



# The Agricultural BMP Handbook for TMDLs in Minnesota

April 2012 Draft

# Objective

- Define BMPs
- Understand which practices have measured pollutant reductions associated with implementation in the upper midwest.
- Determine what practices need additional research to support their implementation in response for public demands for pollutant reduction.

# What it is

- Comprehensive collection of literature that attempts to quantify BMP effectiveness, costs, and potential barriers to adoption.
- Will allow conservation professionals, consultants and stakeholders to estimate the level of treatment needed to meet targeted load reduction.

# What it is NOT

- Field Office Technical Guide
- A replacement for our current Pesticide and Nitrogen BMP's

# Research Gaps

Table 3. Status of Upper Midwest and Minnesota BMP Research

Type	BMP	Turbidity/ Sediment	Phosphorus	Soluble Phosphorus	Nitrogen/ Nitrates	Ammonia	Pesticides	Bacteria	Dissolved Oxygen
AVOIDING	Conservation Cover (327)	◐	◐	○	●	○	○	○	○
	Conservation Crop Rotation (328)	○	○	○	●	○	○	○	○
	Contour Buffer Strips (332)	●	○	○	○	○	●	○	○
	Contour Farming (330)	○	○	○	○	○	○	○	○
	Cover Crops (340)	○	○	○	●	○	○	○	○
	Grade Stabilization (410)	○	○	○	○	○	○	○	○
	Livestock Exclusion/Fencing (382 and 472)	○	○	○	○	○	○	○	○
	Nutrient Management (590)	●	●	●	●	●	○	○	○
	Pest Management (595)	○	○	○	○	○	◐	○	○
	Tile System Design	○	○	○	◐	○	○	○	○
CONTROLLING	Alternative Tile Intakes	◐	◐	◐	○	○	○	○	○
	Contour Stripcropping (585)	○	○	○	○	○	○	○	○
	Controlled Drainage (554)	○	◐	◐	◐	○	○	○	○
	Culvert Sizing / Road Retention / Culvert Downsizing	○	○	○	○	○	○	○	○
	Grassed Waterways	●	○	○	○	○	●	○	○
	Irrigation Management (442 and 449)	○	○	○	○	○	○	○	○
	Waste Storage Facility (313)	○	○	○	◐	○	○	○	○
	Conservation Tillage (329, 345 and 346)	●	●	●	●	○	○	○	○
	Riparian and Channel Vegetation (322/390)	○	○	○	○	○	○	○	○
	Rotational Grazing	○	○	○	○	○	○	○	○
	Terrace (600)	○	○	○	○	○	○	○	○
	Two Stage Ditch	◐	○	○	◐	○	○	○	○
	Feedlot/Wastewater Filter Strip (635) and Clean Runoff Water Diversion (362)	◐	◐	◐	◐	○	○	◐	○
TRAPPING	Filter Strips (393) and Field Borders (386)	●	●	●	●	●	●	●	○
	Sediment Basin (350)	○	○	○	○	○	○	○	○
	Grade Stabilization at Side Inlets (410)	○	○	○	○	○	○	○	○
	Water and Sediment Control Basin (638)	○	○	○	○	○	○	○	○
	Constructed (Treatment) Wetlands	◐	◐	○	○	○	○	○	◐
	Wetland Restoration (651)	◐	◐	○	◐	○	○	○	○
Woodchip Bioreactor (Denitrification Beds)	○	◐	◐	◐	○	◐	◐	○	

○ Not Studied   ◐ Some Study   ● Well Documented



# BMP Chapters

- Each chapter will:
  - Defines practices
  - Lists benefits and design considerations
  - Present most recent, known cost considerations
  - List references

Table 25. Pollutant load reduction estimates in percent for filter strips

Pollutant	Mean	Minimum	Maximum	Number of Entries	Source
Sediment	86	76	91	6	1
Total Phosphorus	65	38	96	4	2, 3
Nitrogen	27	27	27	1	3
Atrazine	58	45	71	6	1
Metolachlor	72	68	78	6	1
Cyanazine	69	59	77	6	1

1 - Arora et al., 1996

2 - Webber et al., 2009

3 - Eghball et al., 2000

# BMP Matrix

AVOIDING								
BMP	Turbidity/ Sediment	Phosphorus	Soluble Phosphorus	Nitrogen/ Nitrates	Ammonia	Pesticides	Bacteria	Dissolved Oxygen
Nutrient Management (590)	Gilley and Risse, 2000; Baker and Laflen, 1982; Baker and Laflen, 1983; Komiskey et al., 2011; Bundy et al., 2001	Ginting et al., 1998; Baker and Laflen, 1982; Baker and Laflen, 1983; Bundy et al., 2001; Grande et al., 2005; Komiskey et al., 2011; Mallarino and Bundy, 2008; Tabbara	Gessel et al., 2004; Ginting et al., 1998; Baker and Laflen, 1982; Baker and Laflen, 1983; Bundy et al., 2001; Grande et al., 2005; Komiskey et al., 2011; Mallarino and Bundy, 2008	Randall and Sawyer, 2008; Randall et al., 2003; Randall et al., 2002; Randall and Vetsch, 2005; Randall et al., 1993; Baker and Laflen, 1982; Baker and Laflen, 1983; Baker and Johnson, 1981; Dolan et al., 1993; Jaynes and Colvin, 2006; Komiskey et al., 2011; Thorp et al., 2007	Baker and Laflen, 1982; Baker and Laflen, 1983; Komiskey et al., 2011			
Pest Management (595)						Buhler, 1993; Hansen et al., 2001		
Tile System Design								

# Appendix

- Appendix B: BMP effectiveness data from other national sources including models.
- Appendix C: Annotated bibliography lists over 400 articles

# Outlook

- There will be the ability to update the handbook and make it a living document.
- Most value may come from identifying what we do not know, as opposed to what we do know.
- Will be used to prioritize future Clean Water Fund research RFPs