

CITY OF HARTFORD

NR 217 WATERSHED-BASED SOLUTION FEASIBILITY



Wisconsin Wastewater Operators'
Association 47th Annual Meeting
October 22nd to 25th 2013

Dave Arnott – Ruekert & Mielke, Inc.

Paul Sebo – Washington County
Land and Water Conservation
Division

October 24, 2013

TOPICS COVERED

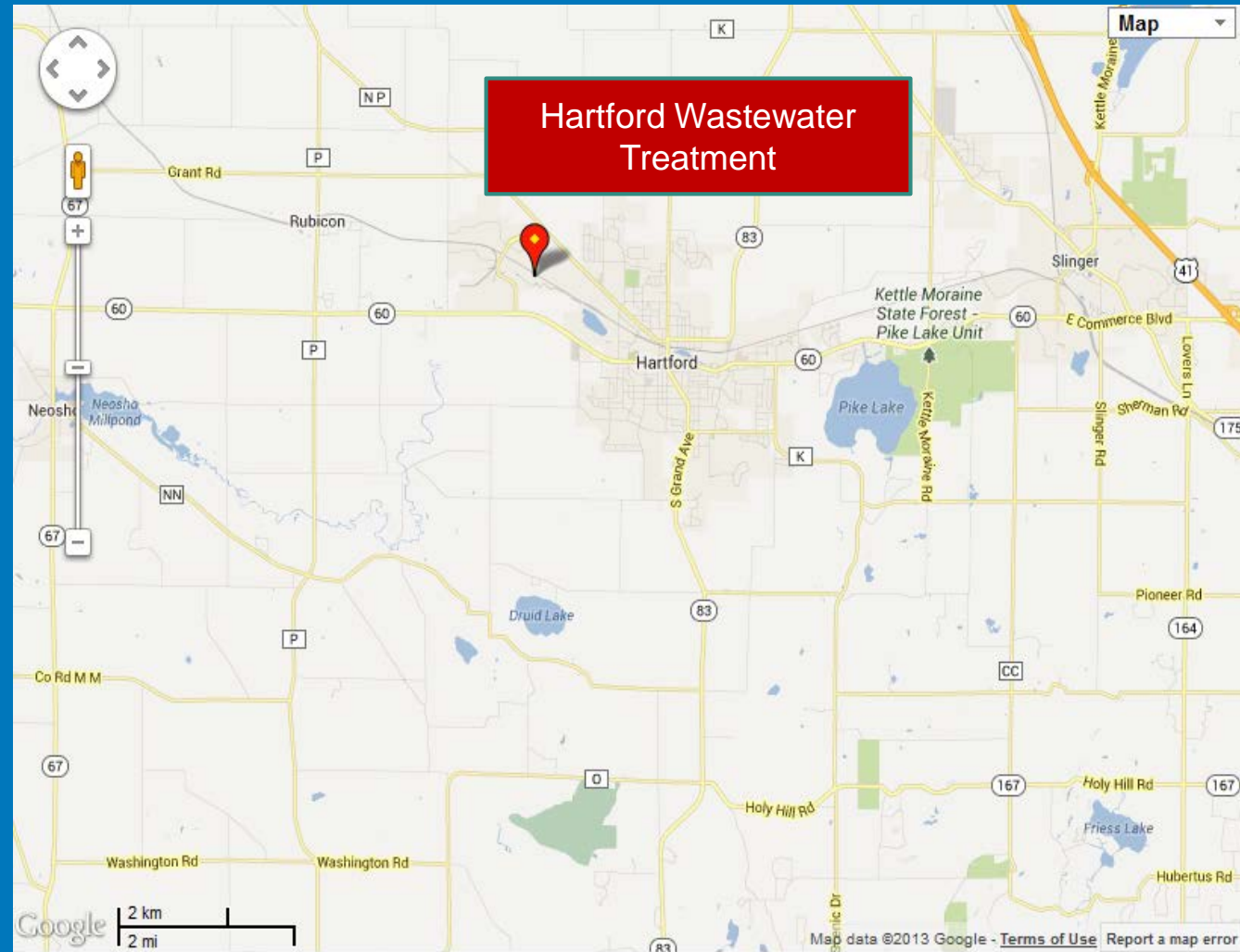
1. Background
2. Mass Balance
3. Adaptive Mgt. & Nutrient Trading
4. Adaptive Management Eligibility
5. Watershed-Based Solutions
6. Unit Reductions & Extrapolation
7. Unit Cost Comparison
8. Watershed Disadvantages
9. Conservation and WI Runoff Rule
10. Federal & State Grant Programs
11. County Grant Programs
12. Conclusions and Next Steps



