

# TMDL an Agricultural Perspective

Kimberly, Wisconsin  
April 28-29, 2010

2010 FWWA Stormwater Conference

Mark Hagedorn  
Brown County  
UW Extension

Bill Hafs  
Brown County  
Land and Water Conservation Department

# Presentation Overview

- Current livestock situation in NE Wisconsin
- Industry trends
- Land use trends
- Distribution/densities of livestock
- Surface water
- Overview of the Lower Fox River TMDL

# LIVESTOCK NUMBERS

## Dairy

### All Cattle and Calves (Fox- Wolf Basin)

	<u>Cattle*</u>	<u>Cropland**</u>	<u>Acres/Cow</u>
Brown	106,000	152,664	<u>1.44</u>
Outagamie	85,000	190,251	2.23
Winnebago	32,500	116,042	3.57
Calumet	62,000	123,889	1.99
Fond du Lac	101,000	253,054	2.50
Waupaca	54,500	138,834	2.55
Shawano	85,000	173,324	2.04

### Counties with highest cattle numbers

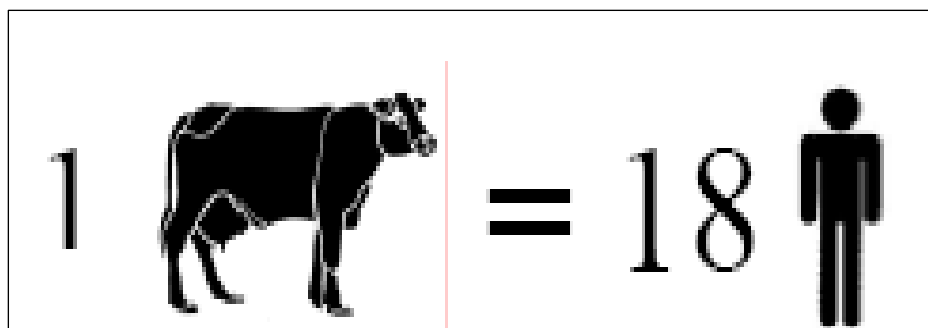
Grant	174,000	301,359	1.73
Dane	144,000	368,720	2.56
Marathon	139,000	292,078	2.10
Clark	137,500	264,764	1.92
Dodge	106,500	317,247	2.97
Kewaunee	101,000	130,617	<u>1.29</u>
Manitowoc	97,000	180,888	1.86

\* 2009 Wisconsin Agricultural Statistics

\*\*2007 NASS Census of Agriculture USDA

# Brown County

- 15 existing CAFO permits (>1000 AU)
- 15 potential (>500 AU) CAFO permits.
- 1000 (1400 lb) dairy cows generates the waste = 18,000 humans (source DNR)
- 80,000 animal units = 1,440,000 humans (waste equivalents).
- City of Green Bay + De Pere Metro area = 200,000 humans on GBMSD.  
**100** Staff work at sewage district.



# 1000 Animal Unit Operations

(statewide 2007 DNR)

**64/134 Dairy CAFO's in NE Wisconsin**  
**Less than 5 CAFO's In Wisconsin in 1985**

## Current CAFO Permit Statistics (Jan. 2007)

159 currently permitted operations statewide

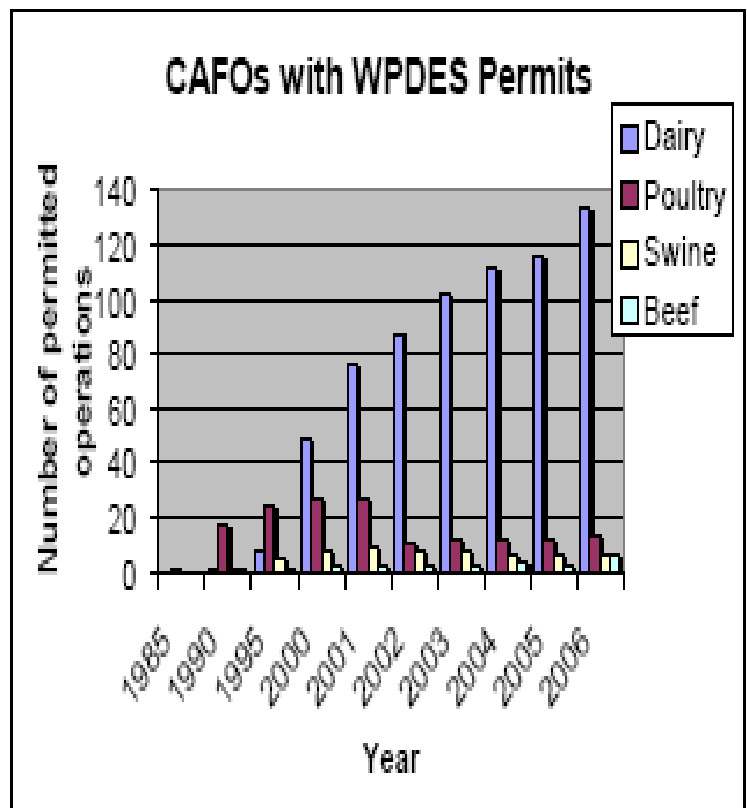
### CAFOs of each animal type

Animal Type	Currently Permitted
Dairy	134
Poultry	13
Hogs	6
Beef	6

### CAFOs in each Wisconsin region

Region	Currently Permitted
Northern	13
Northeast	64
Southeast	11
South Central	31
West Central	40

