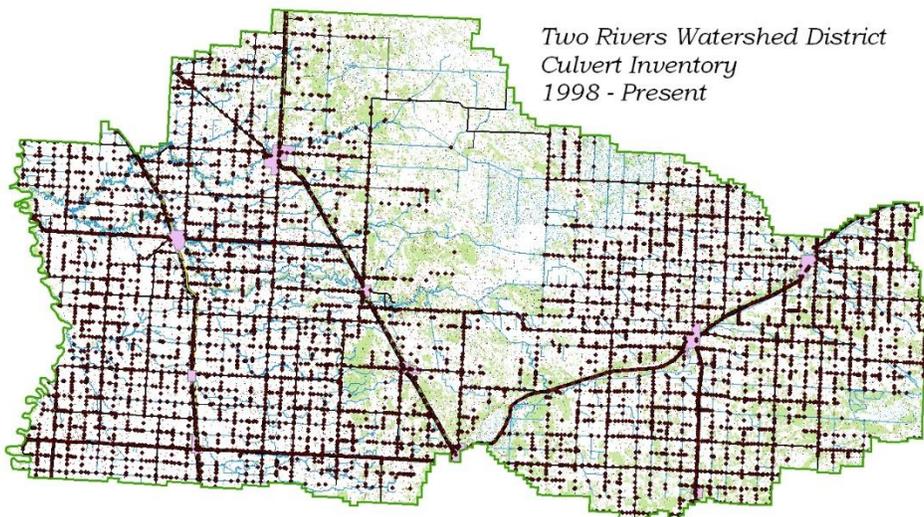


# TRWD Culvert Sizing Policy Provides Both Drainage & Flood Control Benefits

Flooding in the Red River Valley is a well-known and well documented phenomenon from the south end of the valley to the north. Spring floods as well as summer floods, like the summer rains experienced each of the last two years, can cause serious damages to roads, ag land, culverts, farmsteads, cities, and other properties. Annual damages to public infrastructure and private lands can be large. The economic impacts of these floods can include reduced income from crop losses, increased taxes to pay for public damages, relocation of homes due to repeated and excessive flooding, and continual maintenance costs for debris cleanup, repairs, and structure replacement.

The Two Rivers Watershed District and the Red River Watershed Management Board are continually looking for ways help reduce flood damages. Technical papers have been developed in which scientists, engineers, economists and others analyze the various ways to best reduce flooding. Some of the tools used include construction of projects that

- 1) reduce flood volumes (projects to slow or hold runoff),
- 2) increase conveyance (ditching or diversions to get water away ahead of Red River flooding),
- 3) increase temporary flood storage (impoundments), and
- 4) provide protection or avoidance (ring dikes, floodproofing, buyouts, etc.).



*Two Rivers Watershed District  
Culvert Inventory  
1998 - Present*

***Locations of culverts within the Two Rivers Watershed District. Culvert sizing can be an important tool in reducing flooding and erosion.***

and 'North Branch' projects provide drainage and ditch capacities designed to remove the water from the landscape in order to prevent crop damages. Over the years, the District has been involved with the design, funding, and construction of 22 farmstead ring dikes.

Locally the Two Rivers Watershed District has applied these tools in various ways. The 'Nereson' and 'Ross' projects are large scale impoundments that have been constructed totaling over 9,000 acre feet of storage, and the 'Klondike Clean Water Retention Project' is being planned to provide another 37,000 acre feet. The 'Springbrook' project constructed set back levees along an existing waterway to prevent water from breaking out. Others like our 'Soler 4', 'Dewey 5', 'Kennedy 6', 'Middle Branch',

In many cases management of the floodwaters becomes a balancing act to try and provide protection for cropland and infrastructure, but at the same time to regulate flows so that

downstream areas do not become overly inundated. Extreme care must be taken in doing a project that a flooding problem is reduced but does not just move it from one spot and put it on other lands. During times of flooding and excessive runoff, tempers can flare and projects can be hastily implemented that may benefit some but at the same time increase flooding for others.

