

MONTHLY BOARD MEETING MINUTES

- I. **CALL TO ORDER - On Tuesday October 17, 2017, at 7:07 pm a regular meeting of the Board of Supervisors of the St Joseph County SWCD at the Centre Township Branch of the St. Joseph County Public Library was called to order by John Dooms, Chairman.**

PRESENT – SWCD

John Dooms, Chair/Supervisor
Mike Burkholder, Supervisor
Stacey Silvers, Supervisor
Dave Vandewalle, Supervisor

PRESENT – SWCD/NRCS

Debbie Knepp, NRCS DC
Sarah Longenecker, SWCD CC
Sandra Hoffarth, SWCD AA

Present - EX-OFFICIO

N/a
PRESENT – Public
David Straughn

ABSENT – SWCD

Jeremy Cooper, Vice-Chair/Supervisor
Dave Craft
Jan Ivkovich
Dru Wrasse
Richard Schmidt
Randy Matthys
Dale Stoner
Arlene Schuchman
Chuck Lehman
Jim LaFree
Carole Riewe

II. **ADDITIONS TO AGENDA**

III. **REGULAR BUSINESS**

- a. **Legislative Updates – n/a**
- b. **Indiana Conservation Partnership Updates – n/a**
- c. **Minutes: September 19, 2017 board meeting** – Minutes were reviewed and approved as presented.
- d. **Treasurer’s Report: (9/20/2017-10/17/2017)** – The treasurer’s reports was reviewed and approved as submitted.
- e. **Approval of Claims (9/20/2017-10/17/2017)** –A motion (Burkholder, Silvers) was made to approve Claim Nos. 11255-11266 for a total of \$3,916.53 as presented. Motion carried.

IV. **OLD BUSINESS**

- a. **St. Joseph Co. Soil & Water Conservation Partnership Staff Written Reports**
 - i. **Field Office Report**– The field office report was presented to the board & reviewed. (Attached).
 - ii. **NRCS Talking Points - Knepp** went over the NRCS DC talking points (attached).
- b. **Committee Reports**
 - i. **Election** – The election committee recommends Stacey Silvers be re-appointed as a supervisor for another 3 year term. A motion (Burkholder, Vandewalle) was made to approve the recommendation. Motion carried.
 - ii. **Annual Meeting – Entertainment** – Vandewalle updated the board that the committee has not been able to find a band and is now looking for speakers. Hoffarth has contacted Scott Ham who is on the State Soils Board who she heard speak a few years ago and thought he is an engaging, funny speaker who talks about his military experience and water/sanitation efforts overseas and local. The committee is hopeful he is available to speak otherwise they will continue to search. If anyone has suggestions please contact Hoffarth.
- c. **Christmas Party Planning** – Dooms let the board know that we haven’t had a Christmas party in a few years and feels we really need to have one this year. He will work with Hoffarth to set a date and location.

V. **NEW BUSINESS**

- a. **Schedules/ Upcoming Events / Any Related Claims** - calendars were handed out explaining upcoming special events & holiday schedules on the back of the agenda.
 - i. **IASWCD Annual Conference** – a motion (Burkholder, Silvers) was made to release funds to cover hotel and registration for 3 supervisors and 2 staff to attend the 2018 annual conference. Motion passed. It was decided that Dooms will be the delegate with Burkholder as the alternate for the IASWCD Business meeting. Hoffarth informed the board that there is also a supervisors scholarship that can be applied for to cover 1 of the supervisors cost to attend the conference. Hoffarth will apply for Dooms.
 - ii. **National Conference on Cover Crops & Soil Health** – Dooms reminded the board that this year it will be held in Indianapolis on December 7th & 8th. Early registration runs through 11/7/2017 at \$90 for farmers and \$150 for non-farmers. Anyone interested in attending let Hoffarth know.
 - iii. **Headwaters of the Yellow River Grant (Joint field day with Marshall Co.** – Longenecker reminded the board about the upcoming joint field day that will be held on October 25 from 9am-noon at 1400 Miami Trail, Bremen, IN. Supervisor attendance is encouraged to show support of this grant.

- iv. **Jasper County Field Day** – (flyer attached) Longenecker informed the board of this upcoming field day which will be held on November 9. It is a free event. Anyone wishing to attend let Longenecker know and she can set up a carpool.
 - b. **Subscription – Indiana Prairie Farmer** – Hoffarth informed the board it is time to renew our subscription and they have given us the option of a 1 year renewal at \$32.05, 2 years at \$52.38 or 3 years at \$69.50. A motion (Burkholder, Vandewalle) was made to renew our subscription for 3 years at \$69.50. Motion passed.
 - c. **New Employee/Background Check** – Dooks let the board know the supervisors have hired a new Education Conservation Coordinator. Her name is Jane Sablich and she will start on November 13, 2017. Knepp has requested the background check packet from NRCS which is in the mail. As soon as the staff receives it they will get it to Sablich to get the process started. There is a fee for this (we haven't been charged for the last 2) and a motion (Silvers, Burkholder) was made to release the funds to cover this. Motion passed.
- VI. PRIVILEGE OF FLOOR** – Hoffarth explained the article included in the meeting packet is a good article to read about the idea of bringing soil back to life. Dooks read a resignation letter from Jan Ivkovich. A motion (Burkholder, Vandewalle) was made to accept the resignation. Motion passed.
- VII. ADJOURNMENT** – The board meeting adjourned at 8:10 pm.

