Comprehensive Drainage Management Project in Morrison County, MN

Mike Becker, Morrison Soil And Water Conservation District
John Kostreba, Morrison County Public Works
Morrison County

COUNTY BASICS:

Morrison County has an area of 737,783 acres. Approximately 202,000 acres (27.4%) are forested, 198,500 acres (26.9%) are pasture and grasslands, 150,300 acres (20.4%) are row crop agriculture, 122,100 acres (16.5%) are wetlands, 19,700 acres (2.7%) are open water, and 45,200 (6.1%) are urban and other uses.

The scope of this plan is the entire area of Morrison County, which includes 16 cities and 30 townships.

From 2000 to 2010 the population in Morrison County increased by 4.7%, the 34th fastest growing county of Minnesota's 87. Much of this growth was concentrated in the cities of Royalton, Pierz, and Randall, with Two Rivers and Elmdale Townships also showing three figure increases. The following map shows the breakdown of population increases by minor watershed.
The Drainage Data Base Management Project started in 2013 with Morrison County Public Works
Partnership Challenge #1 – How do you re-create data base documentation from paper, legacy or user knowledge data bases?
Partnership Challenge #2 – How do you manage information communications between agencies eliminating time consuming redundant information?

**STATE:**
- BWSR – Minnesota Board of Water and Soil Resources
- Camp Ripley – MN National Guards Camp Ripley Training Center
- DNR – MN Department of Natural Resources
- MPCA – MN Pollution Control Agency
- MDA – MN Department of Agriculture
- MDH – MN Department of Health
- MnDOT – MN Department of Transportation
- CWF – Clean Water Council
- WRC – University of MN Water Resources

**LOCAL:**
- Morrison County Planning and Zoning
- WCTSA – West Central Technical Service Area
- Morrison County Highway Department
- Morrison County

**FEDERAL:**
- NRCS – USDA Natural Resources Conservation Service
- USACE – USA Army Corps of Engineers
- FSA – USDA Farm Service Agency
Morrison County Drainage Management Project Partnership

Morrison County Public Works

Morrison Soil and Water Conservation District

Morrison County Land Services
Morrison County and MSWCD chose to use a **CUSTOMIZABLE** Data Base Management System to support agency OPTIONS of the Drainage (Water) Management Plan.
RtVision developed a WEB database to meet these and other design objectives...

**Objective B**: Study and comprehend the hydrology and storm water management through evaluating watershed changes in surface water elevations in Morrison County.

**Action 1**: Inventory the culverts for size, condition, and elevation to understand the surface water flow in Morrison County. (LCCMR project 2018-2019)
Lead: SWCD

**Action 2**: Tie culvert information into Lider mapping tool to develop a hydrology model showing project impacts for local government decision makers.
Lead: SWCD

**Action 3**: Develop necessary regulation and/or ordinances on culvert sizing and tile drainage.
Lead: SWCD/Townships/Morrison County Public Works/Morrison County Land Services Dept.

**Objective Partners**: SWCD, Land Services Dept., County Board, DNR-Ecological Services, MN Geological Survey, LCCMR

**Financial**: State and local grants

**Timeframe**: 2017-2019

**Measurable Results**:
- Culvert inventory completed and hydrologic model developed.
- Ordinance drafted and adopted by the County Board

**Objective H**: Complete and implement the developing Morrison County Comprehensive Drainage Management Plan and maintain the culvert inventory being conducted.
Customized Data Base Design challenge:

How do you track the wealth of data available from multiple agencies who provide advice and recommendations for drainage activity that will create useful information for Counties and Townships?

“Research, Interviews and Development”
TRANSPORTATION RESEARCH SYNTHESIS

State of the Practice for Managing, Maintaining and Operating Culverts: A Review of Deterioration Curve and Tools

Introduction

When considering the service lives of culverts, MoDOT generally relies on predictions of the durability of the pipe materials with which they are constructed. However, because of varying environmental conditions and other factors, the methods used are subject to assumptions. MoDOT is looking for other factors that affect the service life of culverts under 3 feet in diameter and these factors can be incorporated into mathematical models of culvert deterioration.

To gather information for this effort, MoDOT & Associates conducted a literature search on the state of the practice for managing, maintaining and operating culverts as well as the effects of maintenance activities on culvert deterioration. Anecdotal information and the findings are summarized in the following:

1. What are the best practices for maintaining and operating culverts?
2. What maintenance activity will be performed for the future?

