Agricultural/Rural Riparian Buffer Analysis

December 2014

Executive Summary

The Agricultural/Rural Riparian Buffer Analysis was developed from a 2014 analysis of current requirements for the riparian areas of certain watercourses. This analysis includes a summary of these requirements.

Purpose

The primary purpose of this analysis is to quantify the extent to which riparian areas are subject to regulation.

Key Finding

Approximately 64% of riparian areas of watercourses that were analyzed are not governed by current laws or regulations. Due to the unavailability of data for private ditches and small (intermittent) watercourses at the time of analysis, the percent of riparian areas not governed by current laws and regulations is expected to be higher than 64%.

Introduction

The Agricultural/Rural Riparian Buffer Analysis is not a comprehensive study but instead has been developed to:

- Summarize the benefits of buffers,
- Evaluate the current regulatory and voluntary approaches in use today in Minnesota, and
- Define an estimate in the 67 Minnesota Counties where cropland encompasses at least 30% of the landuse, of where buffers are required by statute or rule and where they are not.

Current regulations for buffers are defined in Shoreland Rules (MN Rule, Chapter 6120, Shoreland and Floodplain Management) and MN Statutes Chapter 103E Drainage law. Due to ongoing confusion and public misperceptions over where buffers are required under these regulations, an analysis of the percent of regulated and non-regulated river, stream and ditch miles in the 67 counties of the state with >30% cropland was conducted and used in this analysis.

Definitions

Definitions relevant to this analysis include:

Riparian: Of, pertaining to, or located on or adjacent to the bank of a watercourse or other water body.

Riparian Buffer: An area along and adjacent to a water body that buffers the effects of adjacent land use on the water body. This typically involves a set back of a particular land use and can involve trapping of sediment, nutrients and/or bacteria, as well as terrestrial and aquatic habitat protection and improvement.

Filter Strip: A strip of perennial vegetation with sheet flow of surface water runoff across the strip, and/or near-surface groundwater flow beneath the strip, to filter sediment, nutrients and/or bacteria from the surface water and/or near-surface groundwater. Sheet flow across a filter strip generally requires a relatively uniform controlling elevation and slope of the filter strip from the adjacent land use to the water body to avoid concentrated flow.

Functions and Values

Buffer Functions and Values

In most situations, riparian buffers provide a last line of defense before surface and shallow groundwater flow reaches a watercourse, but it is important to note that not all waters benefit equally. These buffers work best in conjunction with in-field conservation measures to reduce field runoff, erosion and nutrient transport before entrapment within the buffer area. In addition, buffers provide numerous wildlife and other environmental benefits listed below. Many buffers are not an ideal filter strip, because runoff from the adjacent land may not flow across the buffer.

Benefits

- Trap sediment and nutrients from adjacent lands. Many studies indicate >80% efficiency is possible at the field edge.
- Provide a setback distance from input's (pesticides, herbicide, nutrients, and manure) applied to adjacent lands.
- Improve stream or ditch bank stability with deep rooted plants.
- Provide an infiltration area for surface water. Land with perennial vegetation can infiltrate water at up to 10x the rate of tilled ground.
- Provide an uptake and denitrification zone for shallow subsurface flow. Native trees and grass have root systems far exceeding most agricultural crops or introduced species of grass and will draw nutrients from shallow groundwater flow. Soil biology in buffers (e.g. saturated buffers) can break down nitrates in subsurface water into harmless nitrogen gas.
- Retirement from crop production of areas that have low productivity or are inefficient to farm can provide water quality and habitat benefits.
- Provide habitat for some wildlife species if corridor is wide enough (>400') and/or the buffer connects larger habitat areas together. Aquatic habitat improvements are also realized when negative inputs to a water body are reduced and riparian zone is restored with vegetation.

Limitations

- Site conditions, such as topography, often do not allow for shallow sheet flow.
- A buffer is an edge of field practice. It is typically most effective when erosion and nutrient loss are controlled on the field before reaching the edge of field.
- Subsurface drainage, open tile intakes, and constructed drainage swales can bypass the buffer and reduce its benefits of sediment removal and nutrient uptake.

- Maintenance typically is required to remove trapped sediments and nutrients to continue maximum environmental benefits.

- Regulated buffer areas currently allow for vehicular travel, agricultural implement usage, intense harvest, deposition of spoil, unspecified vegetative species, and routine chemical applications for weed and pest control.

- Narrow buffers can be a predator sink for some wildlife species, including pollinators.