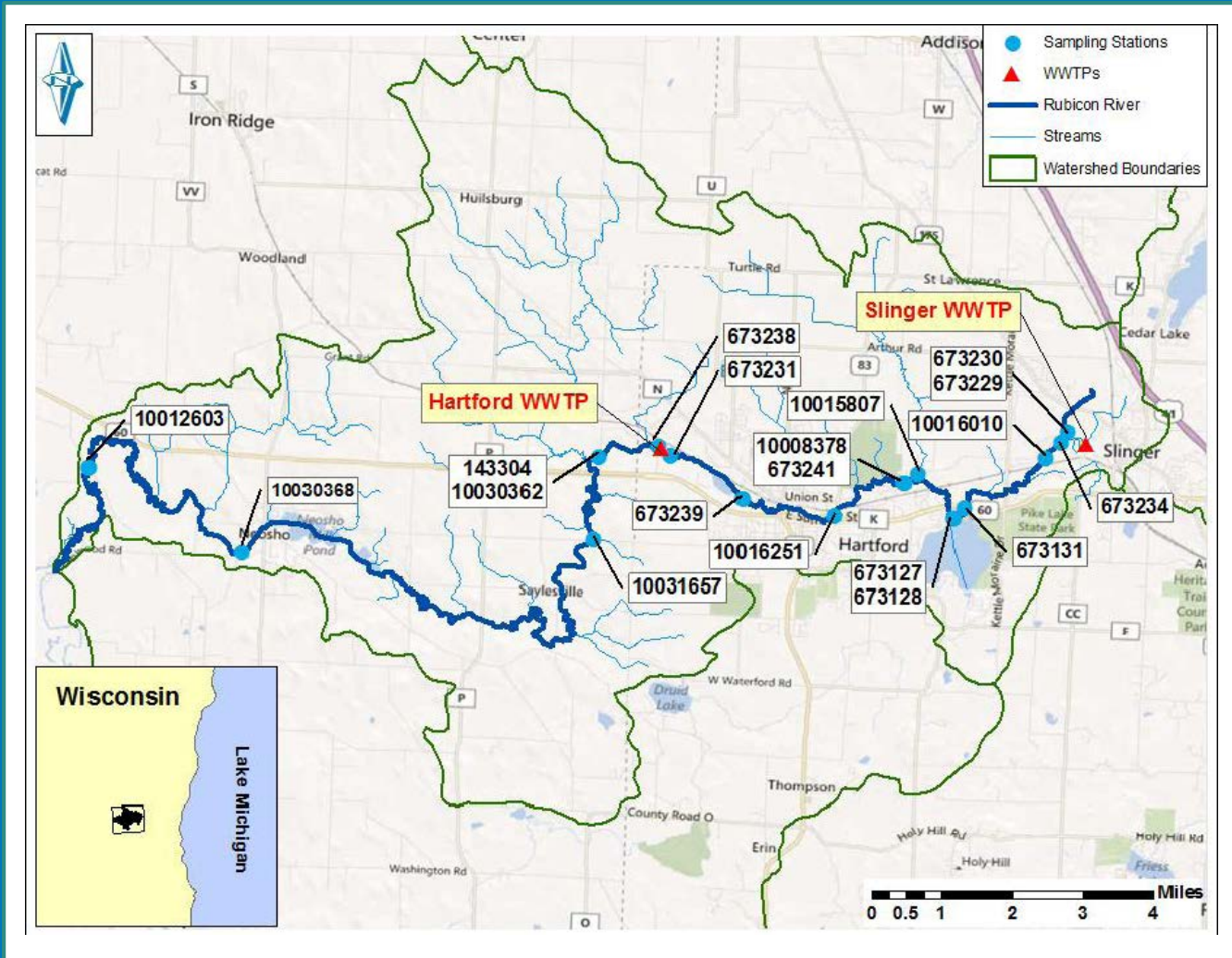
BACKGROUND: CITY OF HARTFORD

Washington County
Population: 14,258

Large Industrial Base
Dairy
Tannery
Metal Finishing



BACKGROUND: RUBICON RIVER



BACKGROUND

Water Pollution Control Facility

- Activated Sludge
- Extended Aeration
- Advanced Treatment
 - Nitrification/Denit.
 - Tertiary Filters
- Design ADF: 3.4 MGD

- New Permit July 2012
 - Interim P Limit: 0.6 mg/L
 - Final P Limit: 0.075 mg/L



PHOSPHORUS MASS BALANCE

Total Load

5,261 lb/year

Allowable Load

1,014 lb/year

Needed

Reduction

4,248 lb/year

Existing Load

330 lb/year

(7Q2)

Hartford WPCF

4,931 lb/year

(Design Flow)

Rubicon River

ADAPTIVE MGT & NUTRIENT TRADING

Adaptive Mgt.