## Trends in CAFO Permit Statistics Over Time



# Brown County Crop Production Overview

<u>Crop</u>	<u>1969</u>	<u>1981</u>	<u>2008</u>
Potatoes	50		
Barley	700	750	
Corn	67,800	65,000	62,000
Hay	87,000	74,000	58,500
Peas	1,600	2,500	
Oats	47,300	31,500	
Snap Beans	300	1,200	
Soybeans	100	200	22,400
Sweet Corn	2,100	1,600	
Wheat	<u>150</u>	<u>2,050</u>	<u>15,800</u>
	207,100	178,800	162,000

# Brown County Dairy Production Overview

	<u>1969</u>	<u>1981</u>	<u>2008</u>
Production/Cow	9,950	13,200	22,300
	#/head	#/head	#/head
# Cows	40,919	39,200	41,000
# Herds	1,348		239
Ave. Herd Size	~ 30		~172
Cattle All		91,400	105,000

In 1975, there were 40,000 cows.

Cattle All = 88,200

# TRENDS

## 2008 US Dairy Statistics Milk Production

(Source: Progressive Dairyman)

- **State Ranking in Total Milk production Wisconsin is #2 nationwide.**
- **Wisconsin average herd size = 91**
- **Number dairy herds 13,730**

### TOP DAIRY COUNTIES IN MIDWEST Region

(12 states)

1. **Dane Milk 2007-08 (81 million lbs) +15%**
2. **Clark Milk 2007- 08 (75 million lbs) +38%**
3. **Manitowoc 2007-08 (75million lbs) +11%**
4. **Brown 2007-2008 (67 million lbs) +14%**

# Land Use

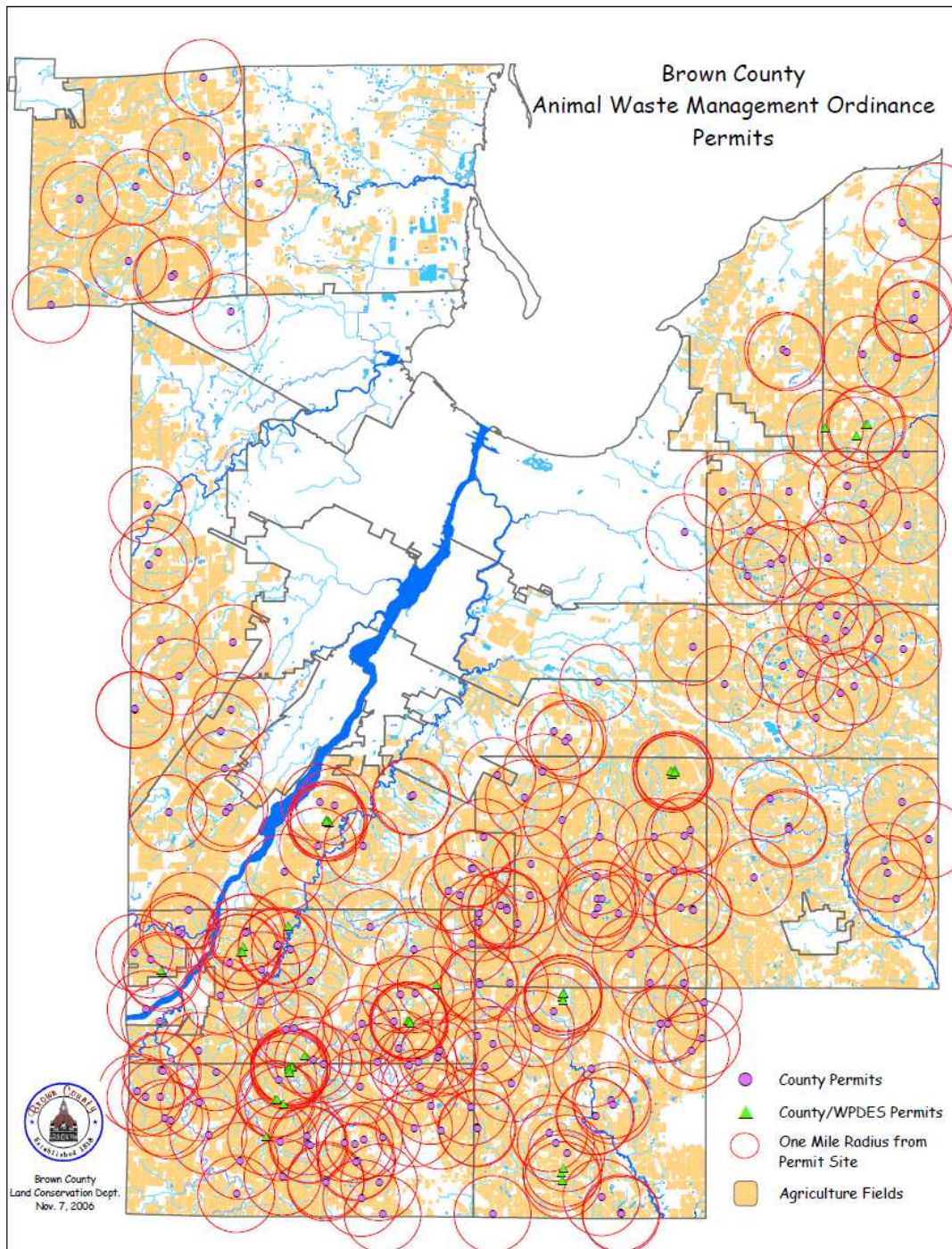
Brown County total land area  
approximately 350,000 acres.

