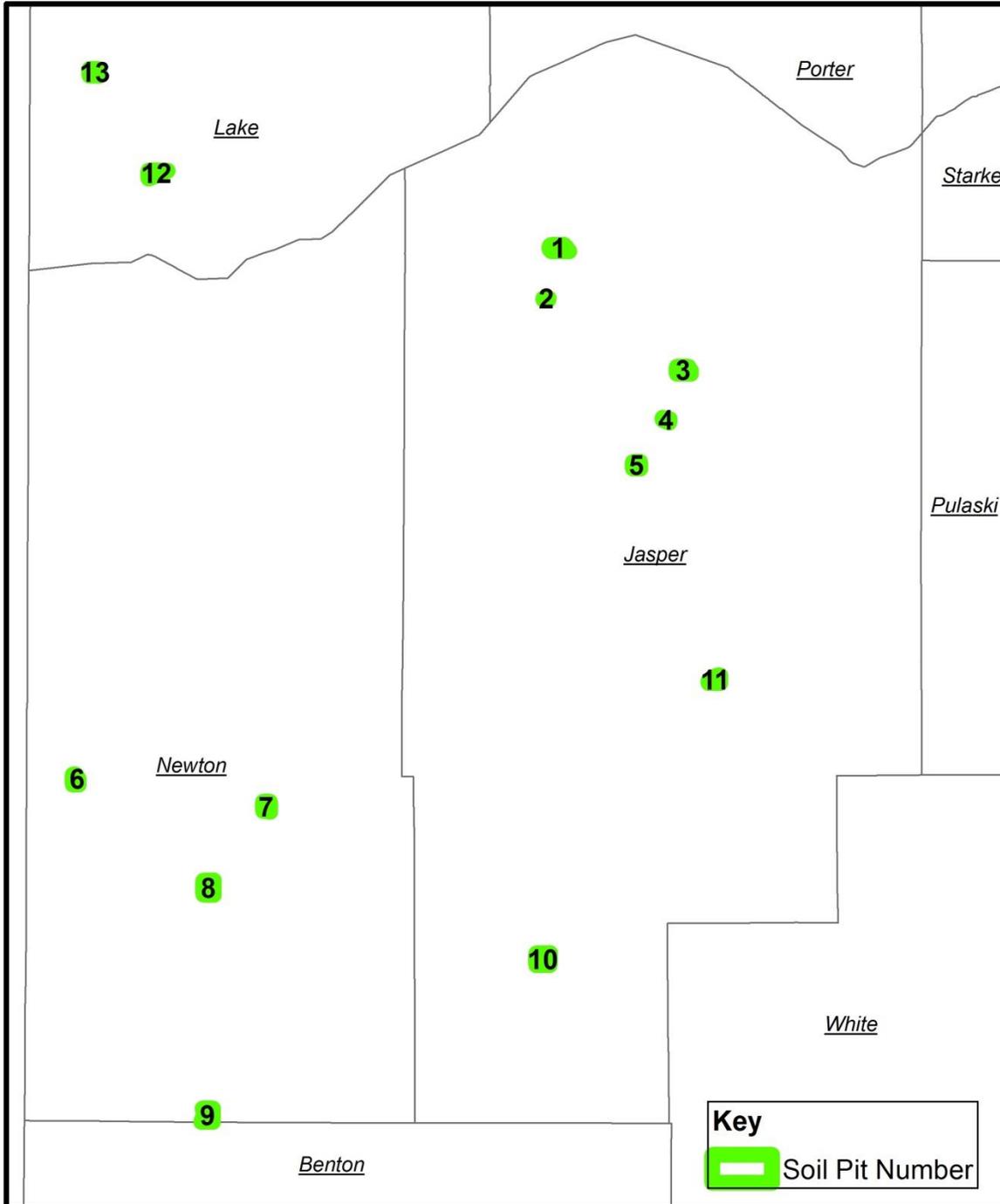


NORTHWEST INDIANA COVER CROP REPORT WINTER 2014

Stories from the pits, crimping cereal rye, and cover crop impact on nitrogen and water quality.