Work to Reduce Runoff in Watershed

Nutrient Trading

Buy/Sell Credits

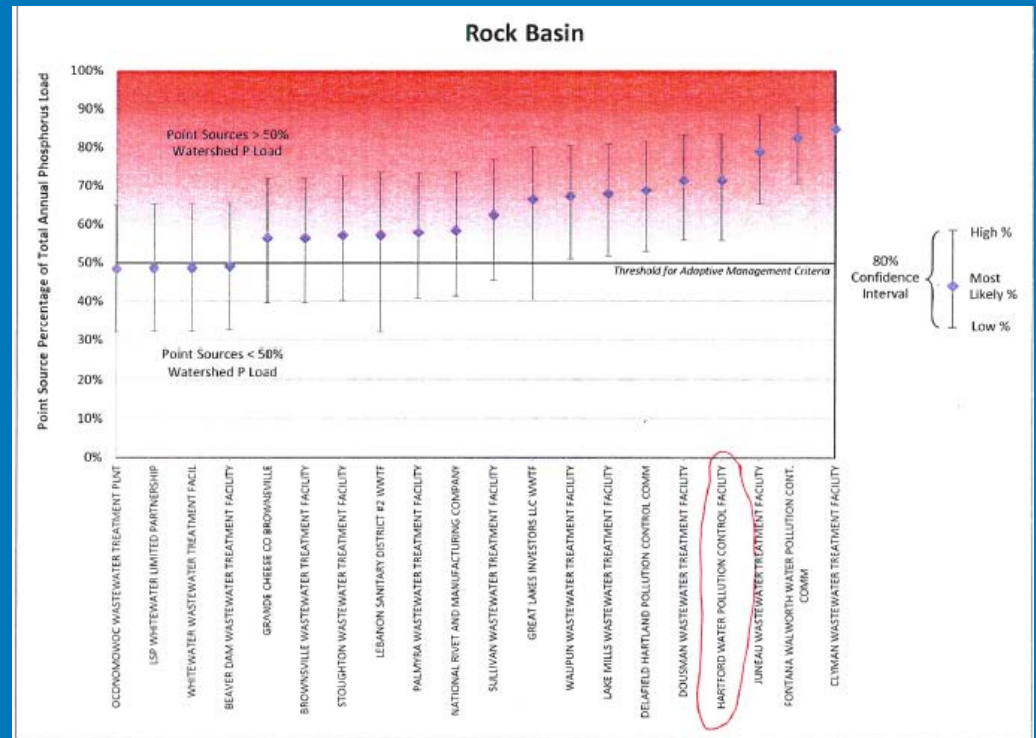


ADAPTIVE MANAGEMENT ELIGIBILITY

Three Criteria:

1. Surface water not meeting WQ Standards
2. Filtration or equivalent technology needed
3. Non-point source dominated Presto:

- 80% C.I., 70% point source
- 30% non-point source
❖ Not eligible



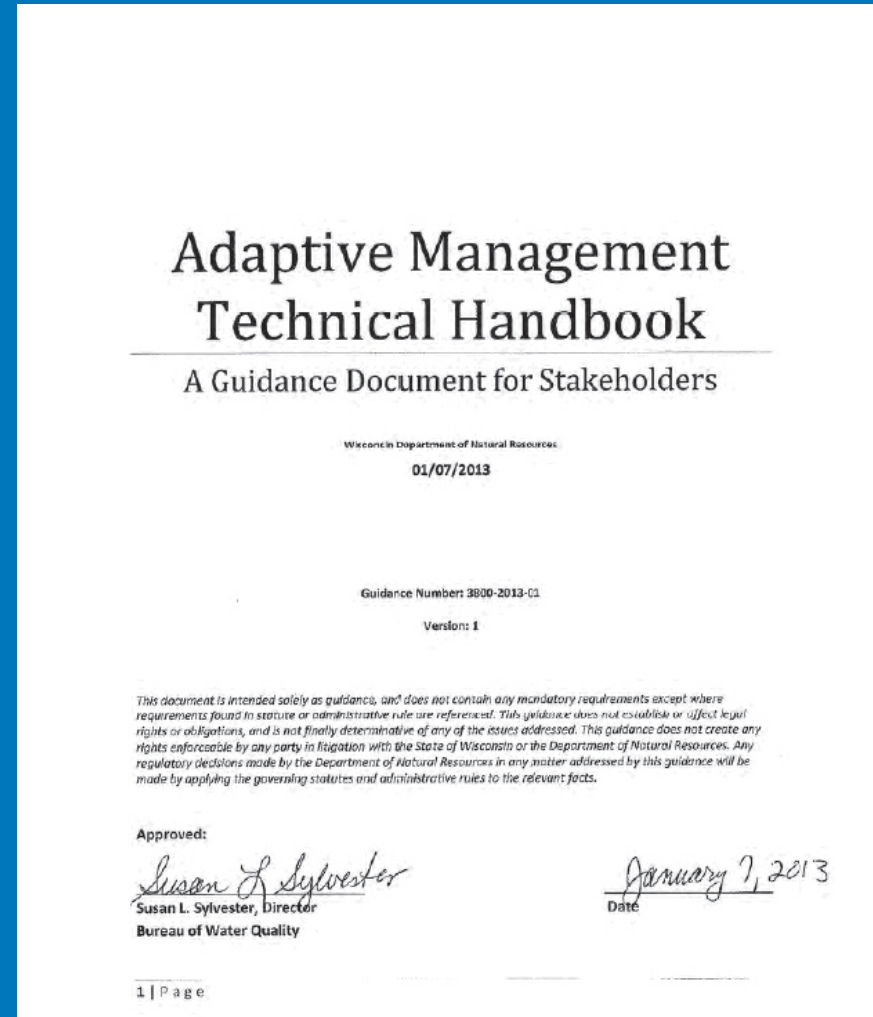
ADAPTIVE MANAGEMENT ELIGIBILITY

WDNR:

Adaptive Management Technical Handbook, A Guidance for Stakeholders

- Need for Non-Point Source Reduction
- Unit Area Method
- Phosphorus Export Method

