2018 STRIPS Landowner Report

Photo: Ryan Schmidt

2018 Research summary

First and foremost, thank you for allowing us to conduct important conservation research on your property last year! We had a good year of data collection for several research projects and wanted to share how those projects are going. This report contains short descriptions of many of the projects our team is conducting and a summary of the data we collected in 2018.

Farnaz Kordbacheh, Postdoc Research Associate, assesses prairie strip species composition with a quadrat at the EIA site.

2018 was a big year for the STRIPS team! We've welcomed Cole Dutter, PhD student, who is working on soil health with Marshall McDaniel. Jessica Nelson is a new Master's student working with Matt Liebman on soil movement and watershed modeling. We've also hired on Doug Davenport, as our communications consultant and a STRIPS Project Coordinator, Omar de Kok-Mercado.

In 2019, Matt Stephenson and Jordan Giese will be continuing their doctorate work with STRIPS in Lisa Schulte Moore's lab. Lydia English will continue working with Matt Liebman, conducting prairie strip vegetation composition surveys. Laura Alt and Jared Flater, PhD students, will be evaluating whether prairie strips have an ability to mitigate resistance gene dissemination from manure-amended fields. Chris Witte, our field activities manager will continue monitoring water quality, and Ashley Kittle, Prairie on Farms manager at the Tallgrass Prairie Center, is monitoring whether prairie roots plug up tiles.

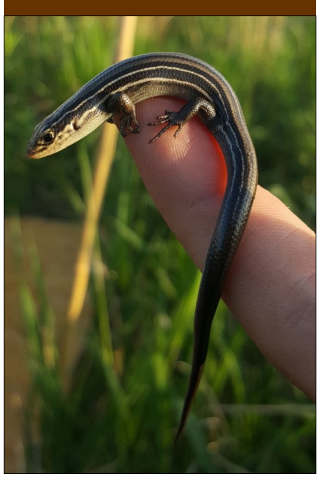
We may be making some changes to which research projects are conducted on which farms, but someone will be in touch with you this spring about our plans either way.

If you have any questions, we would love to hear from you!

Rattlesnake master oversees a two person field crew searching for bird nests on a foggy morning.

Thank you for allowing us onto your farm to conduct our research! This research supports several graduate students and is helping to answer some very important questions about how prairie strips might benefit wildlife, soil and water quality, and other ecosystem processes.

Most of our STRIPS projects will continue in 2019, although we may change where certain projects are conducted. We hope that you will continue your important role in advancing the very promising research being done by the whole STRIPS team!



A Northern-Prairie Skink perches on a finger after processing.

STRIPS 2018 Wildlife Research Summary

Bird Nests

Dickcissel nestlings and iButton for monitoring.

Matt Stephenson and crew searched for bird nests on farms with and without prairie strips and as well as on reconstructed prairies. When we find a bird nest, we estimate the age of the eggs or young, measure the vegetation around the nest, and take a precision GPS location. Previously discovered nests are revisited twice a week until they either succeed or fail. The length of time nests are active on average is then compared to the vegetation measurements we took to see if we can determine what vegetation and landscape variables effect nest survival rates. We also search for nests in predefined search plots for a set amount of time each week. The number of nests we find in each plot can then be compared to determine relative densities of nests on the landscape. These densities are then compared to vegetation and landscape measurements for each plot to see if we can determine why some plots have more or fewer nests than others.

The ISU minivan poses with Matt Stephenson and company.

In 2018 we had a great field crew consisting of Matt Stephenson, Maureen Booth, Cody McKune, Aric Runge, Matt Theisen, and Riggs Wilson. We put many miles, lots of mud, and a few new tires on our ISU minivan as we searched for nests on eight sites around central Iowa. We found 419 new nests of 17 species, bringing our project totals to 1297 nests of 27 species at 11 sites. Most of the nests we found belonged to Red-winged Blackbirds and Dickcissels, but we also found many Vesper Sparrow, American Robin, Common Yellowthroat, Meadowlark, Brown Thrasher, and Mourning Dove nests.

Most of the animals we find under cover boards are mice, voles, or shrews, with reptiles and amphibians being less common. Sometimes we come across rarer species, such as this Tiger Salamander found at the WHI site.

Cover Boards

Another of Matt Stephenson's projects is monitoring reptiles, amphibians, and small mammals. We randomly distribute cover boards (2' x 4' sheets of plywood) in perennial vegetation on farms. Animals take shelter under the boards, increasing our chances of finding them. Whenever we are near a cover board we turn it over and record the animals present. We can compare the frequency of encountering each species to the shape, area, and vegetation characteristics of the conservation feature each board is in to determine what factors are most likely to predict the presence of species.