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Soil pit tour conducted on November 14, 2013

Jasper, Newton, and Lake SWCD Cover Crop Report Fall 2013

In general, cover crops in Jasper, Newton, and Lake Counties were planted at the end of August, through September and even into early November, 2013. We are entering our fourth year of discovering the value of cover crops in northwest Indiana. This year we have some great stories from the pits, about crimping cereal rye, and about cover crops' impact on yield, and nitrogen and water quality. This report's goal is to share those stories.

Stories from the Pits

Over the course of two and a half days, we covered 13 different soil pits and had many good conversations. Here are the goals farmers (in their own words) are trying to accomplish (no ranking):

• Capture nitrogen	• Promote soil biology
• Improve soil quality	• Address compaction
• Reduce weed population	• Capture manure nutrients
• Prevent wind and water erosion	• Build organic matter
• Provide nitrogen credit	• Break hardpan layers
• Increase yields	• Reduce risk of drought
• Diversify rotation	• Be a better steward

We had less than ideal rain for cover crop establishment in September, but better growing weather in October. Harvest was also later than average, which hindered cover crop growth. One of the biggest questions was, "Did I get my money's worth in cover crop growth?" The answer to that was one of the most surprising finds of our soil pit tour. "Success was not always what we saw on top." To help describe and illustrate, here is a recap of what we found in the soil pits. The chart on the next page is a summary of what we found.

Our top observations and lessons learned from 2013:

- *Cereal rye roots go far deeper than wheat roots.*
- *Cereal rye planted before soybeans resulted in 10 bushel/acre increase (64 bushels, up from 54).*
- *Earlier harvest corn (even one week earlier) had much better stands of cover crop.*
- *Plan to seed oats, radish, clovers, and annual ryegrass aerially into earliest harvest fields for most benefit.*
- *Use cereal rye ahead of soybeans and if seeding cover crop after September 20.*
- *Don't judge benefit by just what is on top. Digging a little reveals a lot.*

YouTube videos are available from most pits that describe the details of the particular field, rooting depth, and various discussions on soil health in action.

If you choose to watch one video, I would watch this one:

Did I waste money on this cover crop? <http://youtu.be/GdyceTl8gXg>

Search YouTube for "JCSWCD Cover Crop Guy" and you can explore the various videos.

Summary of rooting depth from Fall 2013 Soil Pits (pit site # is on cover page of this report).

Soil Pit Site	Seed Method	Seed Date	Seeded Into	Cover Crop Type	Rooting Depth (inches)		Video YouTube "JCSWCD Cover Crop"	Key Observations
					11/14/13	4/1/14		
1	Broadcast and VT	Sept 15	Corn Silage	Oats, radish	16		N	Perhaps residual chemical suppressing growth?
2	Broadcast and VT	End of August	Leafy Greens	Wheat	9		Y	Wheat roots don't go deep, but great density in top 9-12 inches
3	Aerial	Sept 9	Corn	Oats, radish	20-24		Y	2 pits dug: Earlier harvest section had more cc growth and rooting
4	Drilled	Sept 28	Alfalfa	Wheat, radish	Wheat=9 Radish =12		Y	1 ft to compaction layer and at 2 ft, alfalfa roots show signs of fighting compaction
5	Broadcast and VT	Mid-Sept	Corn Silage	Oats, radish	16		Y	Oats great fibrous system, radish going deep
6	Drilled	August 20	Wheat	Annual, radish, clover	Radish = 30 Ryegrass = 48		Y	Looks like all radish, but clover and ryegrass going strong
7	Aerial	Sept 6	Corn	Annual, radish, clover	Radish= 18 Ryegrass = 36		Y	It is what's underneath.
8	High Clearance	Sept 3	Corn	Annual, radish, clover	34		Y	3 inches of ryegrass top growth = lots of root depth. Harvested Oct 20
9	Aerial	Sept 8	Soybean	Oats, radish	20		N	
10	High Clearance	Aug 28	Seed Corn	Cereal Rye, radish	36+		Y	We thought this failed due to Aug drought
11	Drilled	Aug 28	Wheat	Oats, cereal rye, turnips winter pea	24+		N	Excellent grazing gains. Great stand.
12	Drilled	Mid-August	Wheat	Annual, radish, clover	36		Y	20+ yr no till, 1 st yr cover cropper
13	Broadcast	End of Oct	Soybean	Cereal Rye	30		Y	20+ yr no-till, 1 st yr cover cropper