Shows NP dominated
❖ Eligible



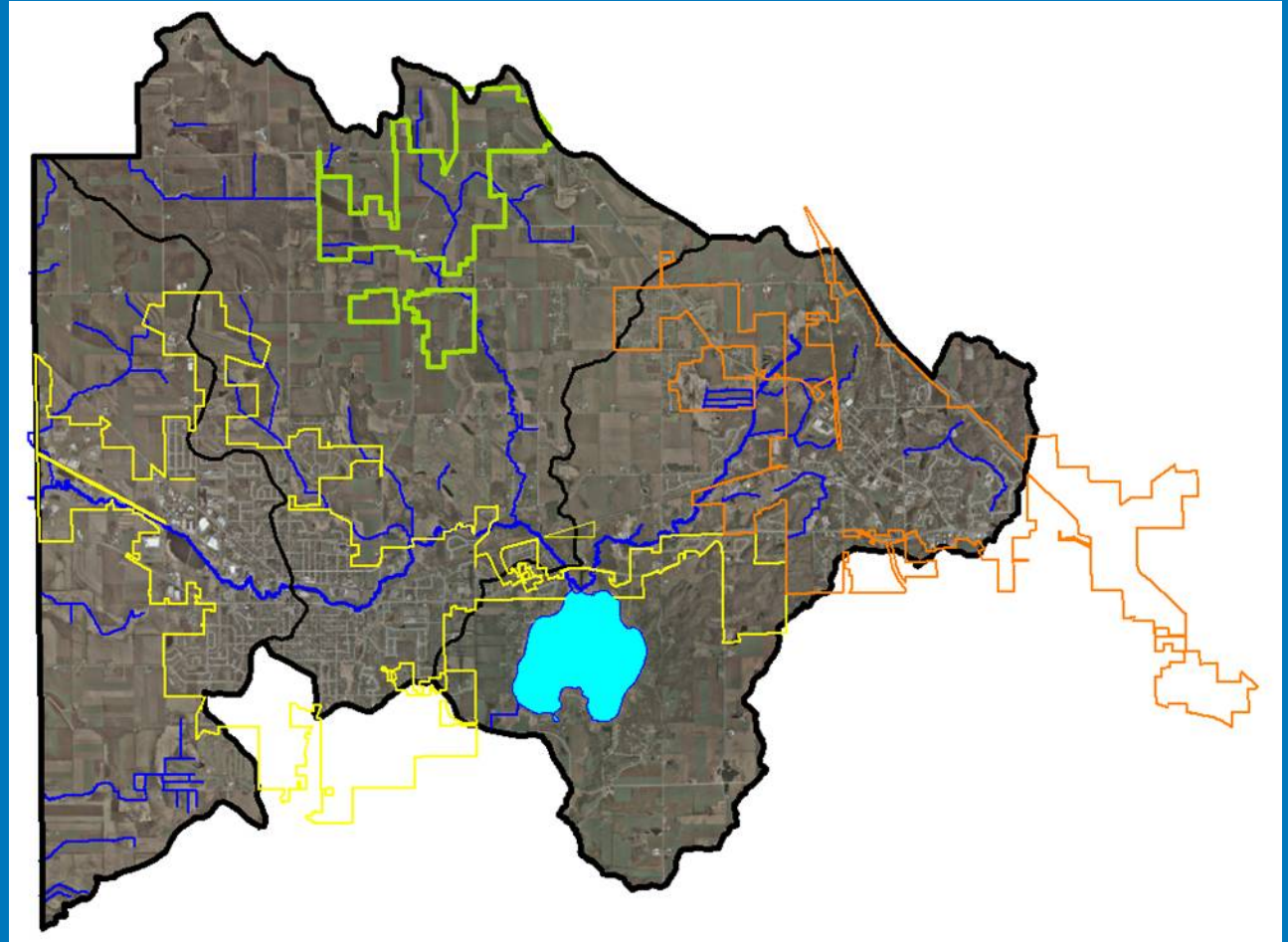
ADAPTIVE MANAGEMENT VS TRADING

TABLE 1
Adaptive Management vs. Trading

	Adaptive Management	Trading
Pollutants Covered	TP (and possibly TSS)	Numerous Pollutants
End Goals	Attaining the Water Quality Criteria	Offsetting the Limit
Offsets	No Trade Ratios	Trade Ratios Apply
Timing	Implemented Throughout the Permit Term	Generating Credits Before They Can Be Used
In-Stream Monitoring	Required	Not Required
Level of Documentation Needed	General Watershed Information	Field-by-Field Documentation

WATERSHED-BASED SOLUTIONS

Study Area:
Dairy Farm



WATERSHED-BASED SOLUTIONS



WATERSHED-BASED SOLUTIONS

Riparian Buffers



WATERSHED-BASED SOLUTIONS

Filter Strips Definition

1. How Located?



WATERSHED-BASED SOLUTIONS

Filter Strips Definition

1. How Located?
2. Sizing

Washington County
Goal is 75 feet



Encourage buffer widths of 30 feet minimum

WATERSHED-BASED SOLUTIONS

Filter Strips Definition

1. How Located?
2. Sizing
3. NRCS Standard

FILTER STRIP (Acres) Code 393

Natural Resources Conservation Service
Conservation Practice Standard

I. Definition

A strip or area of herbaceous vegetation situated between cropland, grazing land, or disturbed land (including forest land) and environmentally sensitive areas.

II. Purposes

The purposes of this practice are the following: (a) to protect water quality by filtering and removing sediment, organic matter, pesticides, sediment-borne phosphorus and other pollutants from *sheet flow*¹ runoff and subsurface flow through deposition, absorption, plant uptake, denitrification or other processes; (b) to eliminate row crop production and associated pollutants adjacent to environmentally sensitive areas; and (c) to protect and stabilize the riparian zone and reduce flood water velocity.

III. Conditions Where Practice Applies

This practice applies to areas where conditions associated with sediment and pollutant delivery from the contributing drainage area are identified and where the installation of this practice, as part of a conservation management system, will provide a direct benefit to water quality and/or riparian stability.

Environmentally sensitive areas may include, but are not limited to: perennial streams, intermittent streams, drainage ditches, sinkholes, crevices, springs, ponds, wetlands, lakes, or impoundments associated with riparian areas.

