Channel Design for Ultimate Conditions
  - Pike Lake Sediment Removal
  - Occasional Low Water Levels in Spring and Prior Lakes
  - Flood-Prone Structures Riparian to Prior Lake
  - Projected Increases in Runoff Volume as Development Increases

  This current study/report is designed to comprehensively address these issues identified in the original plan. The current study/report also forms the technical basis to support plan amendments called for in Table 7-1, Section 7 of the 1999 Plan

regarding outlet channel improvements, outlet structure improvements, and Pike Lake sediment delta removal.

- The **Draft Prior Lake Outlet Channel Feasibility Analysis** prepared by WSB & Associates, Inc.; and Montgomery Watson. This draft report was prepared for the Prior Lake-Spring Lake Watershed District and the City of Shakopee. The purpose of the report was to provide the Watershed District and the City with a starting point from which they can review, and further discuss and negotiate the various considerations associated with a new joint project along the outlet channel. The study was intentionally left in draft form, because it was considered a starting point for defining a project. Much of the analyses and information presented in Section 4: Alternatives Analysis of this current report regarding the outlet channel alternatives comes from this draft Feasibility Analysis. Section 6: Alternative Refinement in this current report picks up where the draft Feasibility Analysis left off in terms of moving forward with efforts of the Watershed District.

RELATIONSHIP TO CITY OF PRIOR LAKE AND CITY OF SHAKOPEE STORMWATER CAPACITY NEEDS

Future conditions stormwater runoff models from the Watershed District, the City of Shakopee and the City of Prior Lake were combined to generate and assess the outlet channel alternatives in the draft Feasibility Analysis, and Section 4 of this report. However, the selected alternative in Section 5 and refinement of this alternative presented in Section 6 largely reflects the Watershed District's needs and runoff management. Sections 5 and 6 of the report do not reflect in comprehensive form the needs of the City of Shakopee for stormwater capacity in the outlet channel. City of Shakopee capacity needs are discussed in the following documents:

- Blue Lake Watershed Outlet Feasibility Report dated March 26, 2001 prepared for the City of Shakopee by WSB & Associates.
- Environmental Assessment of water quantity/quality impacts associated with drainage improvements in the Blue Lake Watershed dated November 2001 prepared for the City of Shakopee by WSB & Associates.
- Environmental Assessment Worksheet for Blue Lake Watershed Drainage Improvements dated December 10, 2001 prepared for the City of Shakopee by WSB & Associates; and associated City Council Certification and Findings of Fact from March 2002, and responses to EAW comments dated February 15, 2002.

The Watershed District considered the City of Shakopee's needs and interests in the planning process by showing how efforts can be phased and fit with in an overall concept for the channel. This overall concept has been discussed with representatives of the City of Shakopee, and there appears to be general concurrence regarding the overall concept. The development of this overall concept is considered one of the more important parts of the project. With an overall concept the various entities can move forward jointly or semi-independently with efforts as their schedules and funding sources allow, but the work is done toward a common concept. This flexibility is important because the

Watershed District desires to address some of the problems and issues of the outlet system sooner than when the City of Shakopee may need additional stormwater capacity in the channel. This approach also allows the Watershed District to complete annual repairs with an overall future concept in mind thereby leveraging maintenance resources. The City of Prior Lake's capacity needs are included in the refined alternative in Section 6 because most of the City area draining to the channel is also in the Watershed District.

EXISTING CONDITIONS

This subsection of the report summarizes existing and historical conditions of lake levels, flooding, shoreline erosion, the outlet box, the outlet channel, and public attitudes. Readers are referred to the District's Water Resources Management Plan, and to full copies of the Outlet Operating Plan and JPA (see Appendices) for additional information.

Lake Levels

Prior Lake level records are presented graphically in Figure 1-3. Outlet box operations started in 1983. Statistical analysis of lake levels from 1983 through 2001 show that about 50 percent of the measured lake levels have been above or below the elevation of 902.41 (i.e., 902.41 is the median lake level for this period) (Table 1-1). Further, 10% of the lake levels have been above the elevation of 903.78, 10% are below 899.73, and the maximum observed level since opening the outlet is 905.68.

Table 1-1: Prior Lake Recorded Lake Level Distributions 1983 through 2001

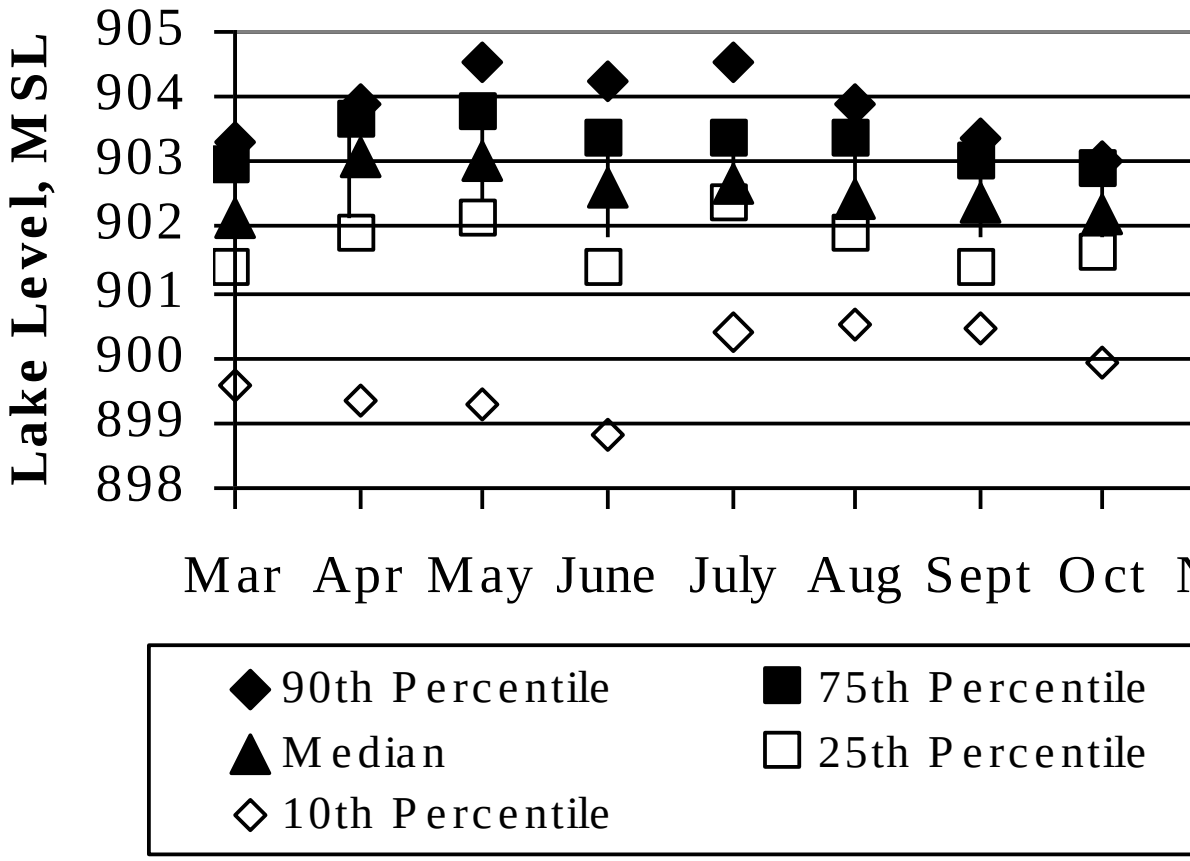
Frequency	Lake Level
Maximum	905.68
90^{th} Percentile	903.78
75^{th} Percentile	903.06
50^{th} Percentile (Median)	902.41
25^{th} Percentile	901.42
10^{th} Percentile	899.73
Minimum	895.46

This means that the ordinary high water (OHW) elevation of Prior Lake of 904 is exceeded less than 10% of the time. The Minnesota Department of Natural Resources (MDNR) has a rule of thumb that the OHW should be reached or exceeded during a five-year storm. A five-year storm has a 20% chance of occurring during a year. As discussed below the 904 elevation is also important because this is where some of the low homes and the City of Prior Lake's no-wake ordinance are affected. Conversely low levels affect the ability of some shoreline owners to access the lake as it recedes.