*Data taken from notes by Sarah Wolf (ISDA), Barb Barten (Gutwein Seeds), Mark Perry (CISCO Seeds), Rose Morgan (Newton SWCD), and Stu Manchester (Vision Ag).

Soil Pit Site 8 Highlight

This picture was taken Nov 14, 2 months after seeding, but only 3 weeks after corn harvest. Looks like a failure, but . . .

Photo: Dan Perkins, Jasper SWCD



Dig a little, and we all learned a lot!
Dan and Hans preaching from the pit.

Photo: Rose Morgan. Newton SWCD

We found roots at 30 inches, despite very little top growth. It will be interesting to see what we find in the spring.

Photos: Hans Kok, CCSI, and Stu Manchester, Vision Ag



Radish that is pencil size was still found rooting to 12 inches. Note earthworm activity near radish.



Note the white roots from the annual ryegrass. Corn next year will travel this path of least resistance!

Soil Pit Site 10 Highlight

New this year was seeding cover crop with a high clearance seeder. Uniform application and good stands were achieved, got the end rows and along tree lines! We also run through some 12 foot tall corn and calculated end row loss for your benefit.



Seeding oats and radish into seed corn



Boom height in 12 ft tall standing field corn

Click on link for video of the actual seeding: [Does high clearance seeding of cover crop work in NW Indiana?](#)

Search YouTube for "JCSWCD Cover Crop Guy" and you can explore the various videos of the high clearance at work.

What is the yield loss from turning on end rows? Less than 0.25% of yield per acre

Recommend lowering of combine head on turning end rows to maximize ears harvested.



Corn down from one wheel on end row by
Dan Perkins: Jasper SWCD

We calculated this by:

- Myself and a farmer counted number of stalks down in one turn = 295 stalks on average
- Assume
 - 1 ear has 450 kernels
 - 90,000 kernels to one bushel
 - Do the math . . .
- One turn of machine on end row = 1.5 bushel loss

Apply to field level:

- ½ mile long field row = 3.6 acres per turn
- 1.5 bushel loss per 3.6 acres

0.41 bushels loss per acre

0.23% loss per acre

\$5 a bushel corn = \$2 an acre loss

So all other things being equal if cost of seeding with high clearance is \$2 cheaper than alternative seeding method, this is an economical seeding option.

Soil Pit Site 11 Highlight

Can you guess what occurred here? It isn't a fence line from grazing. The entire area was open to cattle for grazing . . .

Photos: Barb Barten, Gutwein Seed Services



Photo taken on October 13, 2013



Photo taken on November 4, 2013

A grazing mix of Jerry Oats, Cereal Rye, Austrian Winter Peas, and Turnips was seeded after wheat. Hog manure was applied to part of this field pre-cover crop (end of July) after wheat harvest, but not to the area on the right side of the pictures. The entire field was opened to be grazed by cattle and they ate right to the line where manure had been applied. It was observed that the cows ate around the turnips. Turnips are known nitrogen scavengers . . .

Tissue sampling revealed high nitrate levels in the turnips, which the cattle obviously didn't like. This turned out to be a good thing. The nitrate levels in the turnips were over 9000 ppm. If a feed product is over 8800 ppm of nitrate, the feed product needs to be diluted with low nitrate feeds and fortified with minerals and Vitamin A, or else cattle health can be seriously impacted.