MoDOT & Associates identified several factors that affect the service life of culverts under 3 feet in diameter:

- Environmental conditions
- Construction quality
- Maintenance activities
- Service life

MoDOT & Associates is in the process of developing a methodology for predicting the service life of culverts under 3 feet in diameter. This methodology will be used to develop mathematical models of culvert deterioration.

Airlifted Data Sheet (Front)


table

<table>
<thead>
<tr>
<th>Culvert Categories</th>
<th>Number of Repairs</th>
<th>Average Repair Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>314</td>
<td>$8,430</td>
</tr>
<tr>
<td>Highway 1</td>
<td>292</td>
<td>$22,120</td>
</tr>
<tr>
<td>Sidewalk</td>
<td>9</td>
<td>$3,550</td>
</tr>
<tr>
<td>Entrance</td>
<td>2</td>
<td>$2,300</td>
</tr>
<tr>
<td>Pipe</td>
<td>9</td>
<td>$12,570</td>
</tr>
<tr>
<td>End of Pipe</td>
<td>2</td>
<td>$3,000</td>
</tr>
<tr>
<td>Counter</td>
<td>2</td>
<td>$2,710</td>
</tr>
<tr>
<td>Shoulder</td>
<td>4</td>
<td>$4,060</td>
</tr>
<tr>
<td>Total</td>
<td>559</td>
<td>$11,270</td>
</tr>
</tbody>
</table>

MoDOT & Associates conducted a literature search on the state of the practice for managing, maintaining and operating culverts as well as the effects of maintenance activities on culvert deterioration. The methodology for predicting the service life of culverts under 3 feet in diameter will be used to develop mathematical models of culvert deterioration.
State - Data Base Design Research
Federal - Data Base Design Research

HYDRAULIC DESIGN OF HIGHWAY CULVERTS
Third Edition

Reducing Damage from Localized Flooding
A Guide for Communities
FEMA 511 / June 2005
Legal Liability for Flood Problems

When individuals receive damage from flooding or erosion they often file lawsuits against governments, claiming that the government has caused the damage, contributed to it, or (in some instances) failed to prevent or provide adequate warnings of the hazard. Such lawsuits are expensive for governments not only because damage awards are growing but also because of attorney and expert witness fees... Courts have often held governmental units liable for inadequately maintaining or operating culverts, bridge crossings, channelization projects, and dams.

Kasler (2004)

Costs to Local Government

Localized flooding can cause damage to public property, particularly if the flooding recurs periodically. Even though they are intended to withstand some abuse, sidewalks, streets and roads, benches, trash cans, fences, public buildings, signs, and other public property suffer additional wear and tear from flooding and will require repair, replacement, or repainting more frequently than normal.

Another cost of flooding is the diversion of local government staff and resources. Flood fighting, repairs to public buildings, extra trash collections, and cleanup of public property are all expenses that are borne by the public.
Morrison County Public Works Management and Users to determine what data needed to be tracked and what information was required for reporting:

Mission Objectives:
• Culvert Status?
• GPS location?
• Changes in elevation?
• Road Conditions above culvert?
• Maintenance activity required?
• Equipment needed?
• User interface requirements?
• What culverts types?
From the office the County or Township’s could enter “approximate” culvert locations without a GPS.
We can now drive right up to “approximated” located culverts using GPS “Auto-pick” and enter the complete survey and inspection data required.
Morrison County started with GPS (X,Y,Z) inspection and field level culvert status reporting.
Design the user interface that allows for multiple agencies to define exactly what they want to track.
Created a baseline of culvert inspection information using centimeter GPS technology
We created field level inspection reporting and filtering for specific searches for maintenance activities.
WEB Data Base Design: Browser, Hardware Independent
Documentation and inspection
Water Plan Partnership

Comprehensive Local Water Plan

One Plan-Five Watersheds

2017-2021

"Managing, Protecting, and Enhancing the Water and Land Resources for the use and enjoyment of the citizens and visitors of Morrison County"
EXECUTIVE SUMMARY

The Morrison Soil and Water Conservation District (SWCD) assumed the task of the local water plan update in April of 2016. A ten year plan was approved by MN Board of Water and Soil Resources (BWSR) in 2010 with an update due in 2015. However, due to workload and the action by the county to conduct and develop an updated Comprehensive Land Use Plan, a request was made for a 2 year extension. The BWSR Board approved the extension in October of 2012.