Figure 1-4 presents month by month lake level distributions and demonstrates that there is a seasonal pattern to lake levels. April, May, June and July typically have the highest lake levels. However, May and June have the widest range of values including some of the lowest values. Lake levels typically decline from July through November and remain

Insert Figure 1-3. Historic Lake Levels.

Figure 1-4: Monthly Prior Lake Level Distributions 1983 Through 2001



lower over the winter until March presumably due to decreased runoff and increased evaporation during this period.

Figure 1-5 shows a comparison of average annual lake level for Prior Lake and annual precipitation. This figure shows that lake levels are significantly influenced by long-term rainfall patterns, although this linkage has been dampened by the construction of the lake outlet, which moderates high lake levels and decreases the odds of successive high water years.

Flooding

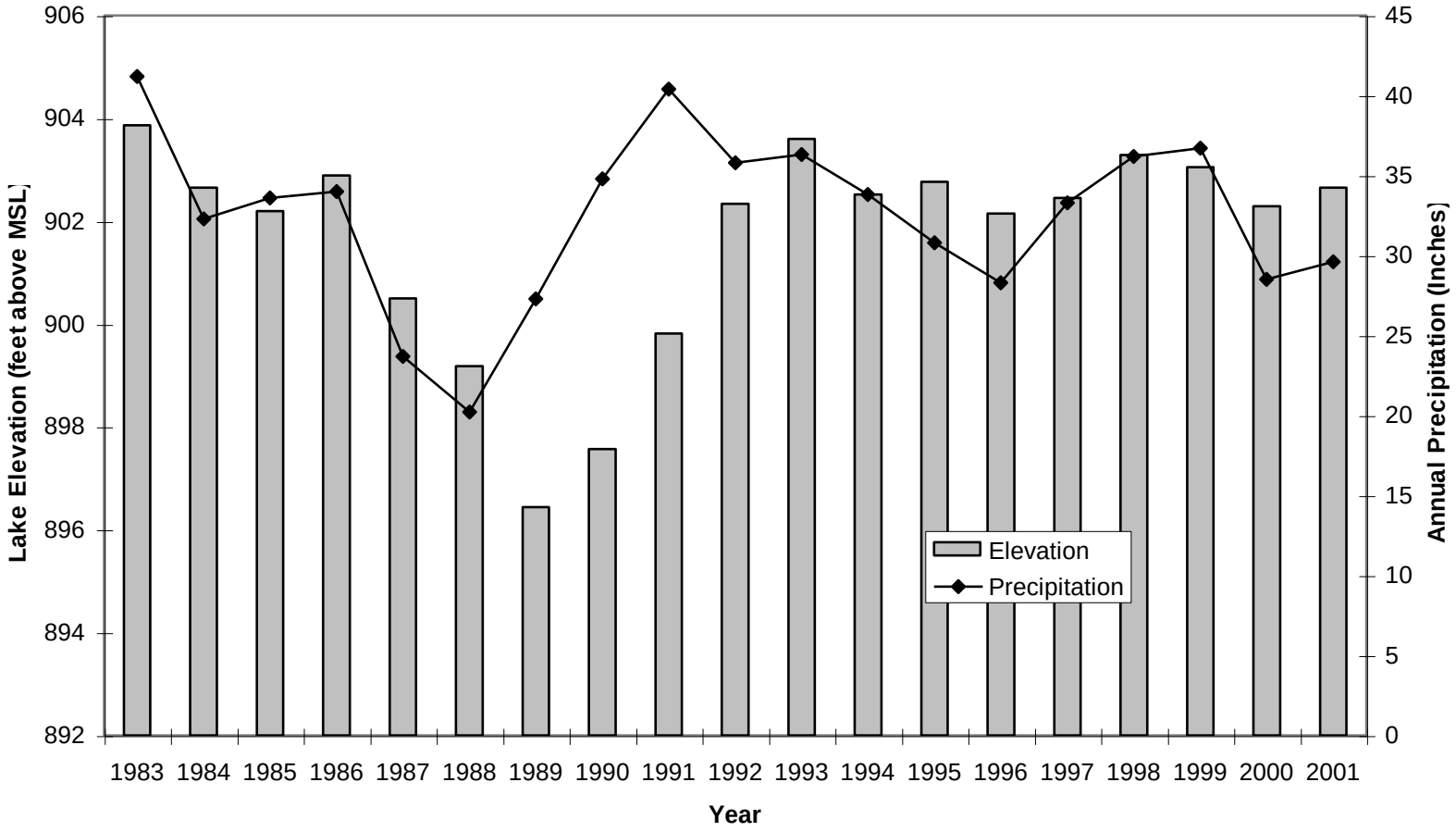
This discussion of flooding is limited to flooding around Prior Lake. The potential for flooding and lake level rises along the outlet channel is discussed under the existing Outlet Channel subsections below. The 100-year floodplain elevation for the Prior Lakes established by the Federal Emergency Management Agency (FEMA) is 908.9 MSL. This elevation was developed from computer modeling completed by the Army Corps of Engineers assuming that the outlet system was not operating. Additional Watershed District modeling efforts presented in the 1999 Water Resources Management Plan shows that the 100-year floodplain with discharges from the lake to the outlet system at 50 cubic feet per second (cfs) and a starting water level of 902.5 MSL is 907.60 MSL.

There are 79 homes around the lake with low entries (i.e., windows or doors) at or below the FEMA 100-year elevation of 908.9 MSL and 51 below 907.60 MSL according to a Watershed District survey completed in 1997. Ten of these homes have low entries either below or within one foot of the OHW of 904. This is the elevation (i.e., 904) at which land around the lake is considered "Public Waters", or part of the lake. More importantly, the elevation of 904 has been exceeded a total of 259 days since 1983. During these periods some of the low homes have to take steps such as sand bagging to prevent flooding. Levels above 904 also seem to be occurring more frequently with recent exceedences occurring in portions of 1998, 1999, and 2001. However, all of these recent exceedences corresponded with high levels of precipitation, and 1990s in general is considered the wettest decade on record.