In this case, the cattle were limiting themselves to the amount of high nitrate feed they were eating because they had a choice of feed in the diverse mix of cover crop. If the cattle didn't have a choice of feed available, calves could have had aborted or serious health impacts to the cattle.

This is a precaution to those that apply manure and then plan on grazing the cover crop and the value of a multi-cover crop species mix. Just something to think about . . .

**Thank you to all the farmers and sponsors who made
the 4th Bi-Annual Jasper, Newton, and Lake Counties Cover Crop and Soil Pit Tour a success!**

Gutwein Seed Services, Rensselaer, Indiana
Vision Ag LLC, Rensselaer, Indiana
Wilson Fertilizers, Brook, Indiana

Prairie Lime LLC, Demotte, Indiana
Heritage Farm Services, Morocco, Indiana
CERES Solutions Pleasant Ridge, Rensselaer, Indiana

Demonstration of Crimping Cereal Rye Ahead of Soybeans

Lessons Learned

[Click here for videos of the crimper at work.](#)

I have heard it said that “if you don’t fail at some aspect in farming every year, then you’re not trying hard enough to be successful.” Our first experiment with crimping cereal rye before planting soybeans was our failure this year. In failure, we gained a perspective for future success. Here is the story:

You may have read that crimping cereal rye before planting soybeans offers a potential yield advantage via moisture retention, infiltration increase, weed control, disease reduction, and input reduction costs via reduce herbicide and tillage passes, along with increases in soil health and environmental benefits (Mirsky et al., 2009). South America has been using the method for 15 years, and success has been documented in Pennsylvania, Washington, and Maryland (Moyer, 2011). Based on this information and the following goals, we thought we would jump in . . .

Goals:

1. Learn to produce non-GMO soybeans, which will not require cultivation for niche marketing.
2. Keep ground cover over winter with living cover crop.
3. Farm system has net revenue per acre equal to a conventionally raised crop.

1. The tool for crimping the cereal rye.



2. Cereal rye at pollen shed (>75% anthesis) = perfect for rolling to get 98% kill.



3. Field crimped nicely on June 4th.



4. Soybeans planted on June 4th, with a planter. Next time we will use a drill!



5. Seed depth and closure was good.



6. Emergence was ok.



Photo taken on July 23

7. Crimped cereal rye vs. No cereal rye

Photo at planting June 4th



8. The control with no cereal rye was weed filled and had poor emergence and stands.

Photo taken on July 23



All photos taken by Dan Perkins, Jasper SWCD

9. The soybeans with cereal rye strip had unacceptable levels of weed pressure. Drilling soybeans next time may eliminate this problem.

Photo taken on September 5



Strip was not harvested due to weed pressure. Plan to attempt again in 2014 with lessons learned.



Soybeans emerging through crimped cereal rye.

