University of Wisconsin-Extension
DISCOVERY FARMS
University of Wisconsin-Madison

The Tree
Discovery Farms' Newsletter

May 2007 University of Wisconsin-Madison UW-Extension Volume 6, Issue 2

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- ✓ Learn how to use Discovery Farms data for your farm!
- ✓ Frequently asked questions about the differences between soil loss estimates and water quality on your farm
- ✓ Find out the status of Discovery Farms' involvement with CNMPs.
- ✓ Suggestions for manure management during the summer and fall!

Director's Column-Sharing the Good News

Through my work and family activities I have an opportunity to attend a lot of meetings. At several of the past meetings I've heard concerns about how people tend to focus on the "negative". In my job that means we talk about what people are doing that impacts the environment in a negative manner, versus talking about all the good practices that producers have put in place. We focus on the number of fish kills or contaminated wells and don't talk about the millions of tons of fertilizer or manure that has been safely applied to fields.

I've been told that good news is not news; I disagree. There are stories of producers who are protecting/enhancing our environment, and there are stories on what negatively impacts the environment. Do we have issues that some producers need to address? Absolutely! Will we continue to identify these issues and work with producers, agency personnel and agribusiness to adopt farming systems that minimize these losses? Absolutely! But, can't we give both sides of the story?

This spring the southern part of the state had conditions (frost, ice) with a very high potential for surface water runoff and warnings were issued throughout the state. I am not aware of any fish kills or documented manure runoff events. I know a couple of producers who had issues with manure application or storage, who acted immediately to contain the spill and implemented emergency response plans. Both events had no documented negative impact on the environment. Can't we agree that taking the proper course of action is equally newsworthy? Have a wonderful summer, and enjoy the warmer weather.

"Nothing can stop the man with the right mental attitude from achieving his goal; nothing on earth can help the man with the wrong mental attitude."

~ Thomas Jefferson

Kenneth R. Fuhrer

Practical Uses of Discovery Farms Data

Written by: Amber Weisenberger

Website / Information Coordinator

Over the past few years, the Discovery Farms staff has informed producers, agency personnel, and the general public about the characteristics of agricultural runoff quantity and quality observed at real, working farms in Wisconsin. Some of the primary topics are periods in which runoff typically occurs and the circumstances that can lead to water-quality problems. We have termed these "Critical Periods". While it is understood that there are many different management styles in different areas of the state which may have unique critical periods, we are seeing common themes emerge. As the Discovery Farms Program continues to educate, we will strive to provide more information to help producers make informed management decisions, especially during critical periods.

"Even though runoff from non-frozen ground doesn't happen that often, it is often the period in which one "bad" storm can greatly affect annual losses of sediment and nutrients."

In February, Discovery Farms issued a manure spreading alert to warn producers about the potential for manure runoff. This warning was sent out because of the actual conditions measured on the farms throughout the state and weather forecasts. Even though forecasts may not always be accurate, significant snowmelt runoff did eventually occur, and runoff was measured at all of our Discovery Farms. Using several years of wintertime data, we are establishing critical conditions for frozen and snow-covered ground to help reduce the impact of runoff when it occurs.

As spring and summer approaches, we are moving into a different type of runoff period in which different conditions need to be met in order for runoff to occur. Over the entire time that the Discovery Farms Program has been working with the U.S. Geological Survey to monitor runoff, it is clear that it does not run off every time it rains. Typically, the non-frozen ground period makes up less than half of the annual runoff recorded. Even though runoff from non-frozen ground doesn't happen that often, it is often the period in which one "bad" storm can greatly affect annual losses of sediment and nutrients.

Practical Uses of Discovery Farms Data Continued...

These "bad" storms can be classified as "gully washers" in which the amount and intensity of rainfall can overwhelm most engineered management structures, or, they can be storms that occur during multiple days in which the total amount of water added to the landscape can cause severe losses.

To help producers manage for these conditions, the Discovery Farms Program and the U.S Geological Survey are currently developing an index of risk that evaluates current on-farm meteorological data and combines it with weather predictions to help determine when runoff has the greatest chance of occurring. This "Critical Condition Index" is at the beginning stages of development, but it is showing potential. On-farm meteorological data includes soil moisture, soil temperature, solar radiation, wind speed, wind direction, air temperature, precipitation, and relative humidity. Perhaps not surprisingly, one of the most important parameters in predicting when runoff is likely to occur appears to be the soil moisture conditions preceding rainfall. We will continue to provide updates on the progress of the Critical Condition Index as we learn more.