One philosophy that has been used is the “adequate and equitable” idea. **Adequate** refers to providing enough drainage to prevent a majority of crop losses, and **equitable** refers to equal distribution of positive and negative effects of drainage in all areas of a watershed from the upstream end of a drainage system to the downstream end.

One of the methods of providing adequate and equitable benefits is culvert sizing. This flood reduction tool uses the idea of better utilizing distributed temporary storage and metering runoff without causing a significant increase in the risk of flood damage where runoff is temporarily stored. It not only can reduce downstream flood peaks, it also can provide a more uniform level of flood protection within a drainage system. It may not work in every situation, but if implemented systematically it can have significant positive impacts in most areas.

The guiding principles for culvert sizing are as follows:

- Risk to highways should not exceed current standards for safety and maintenance
- Risk to developed properties upstream of road crossings should not exceed accepted standards
- Benefits of drainage should be equitable throughout the drainage system
- The drainage system should detain water in excess of downstream channel capacity, to the extent practical
- Temporary storage of water on cropland should be uniformly distributed throughout the drainage system, to the extent practical
- Detention of water on cropland for most rainfall events should be no longer than 24 to 48 hours to avoid crop damages
- The recommended design methodology should be easy to apply, yet comprehensive enough to provide safe roads and an adequate and equitable drainage system
- Culvert sizing can be implemented either one site at a time, or over an entire sub-watershed area all at once. Benefits will be realized quicker by doing an entire sub-watershed.

The Two Rivers Watershed District has been using culvert sizing when issuing permits for culverts since 1996. When considering culvert sizing, permitting agencies and drainage authorities need to consider the effects on crops, erosion and sedimentation concerns, damage to roads, and damage to buildings. These considerations relate to duration of flooding, high flows (out of bank), peak flows (road overtopping), and peak stages. Culverts are sized according to the number of acres that drain through them. For small drainage areas smaller culverts are used, and as drainage areas increase the recommended culvert size incrementally increases. In an ideal situation of adequate and equitable drainage, all of the culverts in a watershed area would be sized accordingly, and they all would then be working together to meter flows, reduce flood damages, provide 24-48 hour drainage for crops, and spread out both the benefits and damages throughout the entire watershed.

The District has found that this strategy tends to work the best when implemented in smaller watersheds. It is important to note that in order to maximize the benefits of culvert sizing, the culverts located the furthest upstream are the most important ones to get the right

size. Culvert sizing by itself most likely will not eliminate flooding, but it is a way to drastically reduce flooding. The TRWD will continue to utilize this tool in order to help with flooding issues. Further information regarding culvert sizing can be obtained by contacting the District office in the Kittson County Courthouse, Hallock, MN.

## Red River Watershed Management Board Provides Resources for Flood Damage Reduction



### HISTORY OF THE RED RIVER WATERSHED MANAGEMENT BOARD

**(RRWMB):** The RRWMB was formed in 1976 by the Minnesota Legislature due to several years of repeated and severe flooding in the Red River Basin.

As a result, a Joint Powers Agreement was developed to form the Lower Red River Watershed Management Board (LRRWMB).

The LRRWMB was created for instituting, coordinating, and financing projects and programs to alleviate flooding and to assure the beneficial use of water in the watershed of the Red River of the North and its tributaries.

The 1976 legislation gave the LRRWMB authority to allow member watershed districts to levy up to two mills ad valorem tax for flood water retention projects. One-half of the tax collected is retained by individual member watershed districts for projects within the district while the other half being transferred to the LRRWMB.

Legislation in 1991 changed the name of the LRRWMB to the RRWMB and redefined the authority of the Board to also develop, construct, and maintain projects and programs of benefit to the Red River Basin.

**PRINCIPAL OBJECTIVE:** The principal objective of the RRWMB is to assist member watershed districts with the implementation of water related projects and programs. The purpose of these projects and programs is the reduction of local and mainstem flood damages, and also to enhance environmental and water resource management. Projects and programs must be of benefit to the Red River Basin and its member watershed districts in order to qualify for RRWMB funding.