This practice does not apply to the treatment of conditions where high levels of pollutants can be anticipated such as animal feed lots, feed storage areas, and milking center waste areas. For these types of situations refer to Natural Resources Conservation Service (NRCS) Field Office Technical Guide Section IV (FOTG), Standard 635, Wastewater Treatment Strip. This practice does not apply where soil loss is above "T" within 300 feet of the filter

strip. This practice does not apply where the creation, restoration, or enhancement of wildlife habitat or movement corridors is the primary purpose. Refer to FOTG Standards 645, Wildlife Upland Habitat Management; 391, Riparian Forest Buffer, and other appropriate standards.

IV. Federal, State and Local Laws

Installation and maintenance of filter strips shall comply with all federal, state and local laws, rules or regulations. The operator is responsible for securing required permits. This standard does not contain text of any federal, state or local laws.

V. Criteria

A. Establishment

1. Areas of *concentrated flow* in the contributing drainage area and through the filter strip shall be evaluated and treated.
2. Filter strips shall be established by one of the following: 1) planting a seed mix in accordance with criteria specified in FOTG Standard 342, Critical Area Planting, Section V.C.5. (Seeding); 2) managing an existing grassed area in accordance with the operation and maintenance plan; or 3) modifying predominantly grassed areas by sapling and shrub control. Modification shall not occur in well established tree and shrub corridors.
3. Where removal of dissolved nitrogen is a primary consideration, at least 50% of the species shall be deep-rooted. Warm-season species are considered to be deep-rooted. Refer to Table 6 in FOTG Standard 342, Critical Area Planting for deep-rooted introduced species. A nutrient management plan must be followed.

Conservation Practice Standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your local NRCS office or the Wisconsin Land and Water Conservation Association office, Madison, WI, at (608) 655-1833.

NRCS, WI
1/01

¹Words in the standard that are shown in *italics* are described in X. Definitions. The words are *italicized* the first time they are used in the text.

WATERSHED-BASED SOLUTIONS

Filter Strips Definition

1. How Located?
2. Sizing
3. NRCS Standard
4. Load

Reduction

Methodology –
Snap Plus



WATERSHED-BASED SOLUTIONS

Snap-Plus program developed by the University of Wisconsin

Snap-Plus 1.132.8

File Edit Tools Reports Options Help

Farm Name: Gehring View Farm Farm data directory: G:\LCDpub\AgInfo\Farmer Data\Gehring_LeRoy\GehringViewFarms\Gehring-Hartford PI trading

Farm Field Soil Tests Nutrient Sources Cropping

Field Name: Home-04-6 County: WI-Washington Acres: 14 Slope: 5 Soil Name: HOCHHEIM Symbol: HmB2 Restrictions: ? Soil Group: B Soil Texture: LOAM

Subfarm: pH: 7.2 OM %: 3.9 P (ppm): 53 K (ppm): 151

Rotation Wizard NPM Fast Facts Calculate all years 2011 soil test date: 10/31/2012

	2009	2010	2011	2012	2013
Crop:	Wheat winter grain +	Corn grain	Corn silage	Corn grain	Soybeans 15-20 inch
Yield Goal:	81-100	171-190	26-35	171-190	56-65
Tillage:	Field Cultivation	Fall Chisel, no disk	Fall Chisel, no disk	Fall Chisel, no disk	Spring Cultivation
Soil Test Date:	10/31/2012	10/31/2012	10/31/2012	10/31/2012	10/31/2012
Lime Rec:	NA	NA	NA	NA	0
Irrigation / MRTN info:	<input type="checkbox"/> Irrigated	<input type="checkbox"/> Irrigated 0.05/MRTN	<input type="checkbox"/> Irrigated 0.05/MRTN	<input type="checkbox"/> Irrigated 0.05/MRTN	<input type="checkbox"/> Irrigated
Season notes: (lbs/acre)	N P205 K20	N P205 K20	N P205 K20	N P205 K20	N P205 K20
Recommendation:	70 0 25	140 0 0	170 0 65	170 0 0	0 0 0
Prior years' extra:	0 0 0	0 0 0	0 0 0	20 0 0	100 219
Adjusted recommendation:	70 0 25	140 0 0	170 0 65	170 0 0	0 0 0
1st & 2nd year legume credit:	190	50	0	0	0
Ext. manure credits (unused):	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
This year's manure:	0 0 0	0 0 0	0 0 0	120 60 192	0 0 0
This year's fertilizer:	0 0 0	0 0 0	55 20 27	55 20 27	0 0 0
Total credits & applications:	190 0 0	50 0 0	55 20 27	175 80 219	0 0 0
Over(+)/Under(-) adj UW rec:	120 0 -25	-90 0 0	-115 20 -38	5 80 219	0 0 0
Annual Total PI	1	0	0	1	1