Meteorological data is collected at each Discovery Farm by weather stations like the one pictured above.

There are many other uses that the meteorological data can provide to aid producers in the determination of current in-field conditions. Wind speed and direction data have been used by some of our producers to maintain spraying records. Soil moisture data have been used to evaluate current field conditions for tractor traffic and runoff potential. Soil temperature data have been used to aid in planting, and the precipitation data have been used to monitor precipitation amounts applied to the crops. The information recorded by the meteorological stations is retrieved twice per day and is accessible through a U.S. Geological Survey website (links to these web pages can be found at the Discovery Farms website). Even though you may not have a weather station located on your particular farm, a comparison between the conditions you observe on your farm can be made to a Discovery Farms weather station in your area. A relationship can be developed between the parameters that are important to you to help you determine the current conditions that are in your fields and allow you to manage conditions more efficiently and appropriately.

To access meteorological data for the UW-Discovery Farms Program, please visit our link to the USGS monitoring pages: http://www.uwdiscoveryfarms.org/corefarms/datasites.htm

Soil Loss Estimates and Water Quality: Apples and Oranges

Written by: Kevan Klingberg
Outreach Specialist

We have all seen lists of Frequently Asked Questions for any topic imaginable. As we present UW-Discovery Farms information at public meetings, here is an FAQ heard a couple times: "The soil sediment loss reported on Discovery Farms (USGS measured) seems very small compared to RUSLE 2 soil loss estimates for the same farm, and even smaller still than tolerable soil loss (T). Is there an inconsistency in these numbers and the way they are calculated? And, if I can show that RUSLE 2 soil loss estimates on my farm are consistently less than T, am I not a water quality champion?"

The discussion of estimated and tolerable soil loss "out on the landscape" compared to soil sediment delivery into a water body and the resulting water quality impact is a complicated conversation that has similar phrases including soil, water, cropland, productivity, nutrients, and resource integrity, yet really is an apple and orange comparison.

Our program can show data that (example) field 1 on the Jones Farm has a T value of 4 t/ac/yr, a RUSLE 2 estimated soil loss of 1.2 t/ac/yr, USGS water sampling results show sediment delivery is 800 lbs/ac/yr into the stream, and water quality analysis shows that 5 lbs/ac/yr N and 2 lbs/ac/yr total P was contained in the runoff water.

Just as apples and oranges are both fruit, they are different fruit. So too, we need to pause, and be careful when contemplating the differences between T and predicted soil loss vs. captured sediment in the stream and measured water quality. We can not knit this all into the same story.

Traditional soil and water conservation plans are developed to help producers maintain soil productivity. They do not specifically evaluate the impact of soil sediment on surface water quality. The RUSLE 2 soil loss model estimates soil movement around, within and away from an agricultural crop field. Like we see in the field, soil erosion leads to shallower topsoil on the upper landscape, thicker topsoil (burial) lower in the landscape, and some of this moved soil actually leaves the field. Soil loss estimates are field specific, reported in tons per acre and are benchmarked against a defined tolerable soil loss value (T) for each soil type. Estimating soil loss and then comparing that value to T is based on soil sustainability. T is the maximum amount of soil individual fields can "tolerate" loosing and still maintain tilth, organic matter, proper rooting depth, water holding capacity, and reserve soil fertility for crop production. Fields that loose more soil than T end up having crop productivity challenges.

The RUSLE 2 soil loss model does not factor into the calculation anything about nutrients bound to sediment or nutrients contained in runoff water. Similarly, there are no factors in the calculation for proximity to streams or a prediction that sediment laden runoff water will enter a water body. RUSLE 2 soil loss estimates do not equal pounds of soil delivered to a stream.

Apples and Oranges: On any given year the USGS capture of sediment contained in surface water runoff will be different than RUSLE 2 soil loss estimates because most of that predicted soil loss remains in the field. In reality, it makes sense that USGS measurements of sediment in runoff water are just a fraction of predicted soil loss.