The principal objective of the RRWMB, as stated above, is derived from legislation passed in 1976 and 1991. This objective is also in direct support of the RRWMB's mission statement. In addition to the RRWMB's principle objective, the Board has adopted several supporting objectives. Taken as a whole, the principal and supporting objectives below form an overall policy for the RRWMB.

- Coordination
- Financial Support
- Basin Planning
- Water Quantity
- Water Quality
- Erosion and Sedimentation
- Education
- Research
- Public Information
- Conflict Resolution

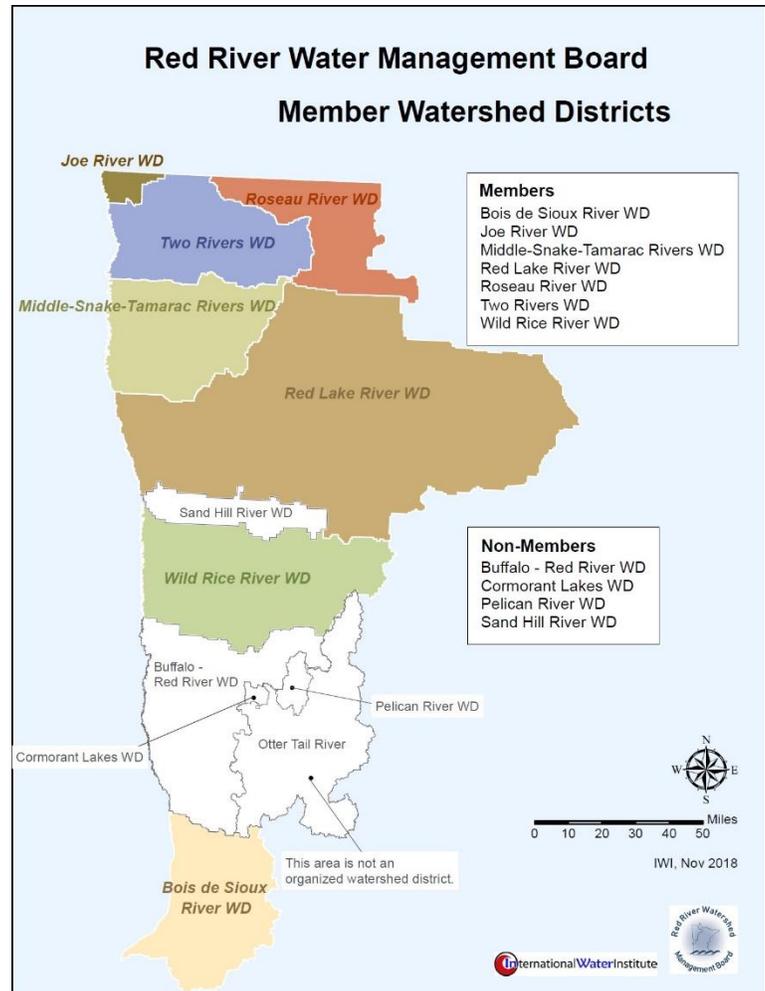
- Policies, Rules, and Regulations of Other Entities

**RRWMB MISSION:** The principal objective of the RRWMB is to assist member watershed districts with the implementation of water related projects and programs. The purpose of these projects and programs is the reduction of local and mainstem flood damages and to enhance environmental and water resource management.

**RRWMB MEMBERSHIP:** There are currently seven watershed districts that are part of the Joint Powers Agreement as noted in the map below. Twenty-one counties are also located within the jurisdictional boundary of the RRWMB.