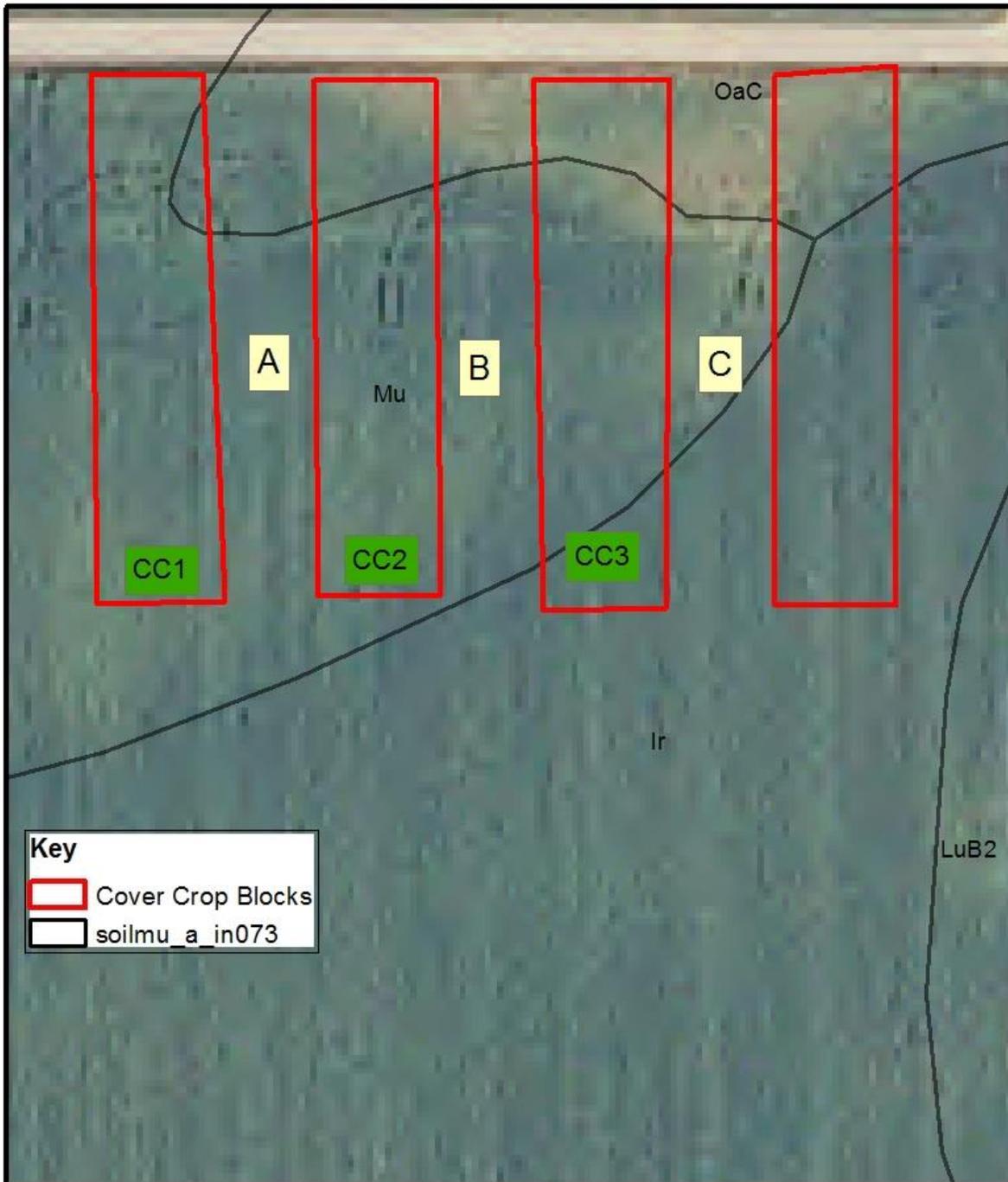
Lessons Learned (what we will do in 2014)

- **Plant soybeans with a drill** = 7.5 inch space, which will close the canopy much faster for better weed control.
- **Seed cereal rye at higher rate.** Debatable, as this will require more weight/down pressure on the crimper.
 - This field was intended for cereal rye seed harvest so it was seeded at 70 lbs/acre. The mat after rolling was 4-5 inches thick.
 - If spreading DAP, then this will encourage tiller of cereal rye and thicker stands.
- **Seed cereal rye as early as possible** after corn (use earlier season corn), so flowering of cereal rye, and therefore crimping, can occur early to mid-May for more timely soybean planting.
- **Plant soybeans into standing cereal rye** at angle.
 - This is most likely result in better emergence and less disturbance for weeds to emerge in the planting row.
- **Roll cereal rye** after planting, although rolling and planting in one pass would be more efficient.
 - Crimping twice didn't increase kill on cereal rye.
- **Be prepared** to deploy a rescue weed control plan at any stage.
- **Try experiment** with Round-Up-Ready Beans first.
 - **Up soybean plant population** to 5-10%?
- **Start with fields** with known low weed pressure.