Soil Loss Estimates and Water Quality: Apples and Oranges Continued…

The stream example mentioned above received runoff water containing soil sediment, N and P dissolved in the runoff water solution, as well as N and P contained in organic matter and bound to soil particles. As we think about a stream receiving surface water runoff from an agricultural field, it is more complicated than 800 lbs of inert sand; it is 800 lbs of fertile cropland soil plus runoff water.

Concerning sedimentation, surely we can talk of a water body becoming filled up with sediment. Impoundments need to be dredged, river channels become narrower and shallower, flood plains get bigger, and most fish thrive better in a gravel bottom instead of a silted bottom.

A still more complicated piece to this puzzle becomes nutrients, organic matter, and other dissolved materials contained in runoff water that enters a stream. We know that a crop of corn needs ~ 120 lbs N and 50 lbs P_2O_5 for acceptable yields. The 5 lbs of N and 2 lbs P/ac/yr contained in the runoff water only represents 4 % of crop nutrient need. One could easily say that the value of those nutrients is $2.65 ($1.95 for N + $ 0.70 for P), and is an acceptable loss and cost of doing business for 150 bushels of $3.50 corn ($525/ac minus expenses).

Apples and Oranges: An acceptable amount of soil and nutrient loss for production agriculture still likely has detrimental impacts on surface water quality. The Federal Clean Water Act identifies lakes, streams, and rivers where fishing, swimming, and other designated uses are negatively impacted due to pollutants (303(d) impaired waters). Wisconsin has a number of these waters identified. In order to improve these water resources, WI needs to define allowable amounts of sediment, nitrogen, phosphorus, and other pollutants that can enter surface water and still maintain water quality standards. This defined amount of allowable pollutants is unique to particular waters, based on a detailed watershed analysis, and is referred to as a Total Maximum Daily Load (TMDL).

There is no doubt that TMDLs will be way less than T's of 3-5 t/ac/yr. We may even find that 5 lbs N and 2 lbs P are at the upper limit of TMDLs. Think about this: 5 lbs N and 2 lbs P/ac/yr coming off of a 2,000 acre watershed and delivered to a small stream is 10,000 lbs N and 4,000 lbs P. Lots of 2,000 acre watersheds exist between any farm and the Mississippi River or Lake Michigan. This is cumulative.

Apples and Oranges: So what does this mean for soil and water conservation, nutrient management, non-point source pollution, water quality and agriculture? 1) RUSLE 2 soil loss modeling does not equal water quality prediction; 2) Soil that moves around on agricultural landscapes mostly stays on the land; 3) Productive cropland soil is different than nutrient enriched surface water; 4) Corn needs 120 lbs N and 50 lbs P, and loosing 4 % of that is mostly acceptable for crop production; 5) Surface water aquatic life, drinkability, and swimability are negatively impacted by nutrient contributions that are only a fraction of crop nutrient need; and 6) Research is needed to define TMDLs.

Data generated on farms cooperating with the UW-Discovery Farms Program will help our state and federal agencies identify TMDL targets that are necessary, reasonable and achievable. Until these targets have been identified we all need to work with producers to get soil losses down to tolerable levels. If all farm operations were cropping the land at or below T, then we could work to reduce soil losses on critical sites to a more acceptable level.

Update on the CNMP Project

Written by: Tim Popple
Outreach Specialist

Comprehensive Nutrient Management Planning (CNMP), or more appropriately, whole farm environmental planning, has become a top issue for agricultural producers and governmental agencies in Wisconsin. Certain USDA programs now require producers to develop CNMPs on their farms for program participation. WI Natural Resources Conservation Service (WI–NRCS) determined that statewide guidance was needed to clearly define necessary components of and suggest a method for planners to develop CNMPs with WI farmers, and identify a method for WI-NRCS to receive and document completed plans.

The Discovery Farms Program staff and WI–NRCS cooperatively worked with livestock producers to test sequentially improved plan development protocols and develop CNMPs. The original version of the CNMP development process revolved around several checklists generated at the national NRCS level. This format was very comprehensive, yet it was redundant and the prioritization of on-farm actions was unclear. As Discovery Farms assisted the first few farmers in working through the original CNMP development process it became clear that changes were needed based on the planner and producer experiences.