**SERVICES PROVIDED TO MEMBER WATERSHED DISTRICTS:** The RRWMB is a unified voice for its member watershed districts in Northwest Minnesota and provides the following services to its members including but not limited to:

- Financial Resources for Flood Damage Reduction Projects
- State and Federal Lobbying Efforts
- Coordination of Legal Services
- Tracking of Permit and Regulatory Processes
- Allocation of Financial Resources for Stream Gauging Activities
- Water Quality Studies, Research Initiatives, Modeling, and Engineering Efforts
- Regional Planning Efforts
- Education and Outreach
- External Funding for Several Partner Initiatives That Meet the RRWMB Mission, Principal Objective and Supporting Objectives



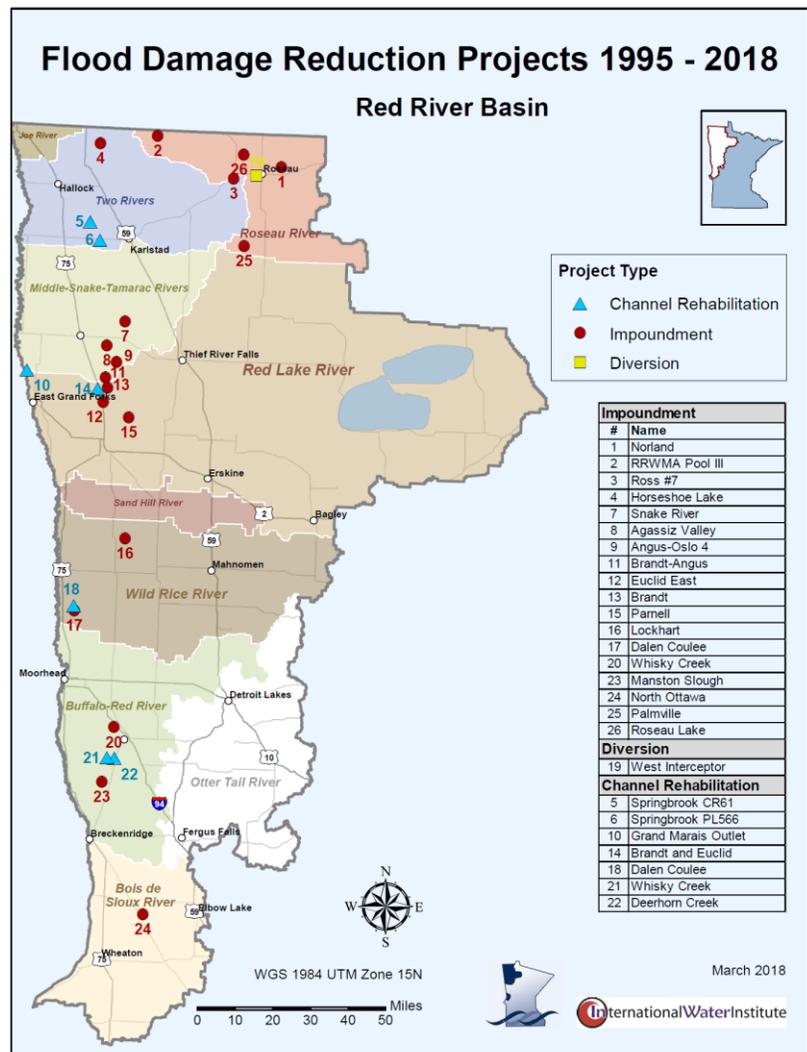
## PROGRAMS AND ACCOMPLISHMENTS:

- **Regional Flood Control** – Over 40 flood control projects have been constructed in the Minnesota portion of the Red River Basin since the late 1970s and early 1980s. These projects provide critical protection for urban centers, cities, rural areas and reduces risk for public and private infrastructure that has been constructed or improved. The map on the next page illustrates projects constructed since 1995. It should be noted that several additional projects are in various phases of planning, engineering, design, and permitting.

- **Rural Ring Dike Program** – This program has resulted in over 270 individual ring dikes being constructed since 1997 to protect farmsteads and on-farm agricultural infrastructure such as certified seed storage, general grain storage, grain handling systems, chemical storage, machine sheds and shops, and related items. The total amount spent on this activity by the RRWMB during that time frame is approximately \$2,550,000.

Other funding partners include:

- State of Minnesota at \$5.1 million dollars (50% cost-share).
- USDA NRCS at \$1.2 million dollars through the EQIP/AWEP programs at the federal level.
- Local watershed districts and landowners have also contributed approximately \$2 million to the cost of design and construction.