Shoreline Erosion

Shoreline erosion caused by wave actions at higher water levels is a concern around Prior Lake. Some residents have lost shoreline and others have added structural protection measures such as rip-rap. Over 1,000 shoreland parcels were evaluated by the City of Prior Lake to characterize shoreland conditions for Upper and Lower Prior Lakes in 1999. A majority of the Prior Lake shoreline has been altered as development occurred in the area over the past 100 years. For Upper Prior Lake, shoreline erosion problems were identified for 16 out of 366 parcels (4%); and 40% of the parcels (145 out of 366) had structural rip-rap for shoreline protection. For Lower Prior Lake, shoreline erosion problems were identified for 32 out of 691 parcels (5%) and 41%of the parcels (283 out of 691) had structural rip-rap for shoreline protection.

Figure 1-5: Prior Lake Average Lake Levels and Precipitation



The concern for erosion has lead the City of Prior Lake to create a No-Wake ordinance. The ordinance goes into affect once the lake reaches or exceeds the elevation of 904. The District also optimizes use of the outlet system, within the constraints of the Operating Plan, to minimize shoreline erosion and periods of boating restrictions under the No-Wake condition.

Outlet Box

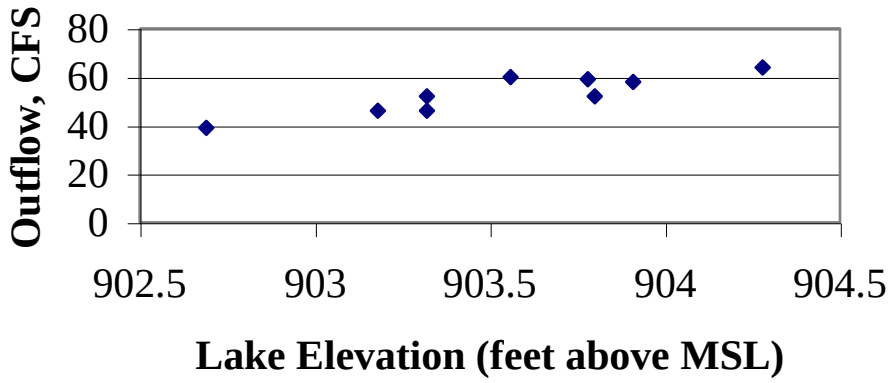
The outlet box is located on the northwest side of Lower Prior Lake (Figure 1-6). As shown in Figure 1-7, the outlet box consists of a 36-inch diameter reinforced concrete pipe (RCP) with an invert of 898.7 feet and slope of 0.5% surrounded by a concrete structure with adjustable gates.

Figure 1-6: Prior Lake Outlet Box

There are four removable gates on the north side, eight on the south side, and a sliding gate on the front side. The concrete control structure introduces some energy losses, so that the maximum flow with the gates wide open is slightly less than the capacity of the 36-inch RCP at lower lake levels. However, as the lake rises the maximum free-flow capacity of the pipe becomes more limiting than the control structure. The current discharge capacity of the control structure and pipe is presented in Figure 1-8 for various lake elevations. This curve was developed from discharge measurements taken by the Watershed District in 2001. The maximum discharge for all lake elevation levels is about 65 cfs, which is also the maximum free-flow capacity of the pipe. The Outlet Control Structure Operating Plan (Appendix B) specifies allowable discharge rates for various lake elevations and times of the year (Figure 1-9).

Insert. Figure 1-7. Schematic of the Existing Outlet Structure. (see Outlet Structure Modification Feasibility Study.

Figure 1-8: Prior Lake Outlet Gaged Flows, 2001 with all gates open



Outlet Channel

This subsection presents a description of the existing condition of the outlet channel. The description first presents a general overview of the existing and historic landscape along the channel corridor. More detailed descriptions for eight individual segments along the channel follow. These eight segments were identified as part of the Draft Prior Lake Outlet Channel Feasibility Analysis. The eight segments generally had distinct characteristics. These segments, as shown on Figure 1- 10, are broken out as follows:

- Segment 1: Prior Lake to Jeffers Pond
- Segment 2: Jeffers Pond to the inlet of Pike Lake
- Segment 3: The inlet of Pike Lake to Pike Lake Trail
- Segment 4: Pike Lake Trail to County Road (CR) 16
- Segment 5: CR 16 to the inlet of Dean's Lake
- Segment 6: The inlet of Dean's Lake to State Trunk Highway (STH) 169
- Segment 7: The STH 169 to STH 101
- Segment 8: From STH 101 to Blue Lake

The following descriptions of the segments present existing conditions and observed problems. Goals and solutions to these problems are discussed in subsequent sections of this report.

Insert Figure 1-9: Rating Curve for Prior Lake Outlet Box.

Insert Figure 1-10: Prior Lake Outlet Channel Feasibility Segment Breakdown. 11x17 figure from Draft Feasibility Analysis

Landscape Development. The landcover, landuse, and character of the Prior Lake Outlet Channel (PLOC) corridor have changed greatly since settlement by Europeans began in the 1800's. Surveyors from the General Land Office conducted site surveys before the sale of lands in the western territory. Information surveyors recorded along each of the section lines is helpful in reconstructing an overview of the vegetation at the time of the General Land Office Survey. These include: bearing trees, points where section lines intersected with roads and trails, points where the surveyor encountered a settlement or dwelling, points along the section lines where the surveyor intersected surface water (streams, springs, ponds, lakes, etc.), and a general summary of soils and topography (Figure 1-11). At the time of settlement, the vegetation of the present-day PLOC was primarily Prairie, Oak Openings and Barrens, and Big Woods plant communities (Figure 1-12).

Existing land cover and landuse along the channel corridor are shown on Figure 1-13 along with high quality habitat remnants and important ecological functions. The Minnesota Land Cover Classification Level 1 Summary information was obtained from the City of Shakopee for the northern portion of the channel and was developed for this project for channel portions in the City of Prior Lake.

Parcels along the channel are shown on Figure 1-14. The District owns easements along the channel segments that generally vary from 30 to 50 feet wide, but are sometimes wider. The exception is the public waters such as Pike and Deans Lakes where the District has a permit to discharge. Easements along the northern part of the channel are owned jointly with the City of Shakopee. Through the completion of this study the District has learned that some of the easements were not accurately recorded and in some cases the easement does not match the channel location. As discussed more in later sections the District intends to work with respective landowners to change the easements in these situations to the correct location.