<u>Year</u>	<u>Farms</u>	<u>Land in Farms</u>
1954	2,672	300,900 acres
1972	1,920	274,800 acres
1978	1,730	263,400 acres
1983	1,480	241,500 acres
<b>2007</b>		<b>152,664 acres</b>

**2010 ??**

(Source: 1991 Brown County Farmland Preservation Plan; NASS 2007)

# Distribution and Livestock Density



# Sustainability

- **How many acres are needed per AU for land spreading of animal waste for Phosphorus?**

- **Clemson University 3 acres/cow P**

(Planning Free stall Facilities for the Expanding Dairy John P. Chastain, Ph.D. Department of Agricultural and Biological Engineering Clemson University 2000 )

- **UWEX, CALS, DATCP, USDA –  
1.6 – 2.9 acres/ cow P**

(UWEX, CALS, USDA-ARS Dairy Forage Research Center, USDA-CSREES Initiative for future agriculture and food systems, WDATCP)

- **80,000 AU in Brown County x 2 acres/  
AU = 160,000 acres cropland needed.**

- **Distribution of Livestock operations.  
Density standards need to be developed or other waste technologies promoted and funded.**

# Land Application of Wastes

- 152,000 acres of cropland in Brown County. (2007 NASS)
- 1/3 of Cropland is estimated to have spreading restrictions such as:
  - Set backs to streams
  - Set backs from wells
  - Set backs from wetlands
  - Set backs from KARST, Bedrock, sinkholes
  - Slope restrictions
- **100,320 acres of cropland (66%) is more accurate estimate of spread able cropland.**

# Other Waste

DNR approved land spreading sites Brown County 2/14/07:

**Industrial**= 566 sites, 23,214 acres, 18 facilities.

**Municipal** = 243 sites, 4854 acres, 9 facilities.

**Septage**= 31 sites 1300 acres, 8 facilities.

Total = **29,368.9 acres / 152,034** acres total cropland acres in

Brown County = **19% of cropland approved for land spreading of other wastes.**

## How much Waste is being land applied?

- Animal waste per year from dairy and beef livestock = 551,921,154 gal per year.
- Industrial Municipal Septic waste land applied in 2008 = 41,759,400 gallons/ year. (DNR Form 3400-55 2008)