Respectfully submitted,

Sandra Hoffarth

Administrative Assistant

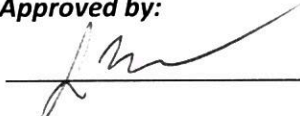
St. Joseph County Soil & Water Conservation District

2903 Gary Drive, Plymouth, IN 46563

Email: Sandra.hoffarth@in.nacdnet.net

www.stjosephswcd.org

Approved by:



Supervisor



Supervisor



Supervisor

Supervisor

Supervisor

Field Office Report September 18 – October 13th, 2017

Field Work:

- Multiple farm visits for construction of Grassed Waterway and Grade Stabilization Structure (CRP)
- Field visit to look at potential filter strip site (CRP)
- 3 Field Visits to develop pollinator planting plans as enhancements (CSP)
- 1 Field Visit to deliver maps for areas to leave standing crops for wildlife (CSP enhancement)
- 2 Farm visits to perform construction checks on 3 Heavy Use Areas, Animal Trail and Walkway, and Pasture Renovation (EQIP)
- Field Visit to check Forage and Biomass planting (EQIP)
- Field visit to meet with landowner and Land Surveyor to approve survey and post boundary Placement (WRE)
- Field check cover crop plantings on 4 farms (CWI)
- 5 Field Visits with landowners to look at areas they would like to plant pollinator habitat (CWI)
- Farm visit to determine if wetland violations had occurred

Environmental Quality Incentive Program

- Process payments for 2 livestock pipelines
- Modify contract to extend the expiration date
- Defer 2 – 2017 applications to 2018
- Calculate cover crop seeding rates for 4 farms

Conservation Stewardship program

- Work on eligibility and toolkit folders for 1 Re-enroll (22 farms)
- Assist biologist with development of 3 Wildlife Habitat Evaluations for Invasive Species Control.

Clean Water Indiana Grant

- Update contracting documents
- Conservation plans developed - 3

Highly Erodible Determinations – 2

Wetlands – 3 determinations

- Meet with producer on potential violation
- Develop and sign Minimal Effect Wetland Agreement with producer

Earth Team Volunteer – meet with and fill out paperwork for Shay Brennan

Meetings:

- | | |
|---|---|
| Staff Meetings – 4 | Locally led Meeting |
| MSP meeting | IDEA Conference |
| Interviews for EEC position | Conservation Reserve Program teleconference |
| N/NE regional staff meeting | Annual Appraisal (Deb) |
| Webinars: Federal Benefits | |
| Soil health with Irrigated Vegetables | |
| Drought's effects on Invasive Species | |
| Inseeding and Precision planning of Cover Crops | |

Office Closed – October 9

DC Talking Points

October, 2017

USDA TOP POSITION NOMINATIONS

Deputy Secretary - Stephen L. Censky has been nominated to serve as the new USDA Deputy Secretary of Agriculture. Mr. Censky is the American Soybean Association's (ASA) Chief Executive Officer. As ASA's top executive, Censky is in charge of managing ASA's legislative, trade policy, international market development, communications, and leadership development programs. Originally from Missouri, Censky was a corn/soybean farmer and worked with USDA on the 1990 Farm Bill.

Undersecretary for Trade and Foreign Agriculture Affairs - Indiana's State Department of Agriculture Director Ted McKinney has been selected as the new Undersecretary for Trade and Foreign Agriculture Affairs. The position that McKinney will assume is a newly created post as part of USDA's reorganization. McKinney has been director of the Indiana State Department of Agriculture since 2014. His international experience comes from serving with Elanco Animal Health and Dow AgroSciences as communications director. McKinney was raised on an Indiana farm and is a Purdue alumni. USDA Secretary Sonny Perdue said, "For our new undersecretary position emphasizing international trade, I have always said that I want someone who wakes up every morning asking how we can sell more American agricultural products in foreign markets. Ted McKinney is that person."

FARM BILL

ACEP – WRE: The easement offer values (Geographic Area Rate Caps, GARC) are out for FY2018 and are the same as 2017. Interested landowners should call their local DC and provide the property deed and idea of offered acreage. Now is the time to submit so that titles can be verified. Application deadlines will be set soon and are likely to be **mid-January**. *Jan 12th*

EQIP Application Deadline: Producers interested in EQIP should submit a signed application by **December 15th** to the local NRCS field office. A new requirement for FY18 is that participants in EQIP must meet eligibility requirements by January 26. NRCS staff will work with producers to determine eligibility and complete necessary worksheets and rankings in order for the applicant to compete for funding. Included in this sign up are several state and national initiatives including:

- National Organic Initiative: Statewide
- National On-Farm Energy Initiative: Statewide
- NRCS Western Lake Erie Basin Initiative (WLEB): Western Lake Erie basin.
- Monarch Butterfly Habitat Development Initiative: Statewide
- Joint Chief's Landscape Restoration Initiative: Bartholomew, Brown, Clark, Crawford, Dubois, Floyd, Greene, Harrison, Jackson, Lawrence, Martin, Monroe, Morgan, Orange, Owen, Perry, Putnam, Washington.
- Working Lands for Wildlife Initiative: available statewide on land which overlaps one of the Indiana DNR C.O.R.R.I.D.O.R.S. priority areas.
- Great Lakes Restoration Initiative (GLRI): Great Lakes Region
- Resource Conservation Partnership Program (RCPP)
 - Tri-State Western Lake Erie Basin Phosphorus Reduction Initiative (Adams, Allen, DeKalb, Noble, Steuben and Wells Counties)
 - Southern Indiana Young Forest Initiative
 - Big Pine Watershed Partnership (Benton, White, Warren, and Tippecanoe Counties)



- The Michigan/Indiana St. Joseph River Conservation Partnership (Elkhart, LaGrange, Steuben, Noble, Kosciusko, DeKalb and St. Joseph Counties)
- Indiana Watershed Initiative: The University Of Notre Dame (Kosciusko, Newton, Jasper and Benton Counties)
- Improving Working Lands for Monarch Butterflies Partnership (statewide)
- Mississippi River Basin Healthy Watersheds Initiative (MRBI)
 - Little Wea Watershed (Tippecanoe County)
 - Big Pine Creek Watershed – Headwaters (Benton and White Counties)
 - Big Pine Creek Watershed - Brumm and Darby (Benton County)
 - Big Cicero Creek Watershed (Boone, Clinton, Hamilton and Tipton Counties)
 - Busseron Creek Watershed (Sullivan and Vigo Counties)
 - Fish Creek Watershed (Greene, Monroe and Owen Counties)
 - Plummer Creek Watershed (Green County)

Regional Conservation Partnership Program: Indiana NRCS has entered into a new RCPP memorandum of understanding (MOU) with DNR Division of Forestry called the Southern Indiana Young Forest Initiative (SIYFI). This project will last from 2017 until 2021. SIYFI addresses a lack of early successional habitat and corresponding declines in at-risk wildlife species in 43 counties in southern Indiana that contain the majority of forested land.

PSS TRAINING

The Program Support Specialists have been invited to attend the 2018 Farm Bill Roll out training sessions to be held in each area. The training will cover the proposed changes for 2018 which will impact the timing of some administrative tasks within the PSS – CRP agreement. This is an important face to face training as the NRCS and SWCD staff will learn of the changes at the same time in the same room enabling them to discuss how the changes will be implemented in their office. The training sessions are scheduled for each area (NE – 10/24; SW – 10/25; NW – 10/31; SE – 11/13). PSS questions can be directed toward Whitney McGrew, Coordinator.

NATIONAL CONSERVATION PLANNING PARTNERSHIP WEBINARS

The National Conservation Planning Partnership (NCP) has developed a strategy that ensures partnership field staff have the right expertise, are stationed in the right locations, and have enough time to work one-on-one with our diverse customer base. The NCP is introducing a new peer-to-peer web conference series to support conservation planning staff and partners. Each month, a new state will host a conversation focused on hot topics and creative solutions surrounding nationwide efforts to put conservation planning first. In this peer-to-peer series you will hear from those states, district conservationists, conservation districts, resource conservationists, and others in various geographical areas that are doing a good job or have wisdom to share.

This series of online workshops, along with an upcoming series of podcasts will be recorded for those that cannot attend the live workshop. Below is a tentative schedule for upcoming online interactive workshops – topics will be announced at a later date. All workshops will be held at 1:00 p.m. (eastern)

Oct 24 – Oregon

Nov 28 – Maine

Dec 19 – New York

NATURAL RESOURCE INVENTORY DATA COLLECTION

The latest NRI data collection cycle will begin on July 10th and will run through November. Field offices could receive questions from the NRI Data collectors during that time period. Any assistance the field office staffs can



provide to the collectors would be greatly appreciated. Questions from the field should be directed to Rick Neilson, Assistant State Soil Scientist at rick.neilson@in.usda.gov or at 317-295-5875.

FFA VOLUNTEERS STILL NEEDED

The FFA National Convention and Expo will be returning to Indianapolis this year and will run from October 25-28, 2017. As in years past, NRCS will be supporting the Natural Resources and Environment Judging events and is asking for volunteer assistance from partnership staff. Please see the volunteer opportunities below.

Natural Resources and Environment Judging Event Volunteer

The purpose of the environmental and natural resource career development event is to foster student interest and promote environmental and natural resource instruction in the agricultural ed curriculum. This event will take place on October 25th at the Indiana State Fairgrounds. Judges are separated into two categories: verbal and teamwork. All volunteers should report to the fairgrounds at 10:00 AM for orientation and will be released of their duties at approximately 3:00 PM. Lunch will be provided.

Verbal Judging:

Students will be provided a scenario that addresses an environmental/natural resource problem from soils, water, ecosystems and waste management. Teams are required to develop a statement that addresses the questions in the scenario and give an oral presentation justifying the decisions made by the team. Each team will have eight minutes to make their presentation. There will be an additional five minutes given to each team to address questions from the judges.

Teamwork Judging:

While the students are preparing their oral presentations, a group of judges will evaluate how well the team members work together to develop their statement and presentation.

If you would like to volunteer for one of these events, please contact Kris Vance at: kris.vance@in.usda.gov.