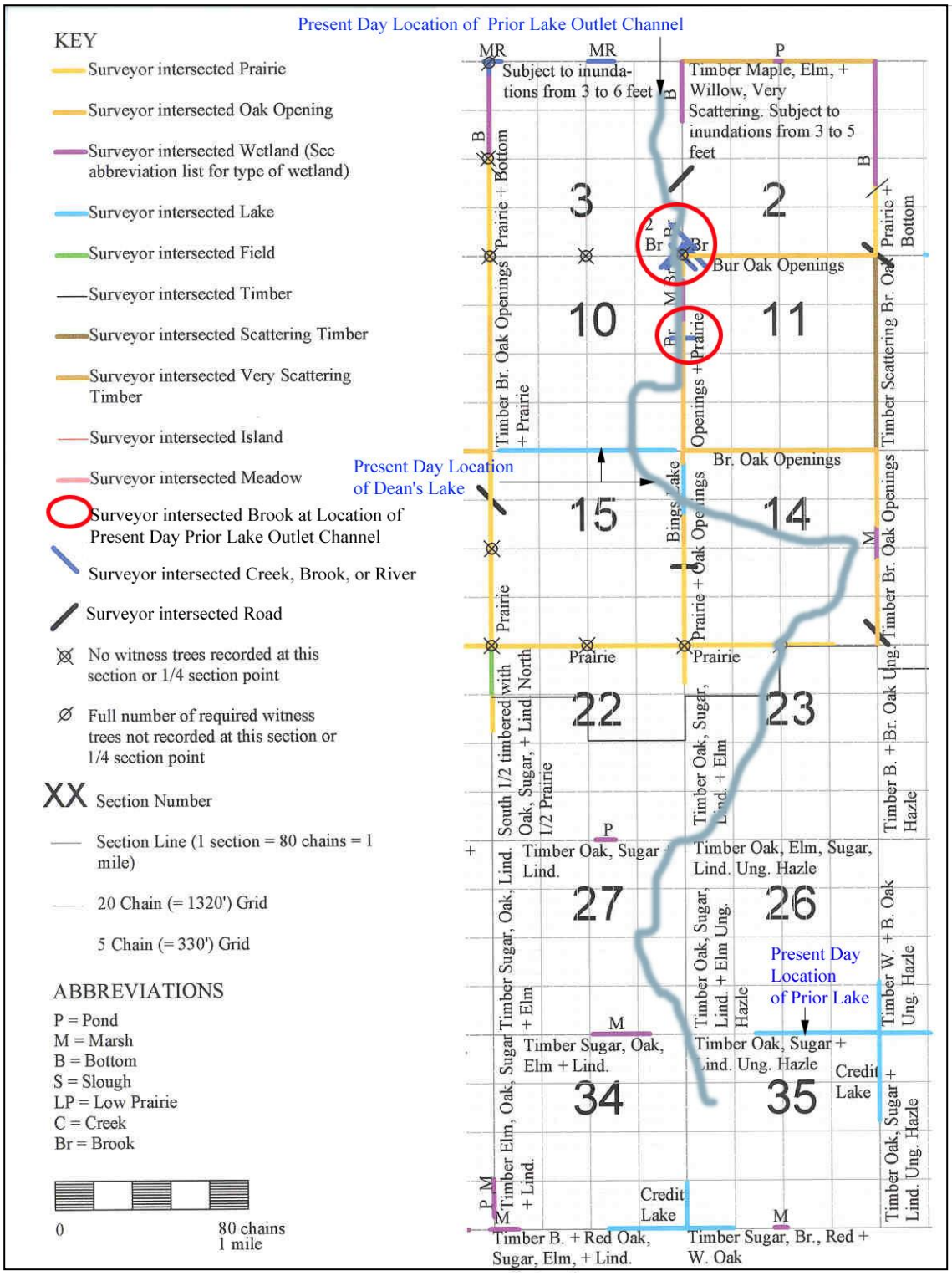


Figure 1-11: Public Land Survey notes for PLOC

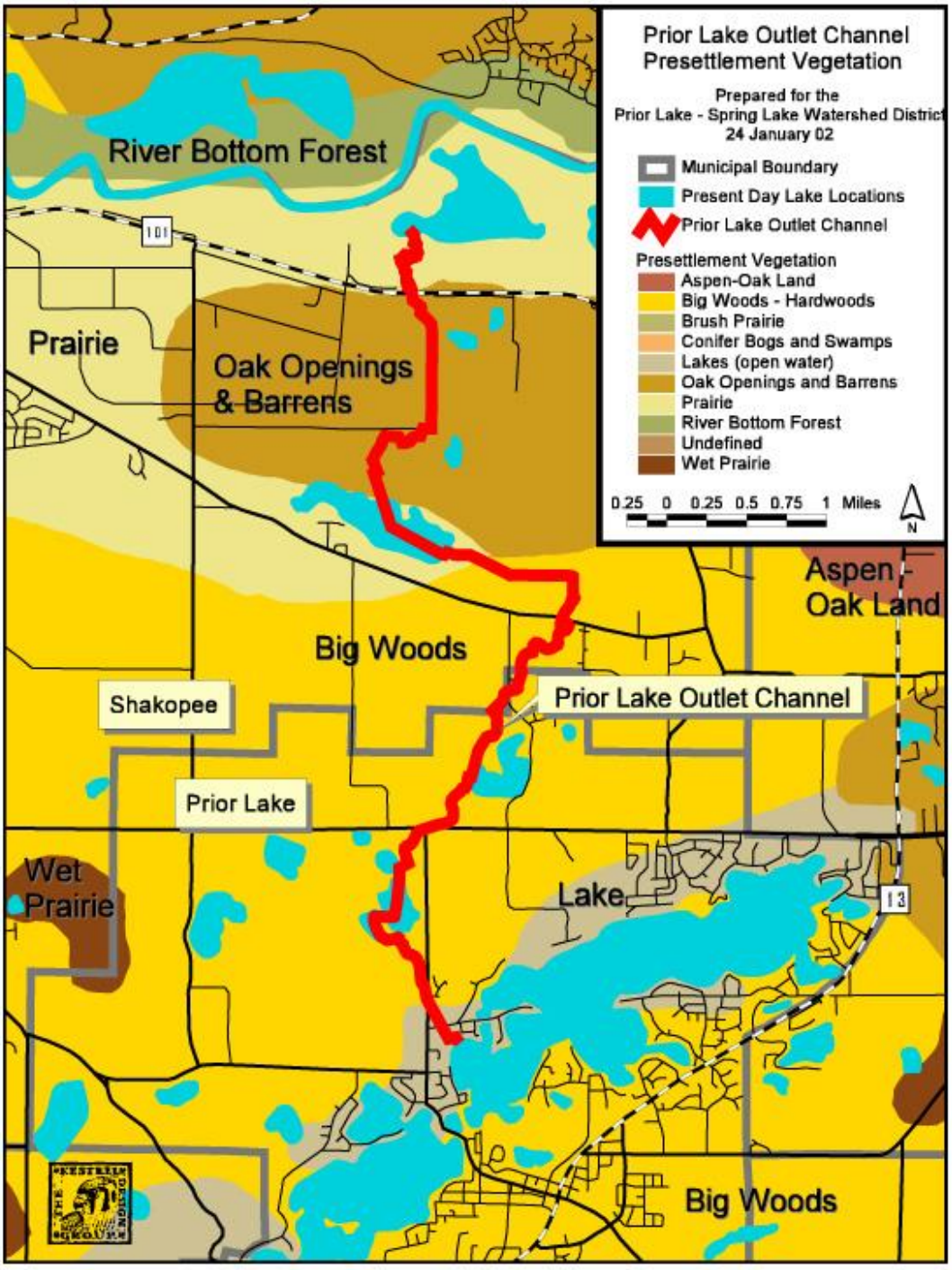


Figure 1-12: Pre-settlement vegetation PLOC

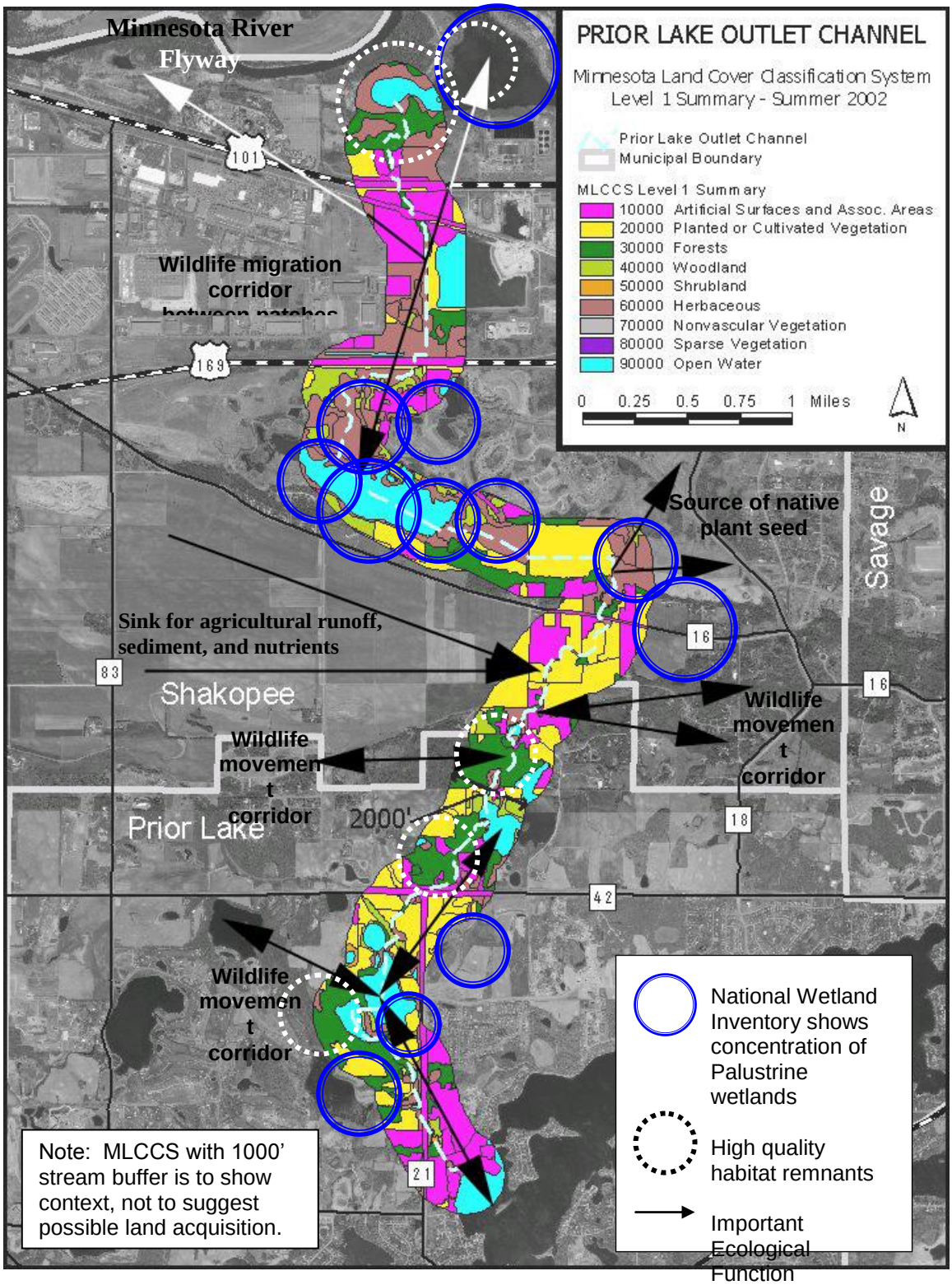


Figure 1-13: Important ecological functions and land cover of PLOC

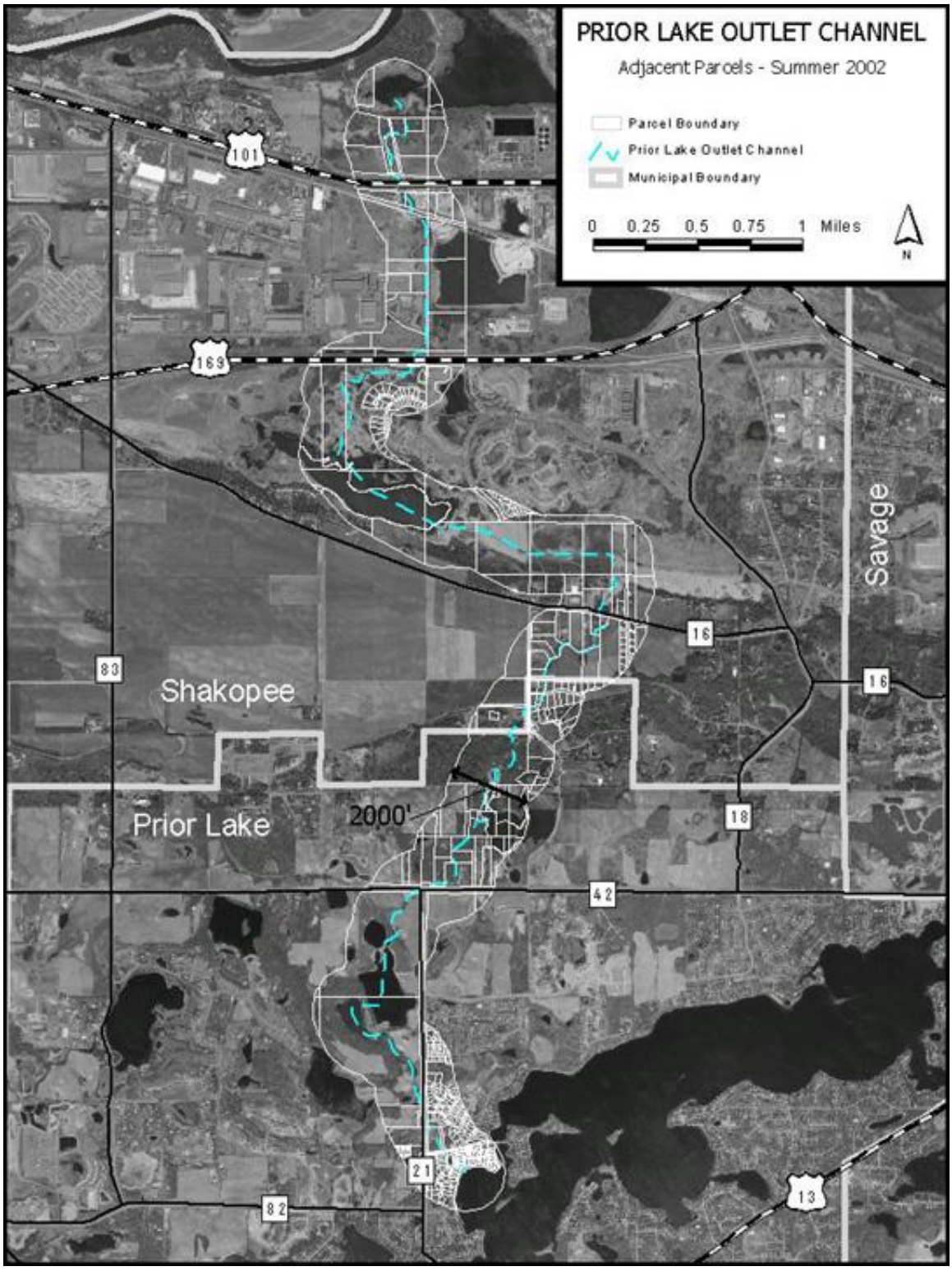


Figure 1-14: PLOC Adjacent Parcels

Segment 1. Segment 1 extends from the outlet on Prior Lake to the outlet of lower Jeffers Pond. The portion from the outlet structure to the west side of CR 21 consists of 2,300 feet of 36-inch reinforced concrete pipe (RCP). The pipe discharges to the channel just west of CR 21. Most of the segment downstream of the pipe discharge consists of ponds or wetlands. There is about 800 feet of channel upstream of Upper Jeffers Pond. Problems observed in the portion of the segment between CR 21 and the outlet of Lower Jeffers Pond include:

- Past problems with washing out of farm road culvert crossing at station 33+00.
- Widening and downcutting of the channel between farm road crossing and Upper Jeffers Pond (Figure 1-15).
- Sediment delta formed at upstream end of Upper Jeffers Pond.
- Inefficient outlet structures from Upper to Lower Jeffers Ponds that have had problems with debris accumulation and high water levels when the outlet channel is in full operation (Figure 1-15).
- Scour hole formed near outlet of Lower Jeffers Pond (scheduled for repair winter of 2002).
- Dominance of invasive species Reed Canary Grass, and Hungarian Brome in the surrounding open lake fringe.

Landcover surrounding Segment 1 is highly developed near Prior Lake and CR 21. The west end of Segment 1, near Jeffers Pond, is mostly agricultural with some patches of forest adjacent to wetlands. The maple-basswood forest southeast of Jeffer's pond has a moderate biodiversity rating by the Minnesota Biological Survey (MCBS). Some small patches of forest within the area adjacent to the segment have a biodiversity significance below the minimum threshold for MCBS.

Segment 2. This segment starts at the outlet of Lower Jeffers Pond and extends to the inlet of Pike Lake. Between the pond outlet and CR 42 it flows through a wetland. Downstream of CR 42 there is a well defined channel with a 1.3% slope surrounded by Maple Basswood forest. The channel is in a well-defined valley with limited potential for lateral migration. There are five driveway crossings in this section. Landcover adjacent to Segment 2 is mostly agricultural, with some large patches of moderate biodiversity maple-basswood forest on the southeast side of Pike Lake. Problems observed in this section include:

- Some downcutting and widening of the channel.
- Washing out of the farthest downstream driveway culvert crossing just upstream of Pike Lake.
- Development of a scour pool downstream of driveway crossing by Pike Lake.
- Significant shade limiting the development of a diverse riparian vegetation community with a deep root structure.
- Dominance of the invasive species European Buckthorn in the sub-canopy.

Segment 3. This segment goes from the inlet of Pike Lake to Pike Lake Trail. Most of the segment is lake or wetland. The exception is an 800 foot section of channel through

the YMCA Camp Kipi Yapi at about a 0.8% slope. There are three driveway crossings and two pedestrian bridges in this segment. Vegetation surrounding the channel, lake and wetlands is Maple Basswood forest. Segment 3 includes Pike Lake and its associated wetlands. The surrounding landcover is agricultural, with some areas of forested residential development near the lake. Some of the forest in this segment is lower quality because of residential development. A large patch of maple-basswood forest is located north of Pike Lake in the YMCA camp. Problems observed in this segment include:

- A sediment delta where the channel discharges into Pike Lake.
- High water levels on Pike Lake.
- There is a home adjacent to Pike Lake in the floodplain.
- Occasional overtopping of the driveway and culvert at the outlet of Pike Lake.
- Significant shade along the channel portion of the segment limiting the development of a diverse riparian vegetation community with deep root structure.
- Downcutting and widening of the channel.

Segment 4. This segment starts at Pike Lake Trail and goes to CR16. The entire segment is an open channel. The upstream portion is channelized with relatively straight reaches, the lower portions have a meandering pattern and follows a shallow valley. The channel slope is about 1%. Surrounding vegetation is largely cultivated or pasture. There are two driveway crossings in this segment. Several rip-rap drop structures have been installed over time to dissipate energy and reduce flow velocities. The surrounding landcover of Segment 4 is dominated by cropland. There are some small areas of rural residential development and farmsteads along the Segment, but the majority of the landcover is cultivated. Problems observed in this segment include:

- Significant channel and bank erosion from horse and cattle access (Figure 1- 16).
- Presence of invasive species Reed Canary Grass.
- Some downcutting and widening of the channel.

Segment 5. Segment 5 goes from CR 16 to Deans Lake. The first 1,000 feet of this channel segment drops steeply at a 1.5% slope to the toe of the bluff. There are two rock check dams along this portion to reduce flow velocities. At the bottom of the bluff the channel is straight and artificial with a 90 degree turn to the west. The straightened portion of the channel at the bottom of the bluff is very flat with almost no slope. The channel at the western end of the segment was widened to the full easement widths in 1998/99 in an attempt to slow flow velocities and settle sediment out in the channel upstream of Deans Lake. The City of Shakopee in partnership with the District and the Lower Minnesota Watershed District in 1999/2000 also constructed a low flow by-pass channel for Deans Lake starting at the western end of this segment going north around the east side of Deans Lake intersecting the channel again just south of STH 169. The by-pass channel has a control structure capable of diverting the first 20 cfs of channel flow around Deans Lake. There are five field/culvert crossings in this segment. Landcover is this segment includes the wetlands east of Deans Lake. Land surrounding the channel along south and east portions of this segment is used for horse pasture (Figure 1-17). The landowner at the west end of the segment has enrolled land in the

Undercut bank upstream of Upper Jeffers Pond Segment 1.

One of three outlet structures on Upper Jeffers Pond Segment 1. Note inefficient structure particularly for floatable debris control.

Figure 1-15: Existing Conditions Outlet Channel

Figure 1-16: Horse and cattle damaging banks Segment 4.

Conservation Reserve Enhancement (CRP) program. There is a patch of mesic oak forest adjacent to the channel near CR 16. A small high quality mesic prairie and mesic oak savanna are located northeast of the channel. Problems observed in this segment include:

- Development of a plunge pool downstream of CR 16.
- Dominance of the invasive species Reed Canary Grass.
- The 90 degree turn in flow direction.
- There have been historic problems with some of the field culvert crossings.

Figure 1-17: Horses damaging banks Segment 5.

Segment 6. Segment 6 is essentially Deans Lake and the large wetland complex north and west of the lake. The segment starts at the inlet to Deans Lake and ends at STH 169. There is no cropland adjacent to the segment, and only a small amount of residential development within 1,000 feet of the channel. The wetlands north and west of Deans Lake are considered areas of high biodiversity by MCBS. In 1999 the District excavated a sediment delta that had developed at the inlet of the lake. Concerns voiced by area residents regarding Deans Lake include:

- Water level fluctuations.
- Sediment accumulations.
- Water quality, primarily algae blooms and water clarity.
- Rough fish
- Dominance of the invasive species Reed Canary Grass

Segment 7. Segment 7 starts at STH 169 north to STH 101. Most of the segment is channelized and straight. The exception is the northern most 1,600 feet near STH 101, which meanders. Channel banks are covered with grasses and forbs except at the northern end where there are shrubs and trees. The upstream end near STH 169 is relatively stable. The middle reaches of the segment have had problems with bank stability (Figure 1-18). Without deep roots to hold the soil together and resist flow these sandy soils are susceptible to erosion and bank undercutting. The channel has also eroded downward in areas as evident by the partially exposed Metropolitan Council Regional wastewater effluent interceptor pipe. A repair project to re-cover the

interceptor pipe and prevent pipe failure is scheduled for the winter of 2002/3. This repair also includes stabilizing the failing bank shown in Figure 1-18 with a combination of structural rip-rap and soil bioengineering techniques. Additional areas where banks were failing were repaired in 2000. There are three sheet pile energy dissipaters in this segment one of which has sustained some damage (Figure 1-19). Problems observed in this segment include:

- Downcutting, erosion and bank failure.
- Exposure of the top of the wastewater interceptor pipe.
- Damage to one of the sheet pile weirs.
- Presence of invasive species Reed Canary Grass, European Buckthorn, and American Honeysuckle.