Field notes:

Rotation Settings

6 year crop rotation starting in 2008

Contouring: None On contour Strip cropping

Filter strips: None Designed, field edge Designed, in-field

Rotation Summary Results 2008 - 2013

Avg soil loss and sed del: 1.5/0.3 t/acre/yr

Field "T": 5 t/acre/yr

Avg P Index: 1

P205 removal: 435 lb/acre

K20 removal: 885 lb/acre

P205 balance: -335 lb/acre

K20 balance: -639 lb/acre

Soil test P is greater than 50 ppm so P205 balance should be less than zero lb/acre.

WATERSHED-BASED SOLUTIONS

Filter Strips Definition

1. How Located?
2. Sizing
3. NRCS Standard
4. Load Reduction Methodology – Snap Plus
5. Harvestable



WATERSHED-BASED SOLUTIONS

Cover Crops

- Definition
- Load Reduction Methodology
 - SNAP PLUS



Cover Crop: A close-growing crop that temporarily protects the soil during the period before the next crop is established.

UNIT REDUCTIONS & EXTRAPOLATION

Sample Farm

- 730 Acres (400 Acres owned)
- Rotational Average PI's from range from 10 to 0.
- Weighted Average P Index for entire farm = 2.4 lb/ac/yr P
- This should mean that our sample farm has a phosphorus load of 1,752 lbs/yr



Snap-Plus modeled reductions:

- Total Farm average PI's were reduced to 1.6 with just filter strip.
- Average PI's reduced to 1.44 with buffers and cover crops.