Planting for the Future



November 9th, 2017

(Rain Date November 10th)

9:00 a.m. - 4:00 p.m. Central Time

5400 East 1000 South, Brook, IN 47922

RSVP to the Jasper County SWCD at 219.866.8008 x3,

jaspercountysoilandwater@gmail.com,

[RSVP ONLINE HERE!](#)



www.



.com



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seeds**

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FRATCO

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Ag Solutions**



Organized by: Jasper, Newton, Benton, Marshall, LaPorte, Lake, and Porter County
Soil & Water Conservation Districts

HIGHLIGHTS

Ray Archuleta
Soil Health Consulting

Dr. Armstrong
Purdue University
Reduce Inputs with Soil Health. How do you know?
Research right from the site.

Farmer Speakers

Session topics
Species, termination, interseeding, roller crimping, air seeders for any equipment, variable rate and species seeding, mixes, and nitrogen from cover crops.

Sessions in Morning Afternoon Mingle

NO SALES PITCHES!

Just good information and conversations!

Lunch provided!

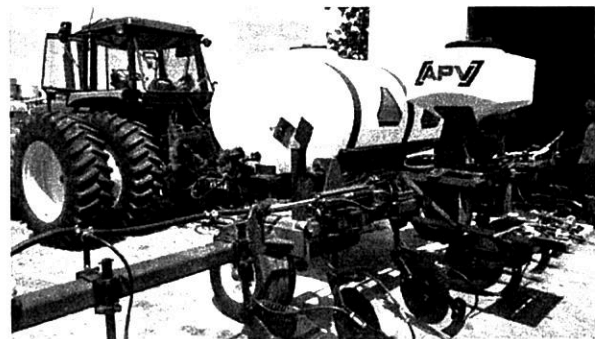
RSVP Here for lunch.

Click here to see a map of the field day site!

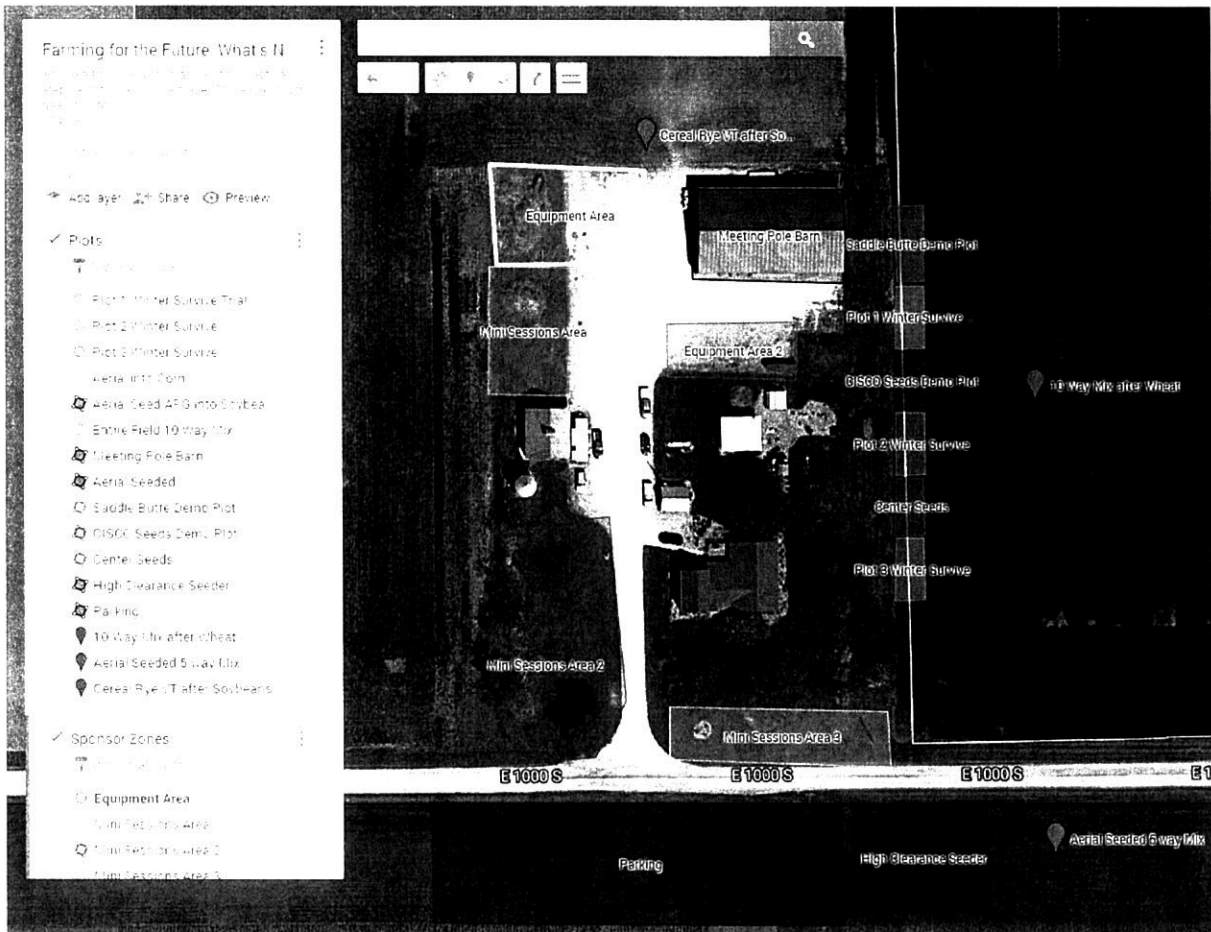
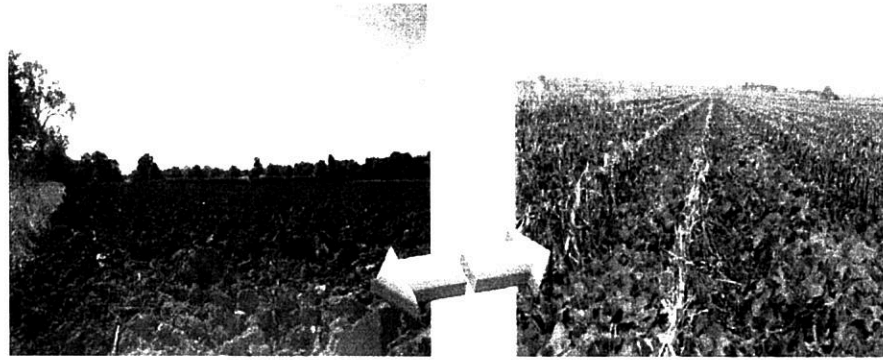
9:00 a.m. - 12:00 p.m. CST - Speakers and Tours

