### **Conservation Efforts – Current and Future**

Amber Radatz & Jeff Endres November 1, 2017 Healthy Farms, Healthy Lakes Task Force





### Models of agricultural management practice adoption have changed

#### Then

Research done on University grounds, had to be brought to farmers.

Farmers were not expected to implement it until results could be shown that practice was sure to work

### Now

"Indigenous research" and farmer to farmer interaction are filling in where traditional research falls short

Farmers are expected to implement even without specific results showing full effect of practices





### Discovery Farms is a concept that bridges between then and now that can provide SOME additional answers









#### Discovery Farms provides credible edge-of-field research









### Presentations, events and written materials serve as valuable resources







#### Use Multiple Sources of N? Consider This,

After two years of conducting nitrogen use efficiency (NUE) assessments, UW Discovery Farms has begun to analyze how Wisconsin farmers can refine their nitrogen management practices to improve economic efficiency and water quality. The data indicate that monitored field with the lowest overall NUE tended to have high N rates and use various nitrogen sources, including inorganic fertilizer, manure, and alfafa redits.

The nitrogen cycle is unpredictable, which makes determining the right N rate for any given year difficult. This is exacerbated when multiple sources of N are adde to the equation. When applying manure to a field and incorporating legumes in a rotation, there is uncertainty related to when and how much nitrogen is available to the crop. However, by reexamining current nitrogen management practices on these fields, there is great opportunity to increase NUE.

Using multiple sources of nitrogen often resulted in higher N rates.



NITROGEN TRANSPORT IN TILE DRAINAGE SYSTEMS by Aaron Pape and Tim Radatz, aaron papetices weekedd

#### agwaterexchange.com

### Written materials





## Wisconsin has about 160 years of dairying history after wheat farming was unsuccessful

### Inputs:

Water Forages (from corn or alfalfa) Grains



Outputs:

Milk Meat Recycled Cow Feed (liquid and solid)

### Dairying is good for our landscape and also comes with unique challenges

Wisconsin is well suited to dairy

- Cows like the cool air and cool seasons
- We can replenish soil nutrients with manure
- Soils are well suited to grow forages
- Minerals in our groundwater make for award winning cheeses
- Much of the state's infrastructure was put in place to encourage dairying

#### There are always challenges

- The frozen ground period is long and makes it difficult (and costly) to maintain soil cover and manage manure
- Annual crops for forages can be erosive and leave soil bare for months at a time.
- Tillage to transition crops in rotation, break weed pressure or incorporate manure can cause erosion





What are some of the solutions to the challenges?





### Challenge: Long frozen ground period

Solutions: Storage, winter manure ordinance, experimenting with making compost, runoff risk advisory forecast, continuing education about risks of winter manure application, meetings, publications, online writing about risks

### Challenge: Bare soil after annual forage crops

Solutions: Cover crops with a variety of seeding methods, minimizing tillage in fall after corn silage, using low disturbance manure incorporation, not leaving manure on surface through winter, spread bedding pack on soil to act as surface residue cover

### Challenge: Tillage for seeding and manure incorporation

Solutions: Seeding alfalfa into standing cover crop using no till methods, using low disturbance manure incorporation, using vertical tillage to minimize amount of tillage in rotation but still use conventional seeding equipment What are conservation practices that are most effective that we use on farms?

### Practices that control soil and P loss

- Waterways
- Contour farming
- Minimal or no tillage
- Crop rotation-alfalfa on 1/3 to 1/2 acreage on farm
- Cover crops
- Residue management
- Low disturbance manure management
- No till seeding of alfalfa and corn into standing covers





Each practice comes with a list of positives and negatives.





### Cover crops

Cover crops grow when there is no main crop growing (grain or forage) and protect water moving over the land surface from taking soil with it (WIN!)

Cover crops can be difficult to get established in the fall, take additional time and money to plant in fall and terminate in spring, and present challenges for next year's main crop (WIN??)







Tillage breaks up compaction, warms the soil quickly in the spring, and prepares the seedbed for quick germination (WIN!)

Excessive tillage damages soil structure and can result in soil crusting (minimal infiltration), erosion, and soil and phosphorus loss (WIN??)

No till practices encourage biological activity and soil structure, retain water longer and prevent erosion (WIN!)

No till practices can layer nutrients on the soil surface, increasing phosphorus loss at different times of the year (WIN??)





### What do fields in each category look like? How do we know whether we need to cut losses? What are achievable goals for farms?

Soil Loss (lbs/acre)	P Loss (lbs/acre)	Take a drive, watch where water flows
500	0.5	Look for:
1000	1.0	Sedimentation in corners,
1500	1.5	Soil covered plants in June
2000	2.0	
		Use treatment practices for concentrated erosion to slow wa and protect soil





How do we estimate the conservation benefit we get from the various practices?

Snap-plus is the primary tool used to estimate and compare the erosion control and P-loss reduction benefits of practices

How does Snap-plus do that??