**Is EQUAL distribution of 593 million gallons of waste per year on 100,000 acres of cropland possible?**

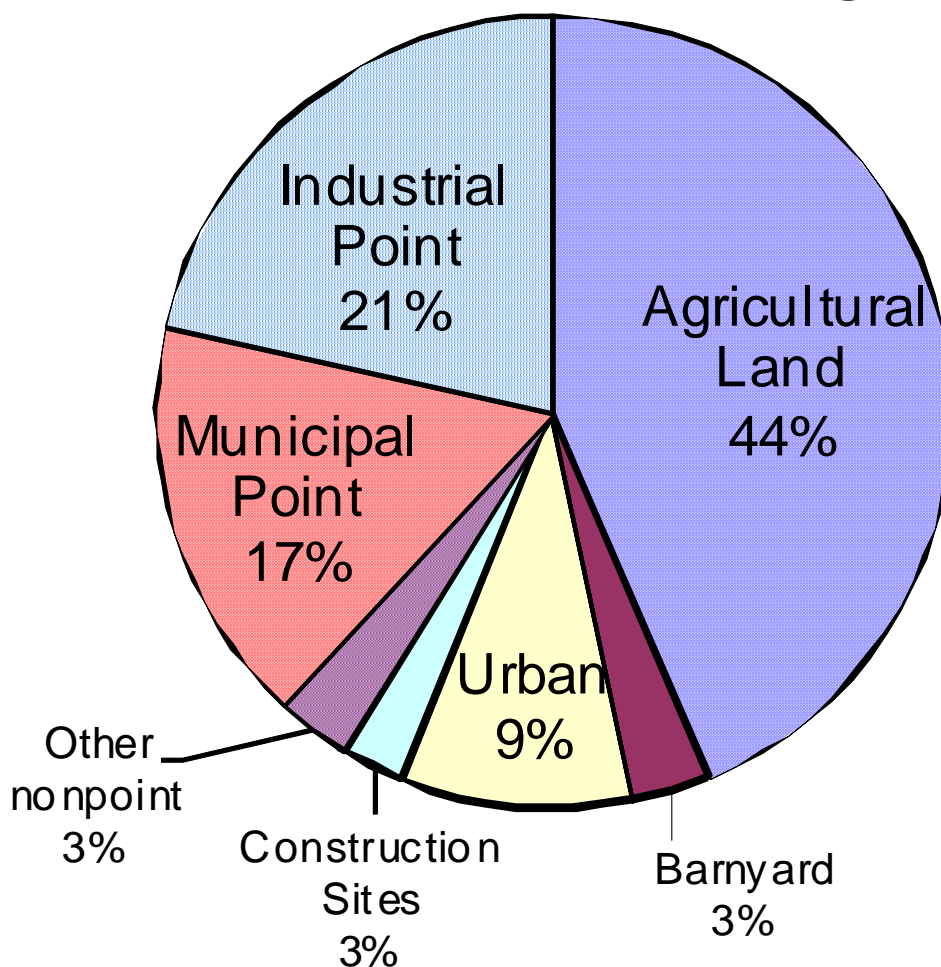
# Surface Water

- The Fox River is the largest contributor of phosphorus to Lake Michigan of all tributary streams (21%).
- The Fox River is the 3<sup>rd</sup> largest contributor of Sediment to Lake Michigan of all tributary streams.

(U.S.G.S. Water Resources)

# Surface Water - Phosphorus

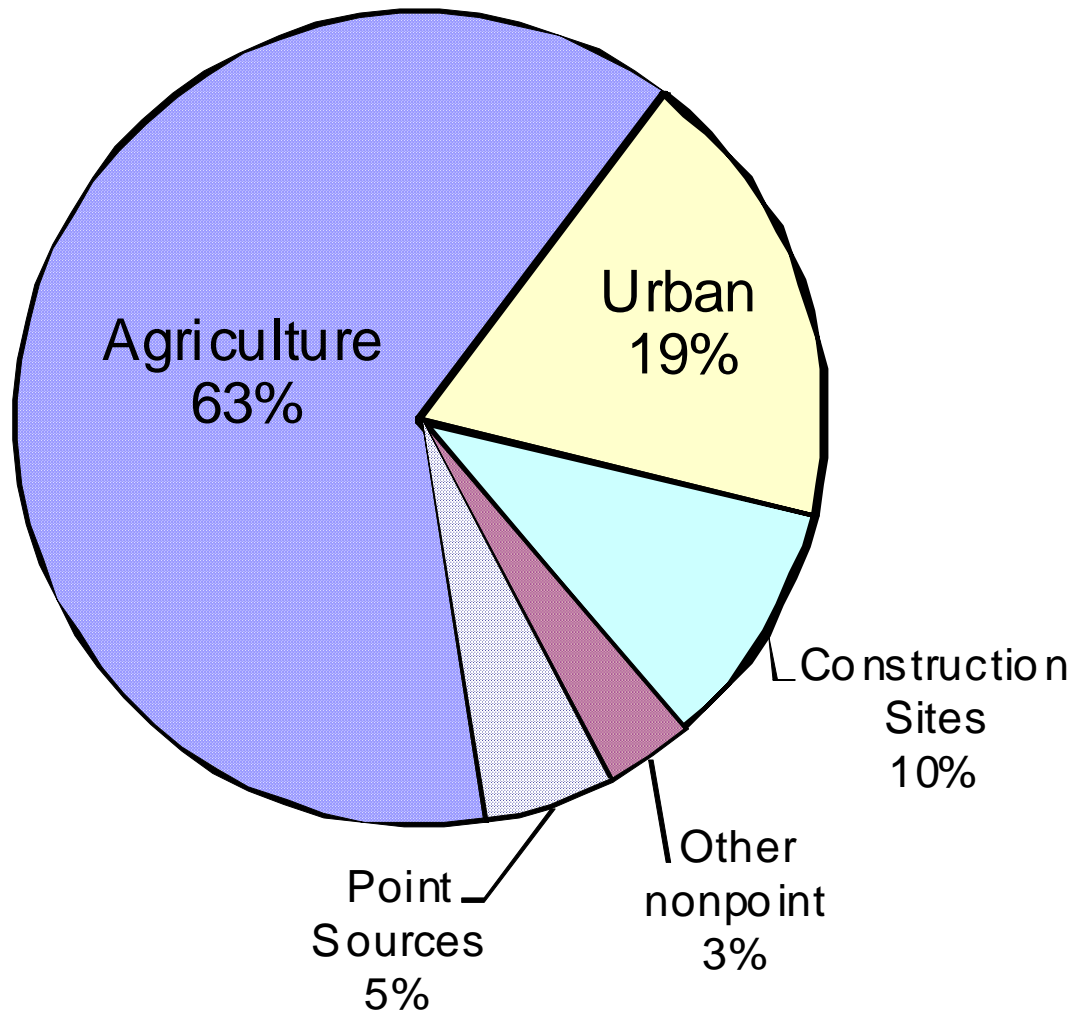
## Total Phosphorus Export Lower Fox River Basin and Duck Creek 2004 Baseline, Total 238,912 kg