The surrounding landcover of segment 7 is commercial and industrial development. There is a large amount of tall non-native grasses and some impervious surfaces. A small patch of dry prairie is located next to Hwy 169, east of the channel. The prairie/savanna has a high biodiversity rating by MCBS.

Segment 8. Segment 8 goes through the Minnesota Valley National Wildlife Refuge starting at STH 101 and ending at Blue Lake. The channel is relatively natural and meanders. There is some erosion and undercut banks (Figure 1-20). Vegetation surrounding the channel is both wooded and herbaceous. The landcover of Segment 8 includes emergent marsh and floodplain forest that is rated as an area of high biodiversity by MCBS. Problems observed in this segment include:

- Dominance of the invasive species Reed Canary Grass and European Buckthorn..
- Erosion and undercut banks.
- Significant shade preventing the development of diverse riparian communities with deep root structures.

Local Attitudes.

District Managers initially identified two alternatives for resolving the high lake levels. The first was to enlarge the outlet system, while the second makes improvements to the outlet system but also requires the dedication of buffers as conservation easements, offers incentives for perpetual conservation practices and 10-year filter strip agreements, and purchases easements on parcels key for future water management. Both alternatives would cost $2-$3 million. However, the Managers preferred the second alternative because they believe it also provides water quality and open space protection opportunities, and protects the existing surface water management infrastructure. To test this position, the District completed a Voter Attitude Survey with assistance from the Trust for Public Land and a professional pollster. The Managers, the pollster and the Trust for Public Land jointly developed a set of questions. A list of voters was obtained from the County covering the watershed. The survey was designed to represent the entire watershed and not just lakeshore owners. The survey was completed by phone in October 1999.

Somewhat developed root structure (i.e., rhizosphere) and relatively stable banks Section 7.

Poorly developed root structure and collapsing banks Section 7.

Figure 1-18: Existing Conditions outlet Channel

Sheet pile energy drop structure in good condition Segment 7.

Sheet pile energy drop structure in poor condition Segment 7.

Figure 1-19. Existing Conditions Outlet Channel

Underdeveloped root structure, collapsing banks Segment 8.

Underdeveloped root structure, collapsing banks and trees Segment 8.

Figure 1-20: Existing Conditions Outlet Channel

The phone survey contacted 300 residents and had a margin of error of +/- 5.5%. Respondents were evenly divided when asked to choose between the two alternatives, identified by the District, for managing water resources in order to reduce flooding. Forty one percent (41%) selected option #1 to "improve and widen the existing outlet drainage channel which runs between Prior Lake and the Minnesota River", and 47 % selected option #2 to "improve, but not widen, the drainage channel and purchase conservation easements from upstream property owners", to allow the District to use these as temporary holding areas for flood waters (12% no opinion).

However, when told the Watershed District Managers preferred options #2 because it provided more long term benefits, minimized opposition, increased recreational potential and improved water quality, 69% strongly agreed (Figure 1-21). These results underscore the importance of getting information to residents about what the District Managers feel are appropriate steps to reduce flooding. Based on current knowledge of the matter, residents lean toward the Districts' choice. However, when they are told about the Districts' position and the reasons behind it, public opinion shifts dramatically in favor of option #2.

When asked their opinion of a third option to spend an additional one million dollars to buy several homes in highly flood prone areas to decrease flood damage, 25% supported and 65% opposed this proposed solution.

Residents were asked their opinion of 14 possible benefits of Option #2. The responses to each benefit were very favorable (Figure 1-22). It was surprising, however, that reducing shoreline erosion, enhancing boating use, and improved flood protection benefits were considered "Very Important" by a lower percentage of respondents than many of the other benefits. This was surprising because shoreline damage, restricted boating, and flooding are the most frequently cited complaints when water levels are high. Improved water quality, protecting the environment, and reducing algae blooms on the lakes received the highest percentage rating as "Very Important."

Finally residents were asked about their willingness to pay for the programs. Fifty-five percent (55%) of residents surveyed support a "reasonable increase" in taxes to help pay for the plan. When asked about specific tax increases, 56% supported a $15 a year increase, 66% supported a $10 boost, and 72% supported a $5 tax increase (Figure 1-23).

The Voter Attitude Survey provided the District with three very important pieces of information:

1. Residents strongly support the Districts' position to improve but not widen the drainage channel and to purchase upstream conservation easements.
2. Residents believe the open space and environmental preservation benefits of the preferred option are very important.
3. A majority of residents are willing to raise taxes up to $15 to pay for these improvement and benefits.

Figure 1-21: Preferences for Water Management Options

Original Question: The Watershed District Managers have identified two possible approaches to managing water resources in the District in order to reduce flooding during the wet months. Both approaches would cost about the same amount of money – approximately 2 to 3 million dollars.

- *One option to manage water resources to reduce flooding would be to improve and widen the existing outlet drainage channel which runs between Prior Lake and the Minnesota River to allow for additional water flows during wet periods.*
- *The second option would include improving, but not widening, the drainage channel, and purchasing conservation easements from upstream property owners, to allow the water district to use these lands as temporary holding areas for flood waters during wet months.*

Which of these do you prefer: Option #1, Option #2, or No opinion?

Follow-up Question: Next, I'll give you some additional information about the first two options.

- *The Board of Managers of the Watershed District believes the preferred alternative should be Option #2, which would improve, but not widen the existing drainage channel, and purchase conservation easements from upstream property owners for holding areas for water.*
- *The Managers chose this options because (1) opposition to widening the channel has already been voiced by the Department of Natural Resources and downstream cities, and (2) the Managers believe this option provides more long-term benefits than widening the outlet drainage channel. Other benefits for this alternative include: increased recreation potential, recharged groundwater supplies, improved fish and wildlife habitat areas, preservation of open space lands, improved access for public trails, and improved water quality.*

Considering this information, which of the 2 options would you prefer: Option #1, Option #2, or No opinion?

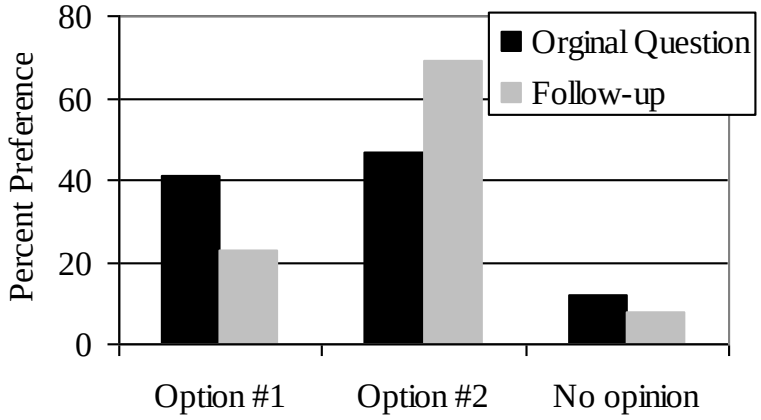


Figure 1-22 : Rating Environmental Benefits of Option #2.