Where Buffers Are Required and Not Required - Current Regulatory Framework and Non-regulated Waters

Shoreland Rules (Part 6120.3300 Zoning Provisions)

Watercourses identified on the Public Waters Inventory (PWI), generally have greater than a 2 square mile drainage area, can be perennial or intermittent, and are governed by Shoreland Rules. Shoreland Rules, for covered PWI watercourses, are generally administered by counties who have adopted local shoreland ordinances.

For purposes of this Analysis the focus was largely on areas of the State that are dominantly agricultural. As such we provide the following agricultural standard from the Shoreland Rules and point out that under certain conditions a buffer is not always required.

Agricultural use standards – Subpart 7 Items A, B, C and D

Item A – "The shore impact zone for parcels with permitted agricultural land uses is equal to a line parallel to and 50 feet from the ordinary high water level."

Item B – "General cultivation farming, grazing, nurseries, horticulture, truck farming, sod farming, and wild crop harvesting are permitted uses if steep slopes and shore and bluff impact zones are maintained in permanent vegetation or operated under an approved conservation plan (Resource Management Systems) consistent with the field office technical guides of the local soil and water conservation districts or the United States Soil Conservation Service."

Item C - addresses feedlots.

Item D – "Use of fertilizer, pesticides, or animal wastes within shorelands must be done in such a way as to minimize impact on the shore impact zone or public water by proper application or use of earth or vegetation."

Estimates of buffer compliance

A number of surveys, inventories, studies and modeling have occurred to determine compliance with Shoreland Rules. Most have utilized aerial imagery and computer programs to assess the current land-use of the fifty foot buffer areas. In one such study by the Environmental Working Group (EWG), in 37 southern Minnesota counties 8,649 acres of 50 feet wide buffers were required and 6,364 acres were present (74% of what is required) and 2,285 acres or 26% was found to be absent. Areas with annual cropping that are covered by existing conservation plans have generally not been assessed.

MN Statutes Chapter 103E Drainage law

Requirements

Since 1977, Minnesota Statutes Chapter 103E Drainage has required the establishment and maintenance of at a minimum 1-rod (16.5 foot) buffer strips of perennial vegetation when viewers (who determine benefits and land rights costs for drainage systems) are appointed. The types of drainage proceedings that trigger the appointment of viewers and the buffer strip requirement include ditch establishment, expansion, or improvement and certain petitioned repairs that require a redetermination of benefits and damages. Ditches where these activities have not occurred since 1977 do not require a buffer strip until these proceedings occur.

Status of Chapter 103E Ditches with Buffers

In 2006 BWSR published a Public Drainage Ditch Buffer Strip Study about the use, maintenance and benefits of Chapter 103E ditch buffer strips. At that time, 12% of Chapter 103E drainage ditches had triggered the requirement for buffer strips. Since 2007, drainage authorities have been required in Chapter 103E to regularly inspect, and annually report ditch buffer strip establishment, inspection and compliance data to BWSR. Based on the reporting data through 2013, the Chapter 103E ditches requiring buffer strips has increased from 12% in 2006 to approximately 20% in 2013 (approximately 8% increase) Much of this increase is due to the number of drainage systems for which redetermination of benefits has been done to update benefits of the systems by parcel and to update the associated distribution of drainage system cost assessments to benefited lands.

Estimates of buffer compliance

The 2006 ditch buffer strip study determined that 72% of the Chapter 103E ditch miles required to have buffer strips were in compliance at that time. Although quantitative information is not available, it is expected that the requirement for ditch buffer strip reporting since 2007, including inspection and compliance information, has increased drainage inspector and drainage authority knowledge about, and compliance with, the ditch buffer strip requirements in Chapter 103E.

Where Buffers Are Not Required

The majority of watercourses in the state are not identified as PWI waters or Chapter 103E governed ditches. These watercourses are generally intermittent in nature and can be as small as a grassed waterway in a cropland field or a tributary to a larger watercourse.

Current Analysis of Regulated and Non-Regulated Waters

BWSR and MN.IT Services staff utilized current data to analyze watercourse types in four selected watersheds and for the entire state in counties that have cropland in excess of 30% of the land-use (67 of 87 counties). This analysis was done to determine the approximate percent of the following four categories of watercourses:

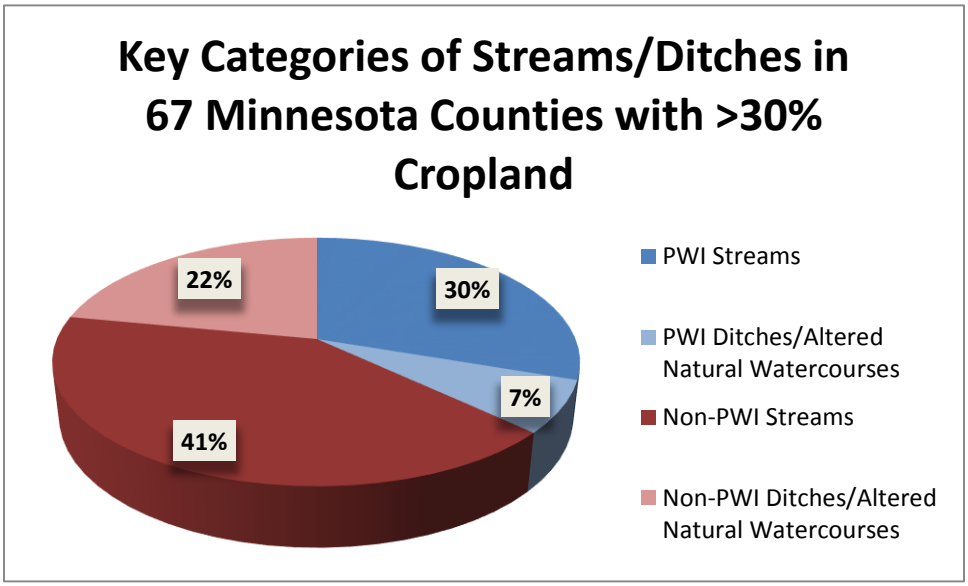
- Public Waters Inventory (PWI) streams
- PWI Ditches / Altered Natural Watercourses
- Non-PWI Streams
- Non-PWI Ditches / Altered Natural Watercourses

In addition to the four major watercourse types that were analyzed, there are also thousands of miles of primarily private ditches and watercourses that are not cataloged in available state databases and are also not covered by Shoreland Rules or MN Statutes Chapter 103E Drainage law. Therefore, the percent of watercourse miles that are regulated is expected to be smaller than what has been estimated.

Public Waters Inventory (PWI)/Non-PWI Streams Analysis

There were two main data layers used in the GIS analysis. First, a copy of the most current and complete statewide streams and ditches data was obtained from the Minnesota DNR. This layer contains at least 13,000 more miles of ditches than what is currently available via the DNR Data Deli. The second data layer used was the DNR Public Waters Inventory (PWI) which contains PWI waters found on the current paper regulatory maps. The first step in the process was to remove all streams designated as public water from the data set containing all streams and ditches. This resulted in two mutually exclusive streams/ditches layers: PWI streams and ditches, and non-PWI streams and ditches. Linear miles were then calculated for all water features in both data sets and calculated for each study area. Results concluded that within all counties that contained >30% cropland (67 of 87 counties), 37% of streams and ditches are included in the PWI and 63% are non-PWI streams/ditches.

A statewide summary completed for 67 counties with greater than 30% cropland found the breakdown of watercourse types displayed below.



Classification	Linear Miles	% Total Streams/Ditches
PWI Streams	21,642	30%
PWI Ditches/Altered Natural Watercourses	4,731	7%
Non-PWI Streams	28,760	41%
Non-PWI Ditches/Altered Natural Watercourses	15,381	22%

The analysis that was conducted can be summarized as it relates to where buffers are or aren't required statewide in the 67 counties as detailed below.

Riparian Classification	Linear Miles	% Total Streams/Ditches	Buffer Required (Feet)
Shoreland Requirement	21,642	30%	50.0
Ditch Buffer Requirement*	4,022	6%	16.5
No Buffer Requirement*	44,850	64%	0.0

** It has been calculated that approximately 20% of drainage ditches governed by MN Statutes Chapter 103E Drainage law are currently required to have at a minimum 1-rod buffer strips.*

Note: This analysis underestimates non-regulated watercourses because there are many miles of non-regulated watercourses that are currently not cataloged by DNR or other entities (private ditches, field level drainage features and small water courses) and were not able to be analyzed as part of this effort. Therefore, the true percent of non-regulated watercourses is believed to be much greater than 64%.

It is important to remember that PWI areas are governed by Shoreland Rules generally require a 50- foot buffer, while Chapter 103E Drainage law requires a minimum a one rod (16.5 foot) buffer strip width, when triggered by the appointment of viewers. To achieve environmental goals, often times a buffer width must be 100's of feet wide (not just 50 or 16.5 feet wide), depending on the site characteristics and the environmental goals to be achieved.

In addition, four major watersheds were analyzed including – the Sandhill River in NW MN, the North Fork Crow River in Central MN, Cottonwood River in SW MN and finally the Root River in SE MN (see Appendix A for maps and data for these four watersheds). This analysis was done to illustrate that the percent of watercourses by category vary from one part of the state to another depending on topography, landscape type, land-uses and drainage activities.

Proportion of Streams and Ditches Included/Not Included in the Public Waters Inventory
Cottonwood River Watershed