Planner and producer comments and feedback were provided to a CNMP workgroup, consisting of WI-NRCS State personnel, District Conservationists and Discovery Farms staff. The workgroup sequentially revised the planning protocol after every completed plan, and UW-DFP tested each revised process with the next set of producers.

This process repeated itself several times over two years. In the fall of 2006 the CNMP workgroup finalized an agreed upon protocol for necessary components of a CNMP, a suggested method for planners to develop CNMPs with WI farmers, and a method for WI-NRCS to receive and document completed plans submitted by farmers. WI–NRCS has begun presenting this material at training sessions and is processing it into template formats for distribution to private sector CNMP planners.

Through this project the Discovery Farms Program and WI-NRCS have jointly created a protocol for WI Comprehensive Nutrient Management Planning. Evidence that a valuable product has been created is revealed through the attendance at training workshops by agency personnel, producers, and private sector consultants, as well as requests for protocol templates.

Also, through the project it was clear that producers wanted a practical and achievable prioritization given to natural resource and environmental issues on their operations that needed change without a lot of redundancy and excess documentation. Producers involved in the project feel that has been accomplished. Producers that had CNMPs developed through the project feel ownership and believe their participation and feedback helped shape the CNMP plan development protocol for WI.

Non-Frozen Ground Options

By Amber Weisenberger

Website and Information Coordinator

Much of the information produced by the UW-Discovery Farms Program focuses on issues with runoff during the frozen ground period. Now that we are coming up quickly on summer, suggestions for manure management during the non-frozen ground period have moved to the forefront of the discussion. It turns out that frozen and snow-covered ground is not the only time where we are at risk for agricultural runoff. Data from our farms suggests that as much as a quarter of the nutrient and sediment losses from agricultural land in Wisconsin happen between late March/early April and when the canopy closes in mid-June and the soil is protected from the erosive energy of falling raindrops.

For purposes of manure management, the non-frozen ground period can be broken down into three windows. The first window lasts from when the frost leaves the ground until the crop canopy is closed and the soil surface is protected (approximately March 15-June 15). During this period, there is often a lot of rain and possibly intense thunderstorms. Soil moisture and weather patterns can change quickly so we must carefully monitor these conditions in order to make the right choices about manure management.

The second window extends from June 15-September 15. This is a low risk time for runoff as the crop canopy protects the soil and normal rainfall is reduced. What is the challenge associated with this time period? The crops are established and there is no place to spread manure during the low-risk window! A great option to consider is planting short season vegetable crops into your rotation in order to open up this window for manure application. Crops like peas, snap beans, or winter wheat can be incorporated into your rotation to add diversity, keep weeds down, and even add extra nitrogen to the soil. The other benefit of crops like these is that you are able to open up a low-risk window for spreading during a time of the year when you may need some extra room in your manure storage facility. If you are interested in this option, contact your crop consultant or local co-op to see if this is a viable option for your farm.

The third and final window of the non-frozen ground period lasts from September 15 until the ground freezes. One major consideration for manure management decisions during this period is that producers with storage should make sure to leave enough capacity in the storage facility after hauling to get through until about April 1 so that they may avoid spreading during the most vulnerable part of the frozen ground period.

Manure management decisions during the non-frozen ground period can be tricky. But, by taking a few extra moments to evaluate the soil moisture and weather conditions, and doing a little planning ahead, we can be ahead of the game and lower our risk for agricultural runoff.

This newsletter is an information source about the Discovery Farms Program. Regarding the mailing list, call/e-mail 715-983-5668 or jgoplin@wisc.edu.

This newsletter can be found on the web at www.uwdiscoveryfarms.org.

Discovery Farms is a program from the University of Wisconsin, and is part of UW-Extension and the College of Agriculture and Life Sciences at UW-Madison. It has a relationship with WASI, as does UW-Platteville's Pioneer Farm.

Discovery Farms receives funding through UW-Extension, UW-Madison, UW-Stevens Point, UW-River Falls; with help from DATCP, DNR, NRCS, USGS, county Land Conservation Departments and county Extension offices; as well as ag industry organizations, such as WMMB, PDPW, WPPA, and DBA.

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