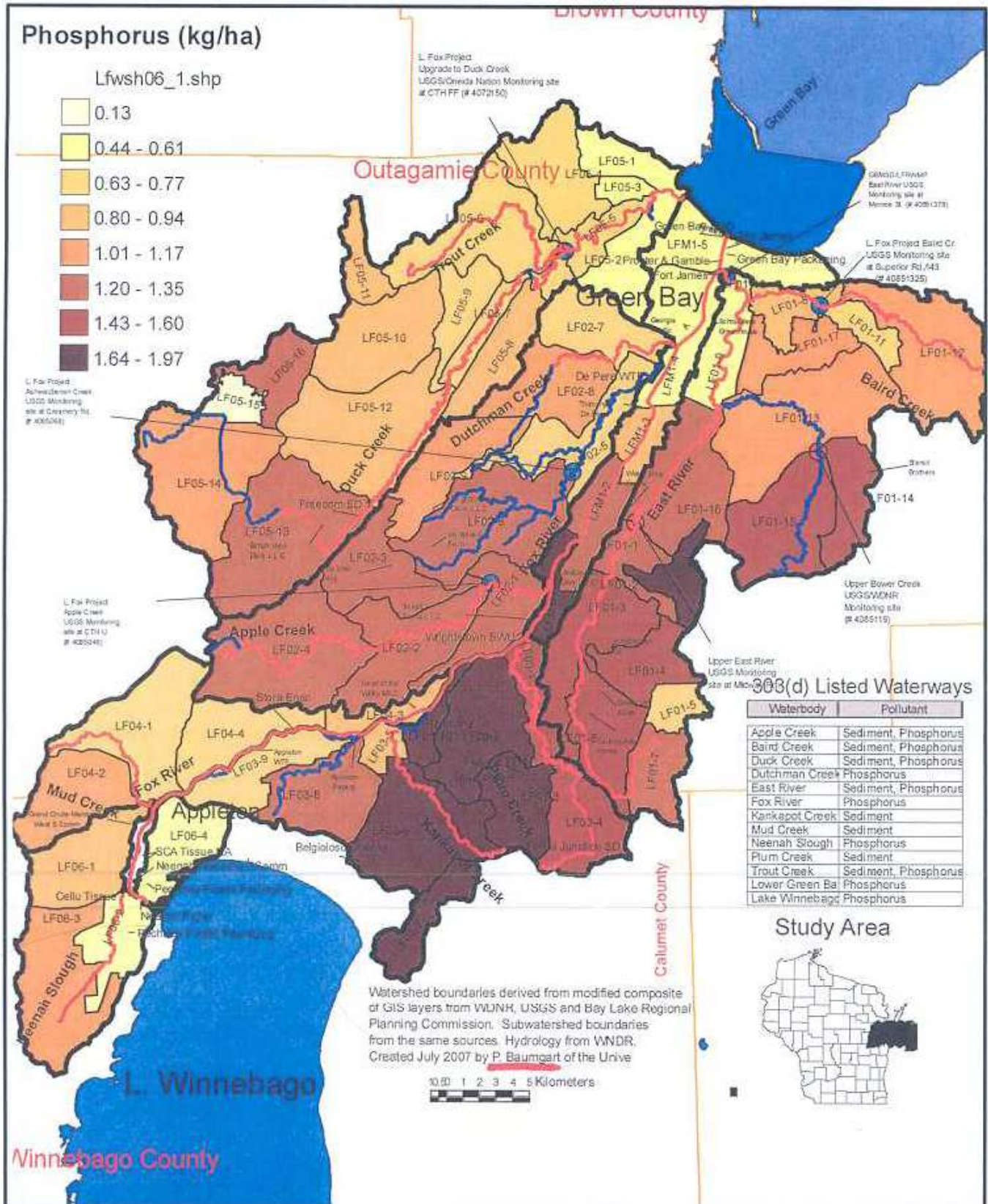
(Data Sources: Integrated Watershed Approach Demonstration Project: A Pollutant Reduction Optimization Analysis for the Lower Fox River Basin and the Green Bay Area of Concern. August 2007; prepared by the Cadmus Group for the U.S. EPA, with contributions from the University of Wisconsin-Green Bay, 26 pp. Solids data from P. Baumgart, UW-Green Bay, 2008.)