Wisconsin's own research calibrates the model

On farm (Discovery Farms and similar) or small plot (University research farms)

SnapPlus is a Nutrient Management Planning software program designed for the preparation of nutrient management plans in accordance with Wisconsin's Nutrient Management Standard Code 590





## What are the numbers for members of Yahara Pride Farms?

30 farms, 1907 fields, 35,104 acres

Median soil test P: 51 ppm

• Field range: 0-348 ppm

Median soil loss: 1.5 tons/acre/year

• Field range: 0-17.5 tons/acre/year

Median PI: 2

• Field range: 0-23





# How do we compare to the standards for soil loss and PI?

### **Tolerable soil loss:**

- 1-5 ton/acre/year as decided by soil type, slope, other landscape factors (NRCS)
- Yahara is mostly 5 ton/acre/year
- 1.9% (672 acres) of total cropland evaluated exceeds tolerable soil loss
- 16.5% of the cropland has a rotational average soil loss of less than or equal to 0.5 tons/acre. Almost half of the total cropland has a rotational average of 0.6 to 2.0 tons/acre/year regardless of T.

### **Phosphorus Index:**

- Farmers required to have rotational average PI of 6 or less on each field
- 61% at 0-2 PI
- 1.5% of cropland is above required level of 6
- Median PI of all fields is 2



## Manure application recommendations have changed through the years

- 1970s: Manure was hauled daily and spread on the surface, then incorporated with a moldboard plow
- 1980s: Conservation tillage was recommended. Manure was incorporated with a chisel plow (this was suggested practice until mid-2000s)
- 1990s: No till gains popularity, shift to applying on surface and leaving it there, no incorporation
- 2000s: Concerns over leaving on surface, some farms regulated to incorporate (based on size not landscape)
- 2010s: Low disturbance manure application is introduced, soil is still frozen for 4+ months of the year

### Manure use and nutrient content have changed through the years

- Until 1970s: All manure spread on field within 24 hours of production. Often close to the barn which concentrated soil test P values in some areas.
- Mid 70s: Begin building manure storage structures and trend toward collecting all manure.
- 1980s: Research comes out on nutrient content of manure and how to plan and credit nutrient applications
- 1990s: Farmers start to write own nutrient management plans, manure and nutrient crediting presented in educational sessions, nutrient management standards are developed. Farmers decrease off-farm P purchasing to use manure P instead.
- 2000s: As farm sizes grow, manure storage is more important. More manure per farm to manage, fewer days to manage it. Less winter manure spreading. Manure nutrient content in storage goes down because of dilution. All farms required to have NMP.
- 2010s: Low disturbance application, manure treatment, draglining, incorporating into standing cover crops are introduced. Stored manure is very diluted with low nutrient content. 60%+ of manure produced in wintertime is NOT spread in wintertime

### Is this what you think of when you think manure application?







### What does it mean for a farm to make a switch to adopt a practice?

### No till and cover crops

- Labor
- Equipment
- Economics/cost
- Time needed to change

Changing method or timing of manure application

- Labor
- Equipment
- Economics/cost
- Time needed to change

### What are the returns on this practice? AKA Will this pay off?





### Are people willing to change? What does that take?

Climbing the last part of the mountain takes more energy, more resources, more will

We must invest in the farmers willing to:

- Develop new ideas and technology (unproven)
- Implement emerging practices (proven but uncommon or hard to implement)
- Maintain proven practices
- Layer these things together

We can't be satisfied with today's new but proven, we must keep striving to move forward.

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What are the returns on this practice? AKA Will this pay off?

What does it take to get to the top?

Or the Tippy-Top?



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### Are people willing to change? What does that take?

Climbing the last part of the mountain takes more energy, more resources, more will

We need continue to build trust and relationships with agriculture We must invest in the farmers willing to:

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## What does a partnership look like going forward? What stands in our way?

Need to support ag in a way we haven't before in order to get over steepest point on the hill

What does support look like?

- Funding
- Positive communications, understanding of what's ahead

Can we change the pace of approving agency initiatives?

How do we go about getting the right cost share programs that are swift and easy to implement to get the most promising equipment and practices out there?

How do we get the right information to farmers deciding what to implement?

What aren't we certain of yet that we need more information/demonstration/research?

Demonstration on how to's of implementing cover crops, no till and low disturbance manure incorporation (and the intersection of the three)

• Made up of farmer experiences and assessment results

Opportunities to cash flow upgrades in equipment (no till, low disturbance manure incorporation)

Do composted or treated manures pose less risk for nutrient loss?





### Key points

- Farmers in Yahara Watershed are innovators and have implemented recommended practices
- Water quality related to agriculture has to be addressed with a network of practices. There is no silver bullet or quick fix
- Working in systems that are restrained by time, economics, social factors and biology require a different type of approach
- Farmers have always been a key part in developing conservation practices
  - We must invest in the farmers willing to:
    - Develop new ideas and technology (unproven)
    - Implement emerging practices (proven but uncommon or hard to implement)
    - Maintain proven practices
    - Layer these things together
- It seems that there are fewer economic returns intrinsically available for farmers as we climb towards water quality goals





### **Supplemental Resources**

Yahara Pride Farms WebpageYahara Pride Farms 2016 ReportUW Discovery Farms WebpageKeys to Controlling Nutrient LossOverview of SNAP Plus





### Thank you!

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### But, reducing soil loss does not always reduce phosphorus loss for the entire year





Till Count: 49; No-till Count: 36