12:30 p.m. - 4:00 p.m. - Lunch, Networking, and Root Beer Floats!

<u>Main Sessions</u>	<u>Speaker (30 minutes each cycle)</u>	<u>Topic</u>	<u>Sponsor</u>
A	Ron Althoff, Gary Cooper	Cover Crop Demo Plot 1 Mixes	<u>Saddle Butte</u>
B	Jeremy Sweeten, Mark Perry	Cover Crop Demo Plot 2- Termination and Drift Laws	<u>CISCO Seeds</u> <u>Stuart & Branigan</u>
C	Jason Carlile, CCA.	Cover Crop Demo Plot 2- Winter Kill and Oats	<u>Carlile Ag Service</u> <u>Center Seeds</u>
D	Gary/Adam Fennig	Get your Cover On!	<u>Fennig Equipment</u>
E	Dr. Armstrong	Reducing Inputs. How do you know?	<u>Purdue University</u>
<u>Mini-Sessions</u>	<u>Speakers (10 Minutes each cycle)</u>	<u>Topic</u>	<u>Sponsor</u>
1	AJ Adkins and Farmers	Drill and Planter Setup for planting green and brown.	<u>Dawn Equipment</u>
2	Dan Towery, Consultant	Knee High Corn and Triple Play	<u>Ag Conservation Solutions</u>
3	Will Glazik: Farmer, CCA	Roller/Crimping Cover Crops and Organic Grains	<u>BCS</u>
4	Evan Click and Farmers	High Clearance Seeding into Corn and Beans	<u>Performance Farm Solutions</u>
5	Hans Kok, Mike Wigginton	Soil Health Indicators in the Field/Soil Cores	NRCS, SHP
6	Wayne Kizer	Annual Ryegrass. Pain or King.	<u>KB Seeds</u>
Edu-Stations = Saturated Buffers, Drainage Water Management, and more.			



Farming for the Future: What's Next?



[Click here for Map of Site](#)

Click on features on map for more details

32 Cover Crop Plots

Saddle Butte Demo Plots

1	Cereal Rye	VNS
2	Radish	Enricher
3	Turnips	Purple Top
4	Kale	Bayou
5	Sunn Hemp	
6	Rapeseed	Dwarf Essex
7	Cabbage	African
8	Mustard	Shield
9	Synergist Mix	ARG, Rape
10	3 Way Mix	ARG, Dixie, radish
11	Soil Buster Mix	Arg, Radish
12	Buckeye Mix	Crimson, Radish
13	15 way mix	Various

CISCO Seeds Demo Plot

1	Barley	Valor
2	Buckwheat	VNS
3	Cow peas	Iron and Clay
4	NutriBuilder	ARG, Crimson, radish
5	Oats/Radish	
6	Forager Mix	Oats, CR, Turnips
7	Ground Brea	Winter peas, Radish
8	Crimson-Cov	Crimson, Radish
9	Clover	Frosty Beerseem
10	Rapeseed	Dwarf Essex

Center Seeds

1	Oats	Black
2	Buckwheat	VNS
3	Clover/Radish	Balansa/Radish
4	Carlille Mix	VNS, Dwarf, Red
5	Allegheny	Oats, Pea, Radish
6	3 oats	Black, Jerry, Brooks
7	Mix	Pea, Rapeseed
8	Mix	Oat, Pea, Rape



Winter survivability plots with new annual ryegrasses and clovers.