- **USGS Stream Gauge Program** – This United States Geological Survey (USGS) program has been funded by the RRWMB for several years and provides funding to the USGS in partnership with its member watershed districts to monitor water levels in rivers and streams in the Red River Basin of Minnesota. This program provides real-time information to local watershed managers during times of flood. More information about water levels can be found at this website: <https://waterdata.usgs.gov/mn/nwis/rt>
- **Additional Investments** – The RRWMB has allocated significant financial resources into other programs and efforts that include but are not limited to the following:
  - Hydrology and Hydraulics Modelling and Studies: The RRWMB is a major partner with the US Army Corps of Engineers and other agencies to develop models of the Red River to study flooding and develop flood damage reduction strategies
  - LIDAR and GIS Technology: The RRWMB provided funding in 2008-2009 to spearhead a regional project to collect and provide elevation data for the entire Red River Valley
  - Education and Outreach

- Coordination Efforts With Partners and Stakeholders: Many collaborations have been initiated and completed with various entities, including the Red River Retention Authority, the Red River Basin Commission, the International Water Institute, the Flood Damage Reduction Work Group, and the MN DNR.
- Services to its Member Watershed Districts

### **How Watershed Districts Are Funded:**

Each watershed district in Minnesota may levy annually for a general fund. This ad valorem tax, known as the “Administrative Levy,” is based on property value, rather than benefits. The watershed district general fund levy may not exceed 0.048 percent of the taxable market value – or \$250,000 – whichever is less. This annual levy must be determined and justified through the watershed district’s annual budget process. Watershed districts also receive funds from “Ditch Assessments,” based on benefits that legal ditches provide to landowners. Assessments collected by county auditors are distributed to local watershed districts twice a year. These funds can only be spent on legal ditch maintenance.

**The RRWMB Levy:** Each of the local watershed district members of the RRWMB may also levy another “*ad valorem*” tax not to exceed 0.04836 percent of the taxable market value of all property within the district. The RRWMB sets the “Red River Watershed” levy each July:

- Half of this levy is credited to the watershed district construction fund for the development, construction, and maintenance of projects and programs that benefit the **local** watershed district.
- The other half of this levy is credited to the general fund of the RRWMB to fund the development, construction and maintenance of projects and programs that benefit the **Red River Basin**.

**Other Funding Partners:** The RRWMB is part of the Red River Retention Authority (RRRA), which is a joint powers agreement with the North Dakota Joint Water Resource District. The RRRA primary objective is to ensure joint, comprehensive, and strategic coordination of retention projects in the Red River of the North Watershed and facilitating implementation and construction of retention in the Red River Basin. The RRRA received federal funding via the 2014 Farm Bill to develop comprehensive watershed plans in Minnesota and North Dakota for approximately 20 projects. More information about the RRRA can be found at the following website:

<https://www.redriverretentionauthority.net/>

### **1998 RED RIVER BASIN FLOOD MEDIATION AGREEMENT:**

The RRWMB is involved with and supports efforts of the Red River Basin Flood Damage Reduction Work Group to guide implementation of a mediated settlement that was finalized in 1998. This agreement calls for the protection of agricultural lands from 10-year summer storm events. The agreement also requires the inclusion of natural resource enhancements or benefits when flood damage reduction projects are engineered, designed, and constructed.

MEDIATION AGREEMENT WEBSITE: <http://www.rrwmb.org/FDRWG/FDRAGMT.pdf>

**RRWMB Contact Information:**

Robert L. Sip Executive Director  
11 5<sup>TH</sup> Avenue East, Suite B Ada, MN 56510  
[Rob.Sip@rrwmb.org](mailto:Rob.Sip@rrwmb.org)  
218-784-9500 (Office)

**Website:** [www.rrwmb.org](http://www.rrwmb.org)

**Facebook Page:** [https://www.facebook.com/RedRiver\\_WatershedManagementBoard](https://www.facebook.com/RedRiver_WatershedManagementBoard)