

West Side Erosion Investigation – Bijou Lake

Introduction

Bijou Lake is located in western Becker County approximately six miles southwest of Lake Park. The Watershed District is interested in solving water quality issues from the runoff entering the lake on the northwest side. Houston Engineering, Inc. was retained to conduct a field investigation to identify the problem areas and conceptual projects that could be implemented to address the problems.

Site Description

Runoff travels east from a watershed area of approximately 200 acres through a 36 inch culvert in West Alpine Lane to Bijou Lake. The contributing watershed and runoff patterns are shown on Figure 1. Approximately 50% of the contributing drainage area is in agricultural production. The remaining areas consist of hardwood forest, wetlands, roadways, and residential lots. Two large partially drained wetland areas are located west of 117th Ave and receive much of the agricultural runoff in the watershed. The north basin is partially drained by a surface ditch while the south basin is partially drained from a subsurface tile (see Figure 1).

Problem Statement

The runoff is causing erosion between the culvert through West Alpine Lane and the lake (see Photo #1). The area is very steep (approximately 1:1 slopes) and the culvert has been undercut and a section has separated (see Photo 2). The area is unstable and could cause problems with the adjacent lots and associated septic systems. When runoff reaches the lake just downstream of the culvert it is believed to be depositing sediment and nutrients both from the bank erosion near the culvert and the agricultural runoff further up in the watershed.

Project Objective

The object of the project is to reduce the agricultural runoff and channel sediments reaching the lake and to stabilize the area just downstream of West Alpine Lane.

Proposed Solutions / Project Concepts

The first part of the proposed solution is to address the agricultural runoff from areas west of 117th Ave. The large tiled wetland (Wetland #2) is likely trapping much of the sediment that is carried into it because of the subsurface inlet. This area could be improved by establishing vegetative buffers surrounding the wetland basin. This would further prevent sediment from entering the basin and further reduce the potential for sediment and nutrients from entering the lake.

The north wetland (Wetland #1) and the associated drainage area have the potential to be a significant source of sediment and nutrients. This partially drained wetland has a surface ditch that flows west under 117th Ave and then through a wooded area to the culvert under West Alpine Lane. The surrounding fields have steep slopes and are currently in row crop production. During significant rainfall events, agricultural runoff

from this area can flow directly to Bijou Lake. The ideal solution for this area would be to restore the wetland basin with a ditch plug, replace the surface ditch with a grassed waterway, and install vegetated buffers around the wetland basin.

The restored wetland basin would likely be a type 3 cattail marsh. This would hold surface water for much of the growing season and would provide storage for runoff. This would reduce the peak flows to the lake and trap sediment and nutrients, preventing them from entering the lake. The grassed waterway involves reshaping the ditch into a flat or parabolic cross section shape and seeding the channel with grass. Grassed waterways typically need regular mowing to maintain the necessary cover and occasionally reshaping of the channel. In some cases a subsurface tile can be installed to keep the waterway surface dry enough to facilitate regular maintenance. The purpose of the waterway is to prevent any erosion from occurring between the wetland and 117th Ave. The grass in the waterway will also slow the runoff compared to bare soil and can trap sediment that enters the waterway directly from the field.

If the current landowner is not receptive to restoring the wetland and constructing the waterway, the installation of vegetative buffers is another method that could provide erosion control benefits. If buffers were established on either side of the existing ditch and surrounding the wetland, they would function to slow the runoff entering the ditch and wetland trapping sediment and preventing it from entering the lake. The cessation of tillage adjacent to the ditch system and the establishment of the vegetation would also help to stabilize the ditch banks preventing erosion within the ditch.

Installing these soil conservation and water quality projects is dependent on landowner decisions. A number of conservation programs are available that could provide financial assistance in establishing these projects. Most of these programs require a portion of the costs to be locally matched (usually paid by the landowner). Typically this is a percent of the installation (construction) cost of a project. Watershed District funds are also eligible local matching funds. The Watershed District could provide the local match for the installation of the projects, relieving the landowner of any project costs.

One program that may be the most desirable for this area is the Conservation Reserve Program (CRP) program. In this program the local matching cost is minimal and the landowner gets both an up front bonus payment as well as yearly payments. The buffer strips are typically enrolled in the program for 15 years at a time. The Watershed District could supplement the bonus payment if needed to successfully initiate the project. The District will have to engage in discussions with the landowners and try to determine what type of projects, programs, and funding packages are most receptive.

The second part of the project would be to address the erosion and bank stability problems between West Alpine Lane and the lakeshore. One approach to this area would be to replace the existing pipe with a much longer pipe that would extend beyond the area that is eroding, approximately 75% of the distance between the road and the lakeshore. The entire gully could be filled in to match the adjacent slopes down to the lakeshore. At

the downstream end of the new culvert, the area would be armored with riprap to prevent any erosion and reduce the runoff velocity prior to entering the lake.

The area upstream of the culvert could be evaluated as a storage area. This may require a survey of the surrounding area. If this area proves to be feasible as a retention area, a stand pipe could be installed on the west side of the road. This would act to trap sediment and nutrients and prevent them from entering the lake (see Figure 2). A ground survey will be required to ensure proper sizing of the drop structure and outlet pipe.

Funding assistance for these projects could be obtained through soil conservation assistance programs. The state cost share program, which is administered by the Becker Soil and Water Conservation District (SWCD) is one possibility. Unfortunately, funding levels are typically low and competition for the funds can be challenging. However, challenge grants and special project funding sources have been used in the past for similar projects. Coordination with the SWCD and NRCS will be vital in successfully receiving funding assistance from these programs.



Photo #1 - Gully Looking East from West Alpine Lane



Photo #2 - Separated Culvert Just Downstream of West Alpine Lane



Bijou West Side Investigation
Figure 1

Scale:	Drawn by:	Checked by:	Project No.:	Date:	Sheet:
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