Whole Field Plots

(surrounding main site and across the street)

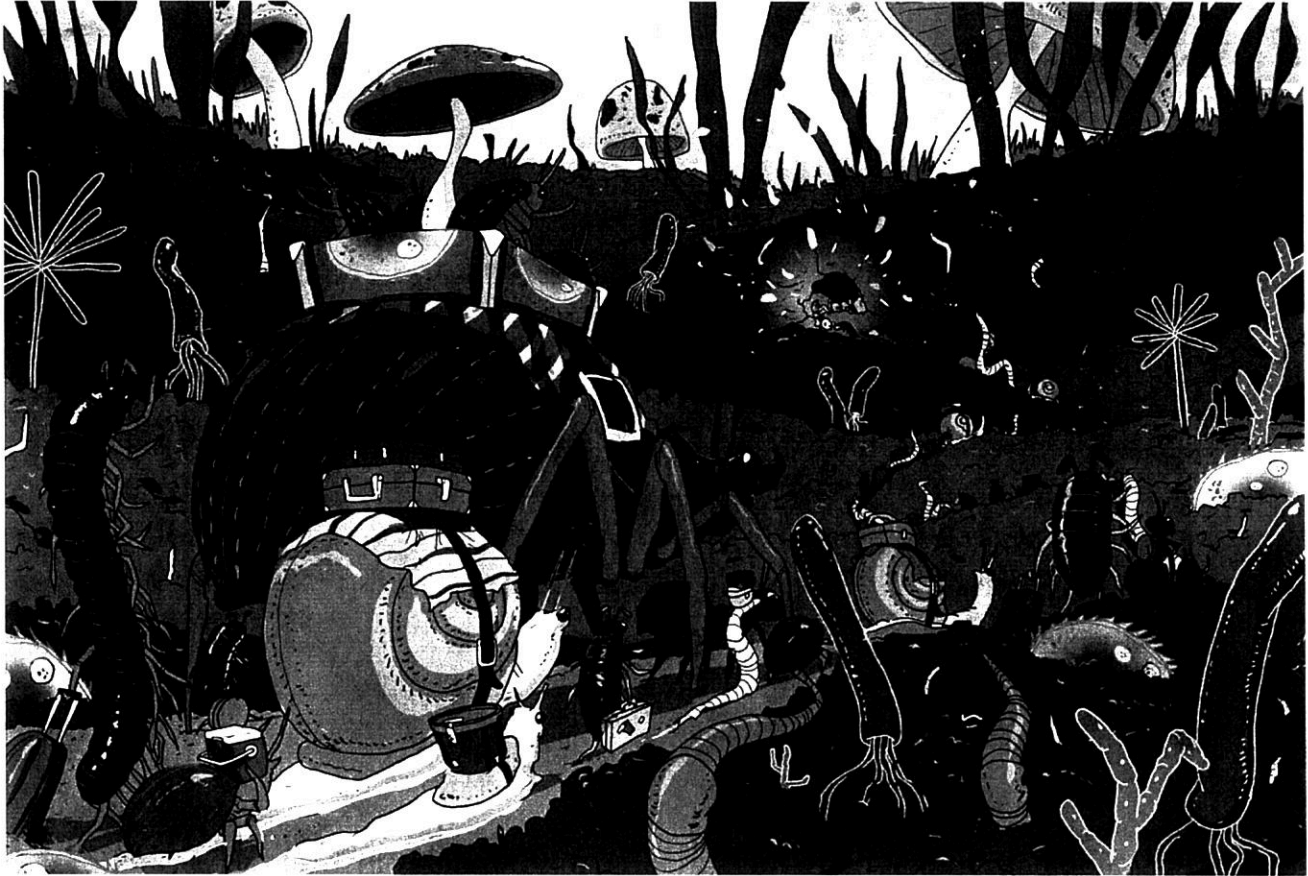
13 way CC Mix After Wheat High Clearance Seeded

Cereal Rye VT after Corn

Aerial Seeding into Soybeans

All Machines on Site





Mike Byers for POLITICO

The Agenda

AGENDA 2020

Can American soil be brought back to life?

A new idea: If we revive the tiny creatures that make dirt healthy, we can bring back the great American topsoil. But farming culture — and government — aren't making it easy.

By **JENNY HOPKINSON** | 09/13/2017 05:00 AM EDT

Four generations of Jonathan Cobb's family tended the same farm in Rogers, Texas, growing row upon row of corn and cotton on 3,000 acres. But by 2011, Cobb wasn't feeling nostalgic. Farming was becoming rote and joyless; the main change from one year to the next was intensively planting more and more acres of corn and soy, churning up the soil and using ever more chemical fertilizers and herbicides to try and turn a profit.

"I'd already had the difficult conversation with my dad that he would be the last generation on the farm," Cobb said.

While looking for a new job, Cobb stopped into a local office of the U.S. Department of Agriculture to pick up some paperwork. That day, the staff was doing a training session on soil health. He stayed to watch and was struck by a demonstration showing a side-by-side comparison of healthy and unhealthy soils.

A clump of soil from a heavily tilled and cropped field was dropped into a wire mesh basket at the top of a glass cylinder filled with water. At the same time, a clump of soil from a pasture that grew a variety of plants and grasses and hadn't been disturbed for years was dropped into another wire mesh basket in an identical glass cylinder. The tilled soil—similar to the dry, brown soil on Cobb's farm—dissolved in water like dust. The soil from the pasture stayed together in a clump, keeping its structure and soaking up the water like a sponge. Cobb realized he wasn't just seeing an agricultural scientist show off a chunk of soil: He was seeing a potential new philosophy of farming.