In the five year period since the 2010 plan was approved, MN Board of Water and Soil Resources began encouraging One Watershed One Plan to be the new operational guideline. Application for a pilot plan was not approved in 2014 but it is recognized that watershed planning is the new norm and the SWCD has already been actively involved in multiple watershed planning efforts. However, Morrison County has five major watersheds, not one, and each of those five watersheds have VRA Plan either completed, or in the process so the updated plan will focus strategies and objectives by watershed, within the jurisdiction of Morrison County.

In addition, in 2015 the county was mandated to develop an Aquatic Invasive Species Plan, and that will be addressed under Surface Waters and added as a reference of the update.

A survey has been distributed in the local newspaper, to all lake associations, at multiple civic meetings, to all township officials, and is available on our website. Response to the survey has been moderately active.

It is important to the Morrison County Board of Commissioners, the Morrison County Land Services Dept., and to Morrison SWCD that the Morrison County Comprehensive Land Use Plan and the Morrison County Local Water Plan be simultaneously written to be supporting documents in land use decision making. In addition, when compatible, it clearly defines the focus and goals of the protection of lakes, rivers, streams, and wetlands as well as ground water for the safety of our citizens.

BACKGROUND AND PURPOSE OF LOCAL WATER PLANNING

Water management in Minnesota developed as a result of the statewide drought in the late 1970s which caused the legislature to encourage more effort at the local level to develop and implement local water management plans to better conserve and protect water and related land resources. County water planning efforts began in earnest in the late 1980s as state funding assisted local units of government in developing their water plans. Water planning developed under the legislative
Objective H
Complete and implement the developing Morrison County Comprehensive Drainage Management Plan and maintain the culvert inventory being conducted.
Objective B: Study and comprehend the hydrology and storm water management through evaluating watershed changes in surface water elevations in Morrison County.

Action 1: Inventory the culverts for size, condition, and elevation to understand the surface water flow in Morrison County. (LCCMR project 2016-2019)
Lead: SWCD

Action 2: Tie culvert information into Lidar mapping tool to develop a hydrology model showing project impacts for local government decision makers.
Lead: SWCD

Action 3: Develop necessary regulation and/or ordinances on culvert sizing and tile drainage.
Lead: SWCD/Townships/Morrison County Public Works/Morrison County Land Services Dept.

Objective Partners: SWCD, Land Services Dept., County Board, DNR-Ecological Services, MN Geological Survey, LCCMR
Financial: State and local grants
Timeframe: 2017-2019

Measurable Results:
- Culvert inventory completed and hydrologic model developed.
- Ordinance drafted and adopted by the County Board

Objective C: Ensure that land use decisions for shore-land development take environmental impacts into consideration.
MSWCD started out using the data captured by Morrison County Public Works in 2016.
MSWCD created their own (similar) user interface
MSWCD extended the number of GPS shots from 2 to 5 at each Township culvert added.
MSWCD then created reports that were needed for the Drainage Plan reporting requirement.
MSWCD excel report from data created for townships and other partners.