For videos of this Roller/Crimper demo, search YouTube for "Jasper SWCD Cover Crop Guy".

Year One Results from Replicated Cover Crop Strip Trial

Cover Crop Vs No Cover Crop Study
www.jaspercountyswcd.org



by Dan Perkins SWCD Not for legal use



0 30 60 120 Feet

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Year One Replicated Strip Trial Summary

Nitrogen lost to local ditches via tile is a negative to the farmer, the crop, and local water quality. A majority of nitrogen loss occurs during the non-cropping season (Kladivko, et al., 2004). Cover crops reduce nutrient losses (Dinnes, et al., 2002; Kasper, et al., 2008) along with a host of other benefits. In Indiana, research done by Dr. Eileen Kladivko from Purdue at SEPAC found that under a conservation cropping system, annual nitrate concentrations in tile water dropped from over 30 mg/l to under 10 mg/l when nutrient management, no-till, crop rotation and *cover crops* were implemented as a system (Kladivko, et al., 2004). This is a win-win for the farmer, crop production, local water quality, and everyone downstream.

In this light, the Jasper SWCD and its partners are working with area farmers to answer the following questions:

1. Will cover crops impact soil nitrate levels? And how does this affect nitrogen management decisions?
2. In Jasper County, do cover cropped fields result in yield increase compared to non-cover cropped fields?
3. With cover crops, can we make our soils work like the soils “found in the old fence row”?

We are using a replicated strip trial with cover crop vs. no cover crop being the only management variable changed across the field.



Cereal Rye drilled – Corn in 2013

Cereal Rye drilled – Beans 2014

No-Till Corn and Beans 15+ years on sandy loam soil

First year cover crop 2013



Cereal Rye drilled Nov 1,
was 9 inches at
burndown, May 1.

Photos: Dan Perkins, Jasper SWCD

Here is the start of some information from one field.

1. Was nitrogen kept in the soil profile?

Cereal Rye on May 1 at 9 inches was holding 21 lbs of nitrogen/per acre according to total nitrogen biomass sampling (top growth).

- a. *Yes, according to PSNT test taken May 1.*
 - Cover crop strips reduced soil nitrate levels by 64% in the depth of 0-12 inches and by 40% at the depth of 12-24 inches at sampling date May 1, compared to the non-cover crop strips.
 - This is expected, given the nitrate has been sequestered into roots and above ground biomass, instead of running out the tile. This is nitrogen that would have been lost.
 - This is a nitrogen credit, but we are unsure when that nitrogen will be available to next cash crop. Most likely it is building organic matter and will act as a trickle release fertilizer. It is estimated 25- 50% of N is available to cash crop, but that is very weather-dependent.

2. Was there a yield increase?

- a. In first year of trial, no statistical difference was found in yields of cover crop strips compared to non-cover crop strips.
 - We wouldn't expect to see yield increase only after one year of cover cropping with cereal rye planted ahead of corn. Planted ahead of soybeans we may expect a yield increase. We will find out in 2014.
 - No yield gain or yield loss.
 - Trial will run for 3 years.
- b. We have two more cover crop vs. no cover crop trials that started in Fall 2013, with a total of three in Jasper County that will run for the next three years in a corn/bean rotation.

This is an ongoing study for the benefit of each farmer, funded in part by the farmer and grant dollars. If you are interested in setting up a similar strip trial, please contact Dan Perkins at the Jasper SWCD office.

Tools used for Biomass Sampling



Tools used for Soil Sampling



Look for signs like this in your area and you will discover innovative farming!



Estimated Water Quality Impacts

With increasing press coverage and possibility of regulations due to agriculture's impact on local and global water quality concerns (Carpenter, 2005; Rabalais et al., 2001), it is in our best interest to voluntarily do all we can to improve and protect water quality to prevent regulation that tell us what to do. Northwest Indiana, and in particular, the Iroquois River watershed has been identified as a contributing source of non-point pollution (Perkins, 2013).