"By the end of that day I knew that I was supposed to stay on the farm and be part of that paradigm shift," Cobb said. "It was that quick."

The shift he's talking about is a new trend in agriculture, one with implications from farm productivity to the environment to human health. For generations, soil has been treated almost as a backdrop — not much more than a medium for holding plants while fertilizer and herbicides help them grow. The result, over the years, has been poorer and drier topsoil that doesn't hold on to nutrients or water. The impact of this degradation isn't just on farmers, but extends to Americans' health. Dust blowing off degraded fields leads to respiratory illness in rural areas; thousands of people are exposed to drinking water with levels of pesticides at levels that the Environmental Protection Agency has deemed to be of concern. The drinking water of more than 210 million Americans is polluted with nitrate, a key fertilizer chemical that has been linked to developmental problems in children and poses cancer risks in adults. And thanks to some modern farming techniques, soil degradation is releasing carbon—which becomes carbon dioxide, a potent greenhouse

gas—instead of holding on to it. In fact, the United Nations considers soil degradation one of the central threats to human health in the coming decades for those very reasons.

Now, some farmers and soil scientists are realizing that for the health of both people and farms, the most important thing you can do is look at soil differently—seeing topsoil as a living thing itself, which can be tended and even improved. Good soil is alive with a host of delicate organisms, many of them microscopic, producing structure and nutrients. As long as they're thriving, soil can better absorb and retain water and feed plants and control pests. But when they die off, because they've been churned up and exposed to the sun and air or smothered with chemicals, the soil gradually becomes little more than powdered minerals.

Science and farming techniques have been evolving—in part thanks to the Agriculture Department's Natural Resource Conservation Service, where Cobb saw that demonstration in 2011 that changed his worldview. But the change isn't coming easily. Even as some farmers move toward more holistic soil management, they're running into friction—from the culture of farming, from the business of agriculture and—ironically—from some federal policies that encourage them to stick to the same old farming approach that got them here.

AMERICA USED TO be famed for its rich and fertile topsoil. Prairie and forests were virtually untouched when settlers first started dividing land into fields across the Southeast and Midwest, making for rich dark soil in which to grow food and fiber.

Since the invention of the plow, farming has focused on disrupting the soil to make it productive. Most farming methods, whether conventional or organic, are based on “tillage” – the premise that to plant crops and control weeds and other pests, the soil must be broken up and turned over, then amended with chemical fertilizers or organic compost to boost fertility. And it worked for a long time.

But tilling, it turns out, kills off many of the microorganisms that build the soil. It churns up their habitat and exposes them to air; it also makes it easier for soil to be washed off the land by rain and wind. Over time, the damage has built up: More than 50 percent America's topsoil has eroded away. In areas of the Southeast, the country's original breadbasket, it's almost all gone.

Soil, at its base, is 50 percent gas and water, and roughly 45 percent minerals such as sand, silt and clay. The remainder is organic matter—decomposing plants and animals. For being such a small portion of dirt, organic matter plays a huge role. It serves as food for microorganisms that do everything from store water to provide nutrients for plants and control pests. Researchers are learning more and more about the exchange between plants

and fungi, bacteria and other organisms in the soil, said Robert Myers, a professor of soil sciences at the University of Missouri.

Among other things, soil is a critical stage in the earth's carbon cycle. Plants draw carbon out of the air, and feed it to the organisms in the soil. In return, they provide nutrients plants need, acting as a natural fertilizer. Disrupting the soil releases all of that carbon back into the atmosphere. As it is exposed to air, the carbon oxidizes, becoming CO₂ and a major contribution to climate change.

"Some people talk about it as an underground carbon economy," Myers said.

But the same organisms are also very delicate. They need a variety of plants to feed on and are killed off when exposed to the sun and wind through tillage. Since colonial times, U.S. soil has lost about half its organic matter, said David Montgomery, a professor of geology at the University of Washington who has written three books on soil health. "It's sort of like draining the natural batteries."

As scientists have learned more about this nearly invisible ecosystem, the soil microbiome, they've begun to realize that promoting the health of those organisms is key to solving a host of problems in agriculture.

"In the last five years, there has been an awakening of the realization of how critical that life in the soil is to our life," said Ron Nichols, a spokesman for USDA's Natural Resource Conservation Service. "[It's] what really enables this whole synthesis process—to be able to cycle carbon from the air into the soil that makes those other nutrients available to plants, that in turn provides us with oxygen and the food that we eat."

NEW AND IMPROVING testing techniques are increasingly giving scientists and farmers a better look inside the soil and promoting better management practices. In recent years, scientists have learned about key soil transactions like exchanges between plant roots and microorganisms that provide nutrients to the plants, and gotten better at assessing organic matter in the soil. The work is underway in a variety of places—land grant universities are working with USDA and even grower groups and agribusiness companies are looking at and sponsoring some of the work to see how it could be implemented into their farmers' operations.