# Surface Water Suspended Sediments

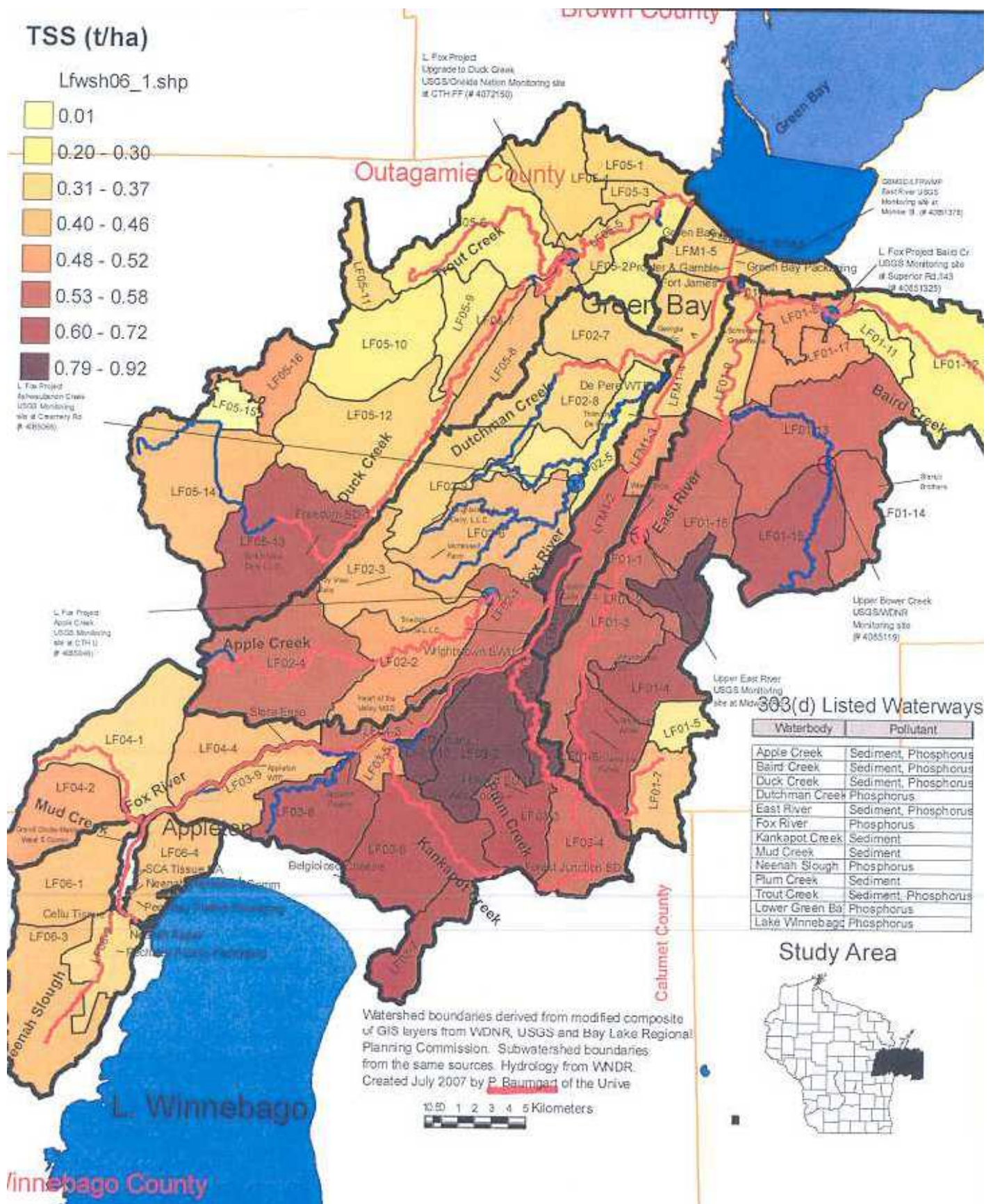
**Total Suspended Solids Export  
Lower Fox River Basin and Duck Creek  
2004 Baseline, Total 57,518 ton**