The Question: *Next I'll ask your opinion of each of the benefits mentioned for Option #2, individually,*

Do you consider ___(a)___ to be very, somewhat or not too important benefit of the Option #2 plan?

- *a1. Increased recreation potential*
- *a2. Recharged groundwater supplies*
- *a3. Improved fish and wildlife habitat areas*
- *a4. Preservation of open space lands*
- *a5. Improved access for public trails*
- *a6. Improved water quality*
- *a7. Reducing shoreline erosion*
- *a8. Enhancing boating use of the lakes*
- *a9. Improved flood protection*
- *a10. Improved fishing opportunities*
- *a11. Preservation of farmlands*
- *a12. Protecting the environment*
- *a13. Managing development and preventing urban sprawl*
- *a14. Reducing algae blooms on the lakes*

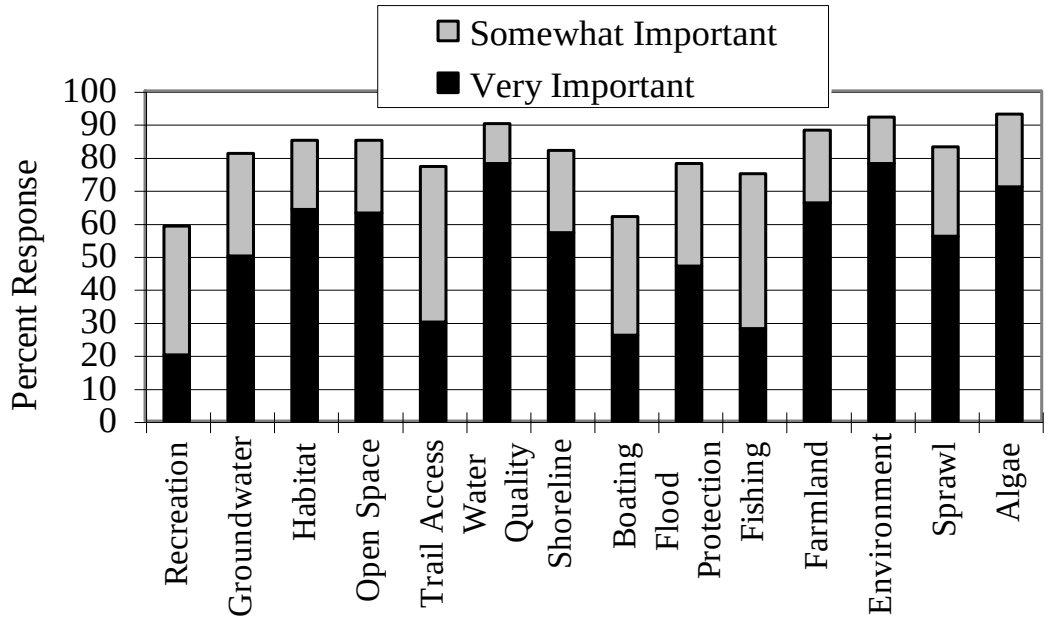
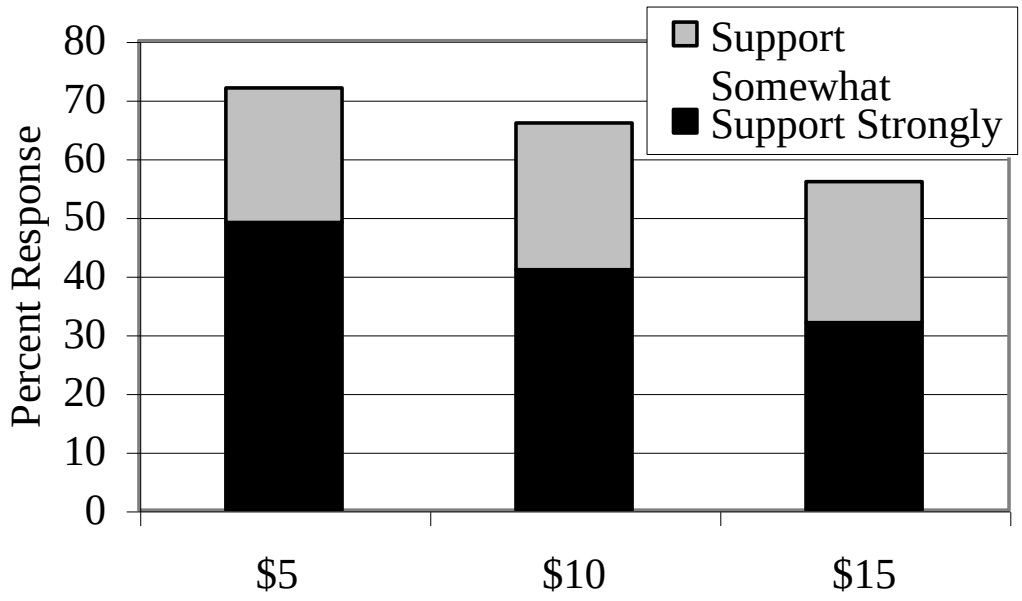


Figure 1-23: Residents Support a Modest Tax Increase

The Question*: At present, the yearly property tax assessment for the Prior Lake-Spring Lake Watershed District is $26 dollars a year for each $100,000 of assessed property value.*

If the Watershed District asked for a ___(a)___ property tax increase to help pay for this program, would you support or oppose it? Is that strongly or just somewhat?

a1. $30 a year
a2. $25 a year
a3. $20 a year
a4. $15 a year
a5. $10 a year
a6. $5 a year



PROJECT ROLES AND PARTNERS

It is anticipated that resulting projects along the outlet system will be completed as a partnership between the Cities of Shakopee and Prior Lake, and the Prior Lake Watershed District. The Mdewakaton Souix Community may also wish to join the partnership in order to obtain drainage capacity for their future needs. The Minnesota Department of Natural Resources (MDNR) will be involved for permitting and review. The MDNR may also provide financial assistance for selected portions of the plan. For example, the MDNR through the Flood Damage Reduction Grant program is already providing the District funds for this Engineers Report and for the Land Acquisition portions of the plan. Scott County and the Lower Minnesota Watershed District have been, and will continue to be involved in review and comment. The Scott Soil and Water Conservation District has and will continue to partner with the Watershed District for the upstream land acquisition portions of the plan.

ORGANIZATION OF THE REPORT

This report is organized into five sections as follows:

- Section 1: Introduction presents background information and existing conditions.
- Section 2: Future Conditions presents future conditions lake levels and flooding based on 2020 land use conditions without any stormwater management.
- Section 3: Strategy Development and Analysis presents and evaluates various strategies for managing existing and future problems along the outlet channel, and flooding around the lake.
- Section 4: Alternative Development and Selection presents the rationale for the selection of the preferred alternative.
- Section 5: Alternative Refinement provides additional detail for the selected alternative, and implementation actions and schedule.