Farmers and agribusiness are, can, and should lead the way in the effort to restore and protect water quality. Cover crops are one tool in the toolbox to improve water quality.

In the Iroquois River watershed (covering Jasper, Newton, and Benton Counties), 9,640 acres of cover crops planted in 2013 (conservative estimation) were responsible for the following estimated nutrient reductions to water bodies (T. Young, personal communication, 2014):

- **2,540 fewer tons of sediment**
 - 226 dump trucks at 10 yards each
 - Equivalent to 2.5 "acre furrow slice" (volume of soil in an acre to depth of 6 inches) saved
- **4,150 fewer pounds of phosphorus**
 - prevented 2,075,000 pounds of algae from growing in surface water
 - \$1,328 worth of phosphorus (\$0.33 per pound)
- **8,341 fewer pounds of nitrogen**
 - 100 million gallons of water could have been contaminated above the drinking water standard of 10 parts per million, or about 38% of Caboose Lake located at State Road 231 and I-65
 - \$5,005 worth of nitrogen (\$0.60 per pound)

Sediment is the number one pollutant by volume in Indiana streams (IDEM, 2013). Sediment enters streams from erosion off of bare soil. Sediment suspended in water limits the amount of light that is available for plants to use for photosynthesis. Floating sediment absorb heat from the sun, raising the temperature of the water, and reducing the amount of dissolved oxygen available to fish and other aquatic animals. Sediment can also kill fish by clogging their gills and smothering their habitat.

Phosphorus enters streams in organic matter, attached to soil particles, or in fertilizer. Phosphorus increases both land and aquatic plant growth. When phosphorus levels in water are too high, algae and weeds grow rapidly, but when they begin to die and decompose, the dissolved oxygen supply in the water is depleted. This condition is called hypoxia, which can lead to fish kills. Phosphorus is released from the decomposing plants back into the water, which continues the cycle. This contributes to the several thousand square miles of "dead zone" in the Gulf of Mexico. One pound of phosphorus can grow 500 pounds of algae in surface water (T. Young, personal communication, 2014).

Nitrogen enters water from human and animal waste, decomposing organic matter, and runoff of fertilizer from lawns and crop fields. Excess nitrogen contributes to algae growth. Excessive nitrogen in drinking water can be harmful especially to young infants and young livestock. The EPA drinking water standard for nitrogen is below 10 parts per million (10 mg/L). Ten pounds of nitrogen can pollute 120,000 gallons of water above the drinking water standard (T. Young, personal communication, 2014).

(Thank you to Sarah Wolf, Resource Specialist for Indiana State Department of Agriculture for putting these estimations together).

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It is the mission of the Jasper County Soil and Water Conservation District to provide leadership and assistance in the proper use and management of soil, water, and related natural resources in Jasper County.

Who is the Jasper County SWCD?

The Jasper County SWCD was established in 1945. We focus our attention on resource problems and solutions in Jasper County. We, in cooperation with the area farmers, agribusinesses, Natural Resources Conservation Service, Purdue Extension, Indiana State Department of Agriculture, and other partners, provide educational material and technical assistance free of charge.

We focus on cover crops because they offer the most cost-effective way to reduce sediment, which is the number one pollutant in our streams. Cover crops are the next innovation in agriculture in a long trend of improving efficiency and productivity.

If you want unbiased, science-based, and practical advice based on the latest research and what works in our area, please call our office and we can discuss ideas and options. We can also put you in contact with local farmers who are experiencing success with cover crops.

Dan Perkins, Jasper SWCD “Cover Crop Guy”

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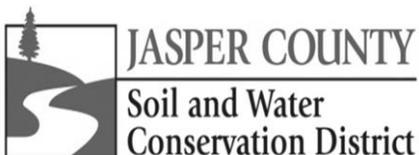
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Thank you to the farmers, ag businesses, and multiple partners who made this report possible!



Newton
County SWCD