# Phosphorus



# Suspended Sediment



# Opportunities

- **Nutrient Management** – state required 2009 Brown County 109,000/ 152,000 acres
- **Winter spreading plans** -100 per year
- **Promotion of new technologies**  
and funding by state of waste water treatment, digesters, dewatering, Waste Transformation Technology to overcome cropland shortage and increase sustainability.
- **Adequate staff** to enforce, inspect, monitor. Green Bay Metro Sewage has 100 employees to monitor and treat waste from estimated 200,000 human residents. 80,000 animal units = 1,440,000 humans and there are less than 10 County and DNR staff monitoring animal waste.
- **Regulation** protects **water quality** and Agriculture from liability (3 billion dollar/ year industry in Brown County)
- **Great Lakes Initiative grants**  
Baird Creek \$377,000 Buffer strips  
Ag Phosphorus \$537,000  
Gypsum \$597,000  
West Shore Pike \$395,000  
Cover Crops \$750,000

# Education needed

Survey of Dairy Farmers in Lower Fox by UW  
( February 2007)

- **168 (58%) responded** (CAFO's not in survey)
  - 86% agreed it is their responsibility to protect WQ.
  - Only 14% would be willing to pay more to improve WQ.
  - Twice as many (36%) identified Waterfowl droppings as more serious than Agriculture (18%).
  - Respondents see water pollution as generated principally by non Ag sources.
  - Two most influential factors are profitability (88%) and out of pocket expense (87%).
  - 75% will maintain or expand herd size in next 5 years.

# Total Maximum Daily Loads (TMDLs)

- TMDL's require that best management practices be designed to meet the water quality objectives of an impaired water body.

# Total Maximum Daily Loads (TMDLs)

- “TMDL” means the amount of pollutants specified as a function of one or more water quality parameters, that can be discharged per day into a water quality limited segment and still ensure attainment of the applicable water quality standard.
- Phosphorus
- Sediment

# TMDL BMP's

Agriculture Management Practice	Maximum Implementation Rate (%)
1. Nutrient Management (reduce phosphorus in dairy cow feed ration by 25%)	90%
2. Manure Incorporation (increase proportion of applied manure that is incorporated within 72 hours)	85%
3. Nutrient Management (stabilize soil-test phosphorus average at current average of 40 ppm (Bray P1 <sup>1</sup> ))	90%
4. Conservation Tillage (mulch tillage and zone tillage)	60% (mulch-till), 15% (zone-till), with total conservation tillage not to exceed 60%
5. Cover Crops (on low residue fields)	72%
6. Vegetative Buffer Strips	100%
7. Decrease Soil Phosphorus Levels from 40 ppm to 25ppm [Bray P1] <sup>1</sup>	35%
8. Biofuel Crops	7%
9. Water Sediment Control Basins	
10. Anionic Polyacrylamide	0%