Total Phosphorus reduction = 688 lbs/yr

UNIT REDUCTIONS & EXTRAPOLATION

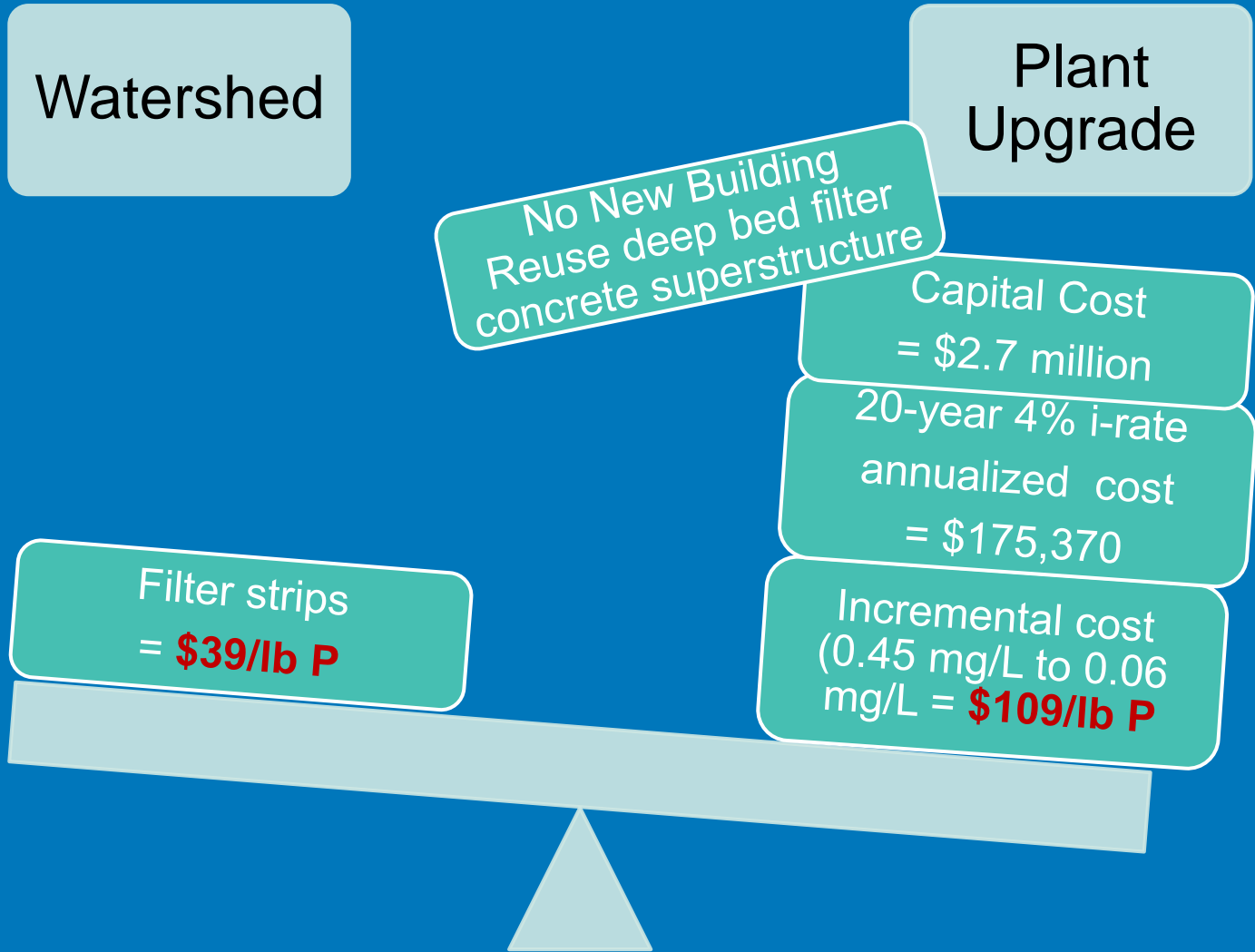
With improvements to sample farm

- Reduction of 688 lb P/year = 1.9 lb P/day
- DNR required reduction of 4,248 lb P/year = 11.6 lb P/day

Extrapolate to entire watershed

- Sample farm, 19% of all filter strip area
- Consider only filter strips and minor barnyard improvements
- 3,139 lb P/year = 8.6 lb P/day
- 74% of problem could be addressed through filter strips (w/o trade ratios)

UNIT COST COMPARISONS



DISADVANTAGES

General Watershed

- Lack of Control
- Uncertainty
- Liability
- Drain Tile

Filter Strips

- Less Cropland Available

Cover Crops

- Harder to Verify
- Timing Dependent

CONSERVATION AND WI RUNOFF RULE



The Washington County Land & Water Conservation Division (LWCD) relies on partnerships with local farmers and landowners by offering:

- Technical Assistance
- Financial Assistance
- Education



CONSERVATION AND WI RUNOFF RULE



Since many conservation practices can be costly and clean water and sustained soil productivity benefit everyone, public financial assistance is often available and in many cases required.

Funding assistance comes from:

- Federal Grant Programs
- State Grant Programs
- County / Local Programs



CONSERVATION AND WI RUNOFF RULE



In 2002, Wisconsin adopted administrative rules (NR 151/ATCP 50), with revisions effective in 2011 that set statewide performance standards and prohibitions for all Wisconsin farms.

All farmers must comply. However, under these rules, a landowner is entitled to cost sharing if required to implement Best Management Practices (BMP) on “existing cropland” or on “existing” livestock operations.



FEDERAL AND STATE GRANT PROGRAMS



Natural Resource Conservation Service

- Environmental Quality Insurance Program
- Offers financial assistance to agricultural producers for BMP installation.



Wisconsin Department of Agriculture Trade and Consumer Protection

- Soil and Water Resource Management Program
- Provides limited funding to counties for staff and for BMP installation.
- Geared towards State priorities.



Wisconsin Department of Natural Resources

- Targeted Runoff Management Program
- Competitive grant targets high priority resource problems.
- Funding up to \$150,000 per site.
- Not available for Adaptive Management or Pollutant Trading programs.

COUNTY/LOCAL GRANT PROGRAMS (IF AVAILABLE)

In Washington County we offer a Riparian Buffer Project:



“Federal and state natural resource agencies have long recognized the need to apply a wide range of Best Management Practices on agricultural lands to improve stream water quality. Although there are many tools available in the toolbox to reduce pollutant runoff from agricultural lands, such as crop rotations, nutrient and manure management, conservation tillage, and contour plowing, riparian buffers are one of the most effective tools to accomplish this task.” (SEWRPC, *Managing the Waters Edge*, April 2010)

CONCLUSIONS

1. Uncertainty and Liability Significant Factors for City



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2. Unit Cost of Phosphorus Reduction Relatively Low with Plant Upgrade



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3. Watershed Used as Secondary Solution-Reduce Extent of Plant Upgrade
4. Watershed Used as Insurance
5. Watershed Used for Public Relations

NEXT STEPS

City Implement Optimization Plan

- Greater Degree of Bio-Phosphorus from Oxidation Basin

Progress Report Due:

June 30, 2014

- Identify Compliance Strategy



QUESTIONS