Promoting soil health comes down to three basic practices: Make sure the soil is covered with plants at all times, diversify what it grows and don't disrupt it. What this means in practice is rotating crops, so fields aren't trying to support the same plant year after year. And it means using techniques like "cover-cropping"—planting a secondary plant like

grasses, legumes or vegetables—between rows of crops or on other exposed soil instead of leaving it bare. Using a cover crop protects the soil, reduces erosion, encourages biodiversity and returns nutrients like nitrogen to the earth.

For the most part, agriculture isn't very good at doing any of these things.

While farmers pride themselves on the stewardship of the land, many have been farming the same way for years, and old habits die hard. Farms have had to get bigger to stay competitive, making it harder for growers to be able to pay attention to the needs of each acre. The majority of farmers in the United States grow the same thing year after year due to a mix of government incentives, habit and ease. Many still till the soil for weed control, albeit considerably less than they have in the past, thanks to herbicide-resistant crops.

“There are a lot of cultural pressures [against] changing in agriculture,” Cobb said, adding that many farmers in his area have questioned what he's doing. “If you change, you are kind of seen as challenging what's right—and it might be taken that you think everything else is wrong.”

Even organic farms have things to learn from the soil health movement. While organic production at its base is aimed at promoting the productivity of the soil, some farmers do still till to control weeds and use nonchemical fertilizer, such as compost, that can run off the land. While organic farms must do some sort of crop rotation, the rules fall short of requiring holistic soil management, though some do.

The USDA estimates that most U.S. acres planted with major crops—about 60 percent—were still tilled in 2010-2011, the most recent numbers available. Just 2 percent of cropland had cover crops over the same time period.

To the obstacles of farming culture and cost, advocates have another frustration: Washington. The federal crop insurance program is based on farmers planting the same crop in the same place each year to have a record for production, and it is not flexible enough to account for practices like cover crops. That reduces incentives for farmers to try new things, since the government-backed program will pay out whether they adopt good practices or not. And since taxpayers subsidize premiums, an increasing reliance on crop insurance to account for low — performing crops often doesn't hurt a farmer's bottom line.

“If we got rid of those subsidies, that would be the quickest way to get people to migrate to healthier soils,” said Dan DeSutter, an Indiana farmer who has been using holistic soil health practices on his land since the early 1990s. “If we are going to be subsidizing crop

insurance, we should give the taxpayer something to show for it, which is clean water, clean air and healthy soil.”

Though lawmakers have allocated money for farmers seeking help moving toward holistic soil management, those programs are voluntary. Congress is currently looking at updating the farm bill—the main omnibus vehicle for national agriculture policy—before it expires at the end of September 2018, but in an already tight budget year, and with farmers generally reluctant to follow any new government mandates, it’s unclear if they will have the appetite to require farmers to adopt newer soil-rejuvenation techniques.

Despite the best efforts of soil health advocates, the rate of synthetic fertilizer use is still on the rise. According to USDA, 97 percent of corn acres nationally needed fertilizer in 2010, the most recent numbers available, as opposed to 85 percent in 1964. The amount of nitrogen used per acre skyrocketed in that time period. In 1964, farmers were applying on average 58 pounds of nitrogen per acre. By 2010, the average was 140 pounds. It’s unlikely those numbers have changed much since 2010.

SOIL HEALTH HAS become the agriculture topic du jour around the world. The U.N.’s Food and Agriculture Organization declared 2015 the International Year of Soils, and the Paris climate deal signed in December of that year included a commitment from signatories to increase soil carbon by 0.4 percent each year, even as it left out other agricultural issues. Doing so, proponents argue, could be enough to halt the annual increase of CO₂ in the atmosphere, curbing the rate of global warming.

It’s also a water-conservation issue, because healthy soils don’t just produce their own fertilizer, they’re better at absorbing water. The U.N. FAO estimates as much as 40 percent of rainwater runs off uncovered dry land soil. But organic matter can hold up to 90 percent of its weight in water and releases that moisture slowly over time, particularly helpful in areas prone to drought.

Domestically, the Natural Resources Conservation Service is increasingly working with farmers to help them adopt better soil management practices, and providing grants and loans to help them get started. Farm groups are also getting involved. In 2014, the National Corn Growers Association, with help from Monsanto, NRCS, the General Mills Foundation, and others, teamed up with the Environmental Defense Fund and the Nature Conservancy to create the Soil Health Partnership to identify and test soil health practices and pass them on to farmers.

If they make progress, American farms will start to look more like DeSutter’s 4,000-acre farm in west central Indiana. Instead of neat rows stripped of extra foliage, his fields look

messy, since each is planted with at least two crops. He rotates his fields among corn, soy, wheat and alfalfa, and between the rows he plants grasses like rye, and legumes like beans and lentils. He's starting to bring cattle onto the land to improve soil health even further with manure, a natural fertilizer. When he started no-till farming and using cover crops in the early 1990s, his soil had about 1.8 percent organic matter. Now it's at 4.5 percent and still ticking up.

"It's a much more complex system," DeSutter said. Conventional agriculture, on the other hand, is "like following a cookie recipe. It doesn't take a rocket scientist."

The payoff for changing that approach is significant, he added, but also requires reckoning with the fact that the land they're farming, and living on, is a much more complex system. "Instead of playing checkers," he says, "we are trying to figure out how to play chess."

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Correction: The USDA's organic standard does have requirements for crop rotation. An earlier version of this story misstated what is included in the rules.