\*\* 1 Time Lifetime expense

## BMP #1

Reduce phosphorus in dairy cow feed by 25%

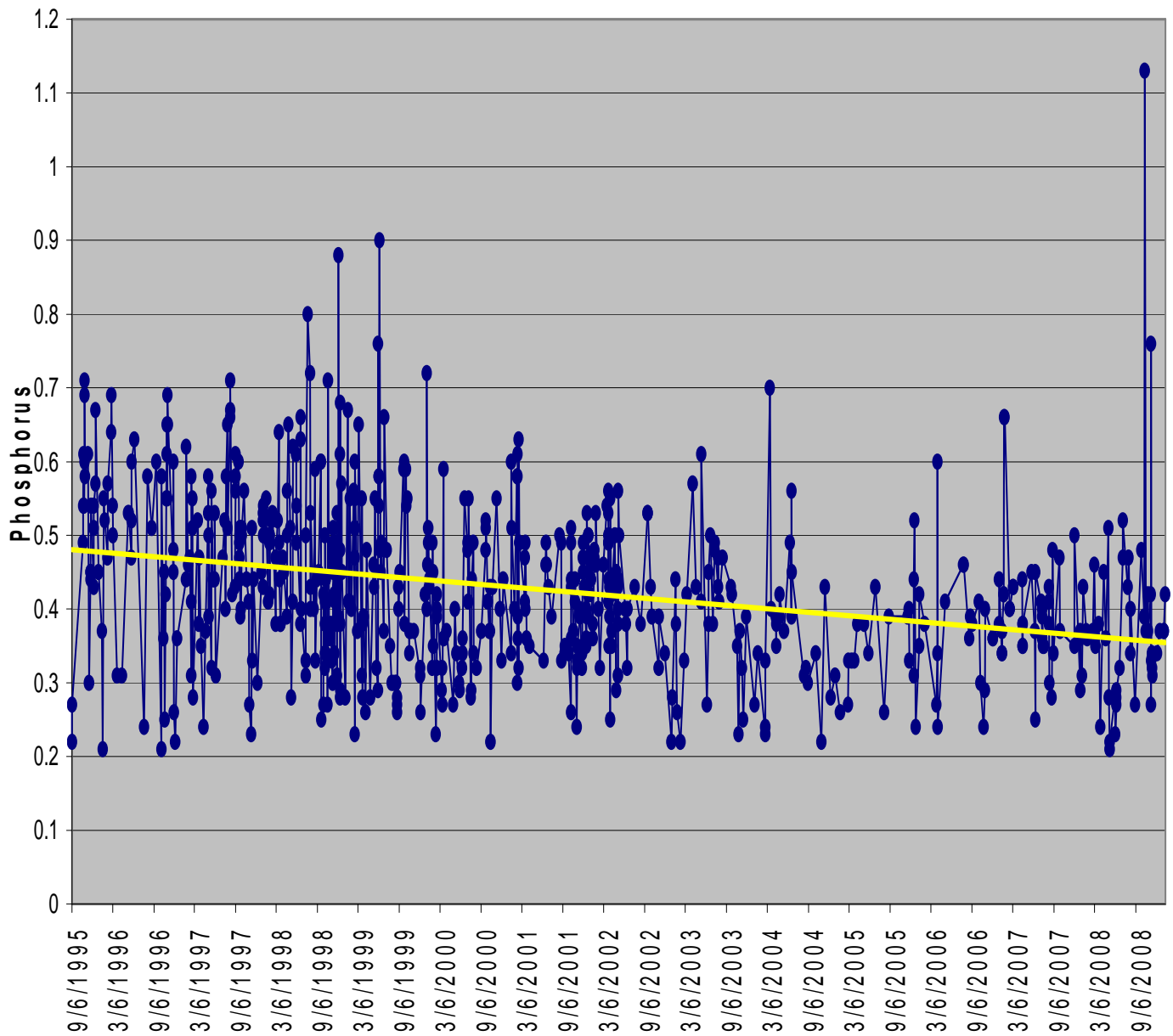
Phosphorus feeding recommendations for lactating dairy cows.\*

<b>Milk yield (lb/cow/day)</b>	<b>Ration P(% dry basis)</b>
55	0.32
77	0.35
99	0.36
120	0.38

\*Assumes feed intake rates of the NRC (2001) model.

# BMP #1 (continued)

Dairy Ration Phosphorous Trends



Date

# BMP #2

## Manure Incorporation

- Increase the proportion of applied manure that is incorporated within 72 hours
- How did we approach this BMP?
- Surveyed the 5 county area
- Increase manure storage

# BMP #2

## Manure Incorporation Storage Survey

	Brown	Calumet	Manitowoc	Outagamie	Winnebago
Herds in watershed area	139	45	3	104	2
Herds with no manure storage	58	7		49	

# BMP #3

## Nutrient Management

- Stabilize soil test phosphorus at 40PPM
- Examines crop removal versus phosphorus production from livestock
- Largest challenge is the uneven distribution of livestock
- We will go into more detail as we review BMP #7

# BMP #4

## Conservation Tillage

- Mulch tillage versus zone tillage

# BMP #5

## Cover Crops

- Utilized on low residue fields
- There is a great deal of corn silage chopped in conjunction with a decreasing amount of alfalfa
- The financial overview of this practice was interesting to examine

# BMP #6

## Vegetative Buffer Strips

- Impacted by NR151 revisions
- We have a unique situation in that Brown County has an ordinance for VBS's
- This yields a wide variety of establishment costs

# BMP #7

## Nutrient Management

- Reduce soil P from 40 PPM to 25 PPM

# BMP #7

## Nutrient Management

- Hyperlink to the online Phosphorous Balancer for Brown, Calumet, Manitowoc, Outagamie, and Winnebago Counties
- [http://www.co.brown.wi.us/departments/page\\_4b3351439d09/?department=68d3c3d55278&subdepartment=9207c5a3d3d5](http://www.co.brown.wi.us/departments/page_4b3351439d09/?department=68d3c3d55278&subdepartment=9207c5a3d3d5)

# BMP #8

## Bio-fuel Crops

- Adding switch grass to the typical cash-crop rotation of alternating soybean and corn-grain
- No where to go with the “end product” shy of dairy replacement and dry cow feed

# BMP #9

## **Water And Sediment Control Basins**

- Affectionately referred to as a WASCOB
- Expensive to construct
- Limited opportunities to utilize
- Not a lot of interest

# BMP #10

## Anionic Polyacrylamides

- New technology to help control runoff, soil erosion, and nutrient loss
- Proprietary technology
- Has been used in reseeding wildfire areas and for establishment of cover growth at construction sites
- Indications are that it is expensive and little use in production agriculture

# Wrap-up for the day!!

- Opportunities/benefits
- Challenges
- Questions