<table>
<thead>
<tr>
<th>Township</th>
<th>Location ID</th>
<th>County Road</th>
<th>Road Name/Number</th>
<th>Wetland Adjacent</th>
<th>Wetland Location</th>
<th>Wetland Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little Falls 16</td>
<td>16-07e-01</td>
<td>CR 264</td>
<td></td>
<td>Yes</td>
<td>North,South,South-West,North-West</td>
<td>Type 2</td>
</tr>
<tr>
<td>Little Falls 16</td>
<td>16-07e-02</td>
<td>CR 264</td>
<td></td>
<td>Yes</td>
<td>North,South</td>
<td>Wetland ditch type 2</td>
</tr>
<tr>
<td>Little Falls 16</td>
<td>16-07e-03</td>
<td>CR 264</td>
<td></td>
<td>Yes</td>
<td>North,South</td>
<td>Wetland ditch</td>
</tr>
<tr>
<td>Little Falls 16</td>
<td>16-07e-04</td>
<td>CR 264</td>
<td></td>
<td>Yes</td>
<td>North,South</td>
<td>Wetland ditch</td>
</tr>
<tr>
<td>Little Falls 16</td>
<td>16-07e-05</td>
<td>CR 264</td>
<td></td>
<td>Yes</td>
<td>North,South</td>
<td>Wetland ditch</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Township</th>
<th>Location ID</th>
<th>County Road</th>
<th>Road Name/Number</th>
<th>Wetland Adjacent</th>
<th>Wetland Location</th>
<th>Wetland Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little Falls 16</td>
<td>16-07e-01</td>
<td>CR 264</td>
<td></td>
<td>Yes</td>
<td>North,South,South-West,North-West</td>
<td>Type 2</td>
</tr>
<tr>
<td>Little Falls 16</td>
<td>16-07e-02</td>
<td>CR 264</td>
<td></td>
<td>Yes</td>
<td>North,South</td>
<td>Wetland ditch type 2</td>
</tr>
<tr>
<td>Little Falls 16</td>
<td>16-07e-03</td>
<td>CR 264</td>
<td></td>
<td>Yes</td>
<td>North,South</td>
<td>Wetland ditch</td>
</tr>
<tr>
<td>Little Falls 16</td>
<td>16-07e-04</td>
<td>CR 264</td>
<td></td>
<td>Yes</td>
<td>North,South</td>
<td>Wetland ditch</td>
</tr>
<tr>
<td>Little Falls 16</td>
<td>16-07e-05</td>
<td>CR 264</td>
<td></td>
<td>Yes</td>
<td>North,South</td>
<td>Wetland ditch</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Township</th>
<th>Location ID</th>
<th>County Road</th>
<th>Road Name/Number</th>
<th>Wetland Adjacent</th>
<th>Wetland Location</th>
<th>Wetland Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Little Falls 16</td>
<td>16-07e-01</td>
<td>CR 264</td>
<td></td>
<td>Yes</td>
<td>North,South,South-West,North-West</td>
<td>Type 2</td>
</tr>
<tr>
<td>Little Falls 16</td>
<td>16-07e-02</td>
<td>CR 264</td>
<td></td>
<td>Yes</td>
<td>North,South</td>
<td>Wetland ditch type 2</td>
</tr>
<tr>
<td>Little Falls 16</td>
<td>16-07e-03</td>
<td>CR 264</td>
<td></td>
<td>Yes</td>
<td>North,South</td>
<td>Wetland ditch</td>
</tr>
<tr>
<td>Little Falls 16</td>
<td>16-07e-04</td>
<td>CR 264</td>
<td></td>
<td>Yes</td>
<td>North,South</td>
<td>Wetland ditch</td>
</tr>
<tr>
<td>Little Falls 16</td>
<td>16-07e-05</td>
<td>CR 264</td>
<td></td>
<td>Yes</td>
<td>North,South</td>
<td>Wetland ditch</td>
</tr>
</tbody>
</table>
MSWCD exported their culvert data to create usable GIS information with Morrison County.
MSWCD added the ability to track “Miscellaneous” items while in the field.
MSWCD Miscellaneous item tracking

Pipe exposed but complete sedimented full, erosion uphill

Morrison SWCD

Junction manhole
MSWCD Right-Of-Way tracking
We wanted to measure combinations of X, Y and Z distances.
The software is setup for each township to can create their own list of assets to enter and view.
Software is customizable to add items to track... *signs, ditches, mailboxes, gravel road data, can all be in One Data Base view.
Centrally located web server can supply data to multiple groups.
Land Services integration with County Culvert data for permitting and inspection requirements
We are working towards integrating this County Culvert data with Public Works permitting for new culvert installations.
Value is to Morrison County Citizens

It is important to the Morrison County Board of Commissioners, the Morrison County Land Services Dept., and to Morrison SWCD that the Morrison County Comprehensive Land Use Plan and the Morrison County Local Water Plan be simultaneously written to be supporting documents in land use decision making. In addition, when compatible, it clearly defines the focus and goals of the protection of lakes, rivers, streams, and wetlands as well as ground water for the safety of our citizens.
Questions ???
MCPW IS MOVING TOWARDS ENTERPRISE

PAPERLESS PROCESSING AND REPORTING

CULVERTS
ROADS
DITCHES
SIGNS
LIGHTING
PROJECTS
(OneOffice)
PERMITS
(OneGov)
TIMECARD (TimeCard+)
CIP (Road and Bridge)
MAINT.