In 2018 we checked cover boards at 12 sites around Iowa either weekly or monthly. Over the course of the year we turned boards 2,747 times and encountered three species of amphibians, nine species of reptiles, and four species of small mammals: American Toad, Blanchard's Cricket Frog, Northern Leopard Frog, Tiger Salamander, Western Chorus Frog, Brown Snake, Common Garter Snake, Lined Snake, Northern Prairie Skink, Plains Garter Snake, Prairie Kingsnake, Prairie Ring-necked Snake, Western Fox Snake, Yellow-bellied Racer, Brown Rat, Deer/White-footed Mouse, Eastern Chipmunk, Meadow Jumping Mouse, and Northern Short-tailed Shrew.

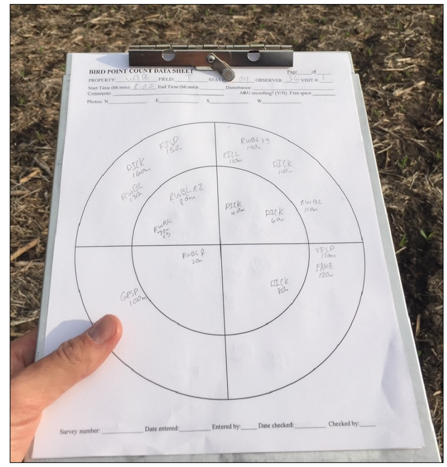
-Matt Stephenson

STRIPS Wildlife Research 2018 Summary

Bird Counts

Jordan holds a female pheasant before releasing it back into a prairie strip.

In 2018, we observed 53 bird species at farms across the state. The most commonly observed species were Red-winged Blackbird, Dickcissel, Brown-headed Cowbird, Common Yellowthroat, Eastern Meadowlark, and Western Meadowlark. Many of these species rely on perennial vegetation for nesting, feeding, and territory defense. Other species detected during bird point counts included Species of Greatest Conservation Need (SGCN), including Northern Bobwhite, Grasshopper Sparrow, Sedge Wren, and Bobolink. 2018 will mark the end of Jordan's bird point counts and he will be shifting his focus to the Pigs and Prairie project in Northern Missouri.



Bird point count datasheet.

During the last four years, we have collected a large volume of data from our Autonomous Recording Units (ARUs) at STRIPS sites around Iowa. We are currently using this data to examine breeding bird use of prairie strips and other land covers commonly found in Iowa landscapes. We're also developing methods for automatic detection of Ring-necked Pheasants around our recording units. If proven effective, this approach could be used on a larger scale to monitor pheasant populations in a cost-effective manner.

Speaking of pheasants, during the winter of 2019, we launched a pilot study to investigate pheasant habitat use and movements at a farm with prairie strips in Wright County. We trapped and placed GPS collars on 18 birds January-March. Each collar will record the bird's location every 4 hours until the nesting season begins in April/May. We will use this data to quantify pheasant use of prairie strips and other available land covers. We hope to expand this project to more farms in coming years.

-Jordan Giese

Yellow Coneflower and Wild Bergamont bloom in a prairie strip.

Summer sunrise over a blooming prairie strip.

Red-winged blackbird fledgling in a prairie strip.

Table 1. Summary of coverboard occupancy project effort and results in 2018.

	Coverboards deployed	Coverboard checks	Reptile & amphibian species	Small mammal species
ARM (Pottawattamie)	19	20	3	1
EIA (Linn)	16	16	0	1
GUT (Story)	24	199	3	3
INH (Jasper)	9	115	3	2
KAL (Jasper)	105	668	3	3
NIR (Audubon)	48	407	3	3
RHO (Marshall)	14	27	1	1
SLO (Buchanan)	18	51	2	0
SMI (Wright)	42	341	1	3
SPI (Guthrie)	12	164	6	1
TER (Greene)	24	253	4	2
WHI (Guthrie)	102	577	9	3

	Acres searched	Nests found	Bird species' nests found
GUT (Story)		18	3
INH (Jasper)	23	81	8
KAL (Jasper)	222	27	8
NIR (Audubon)	214	71	11
SMI (Wright)	370	113	7
SPI (Guthrie)		24	9
TER (Greene)		26	4
WHI (Guthrie)	387	58	8
TOTAL	1216	418	17

Student technician, Riggs Wilson, checks the status of a red-winged blackbird nest in a prairie strip.

Vertebrate wildlife data collection funded by the Iowa Nutrient Research Center, the USDA Farm Service Agency, USDA National Institute for Food and Agriculture, the Federal McIntire-Stennis Program.

Vegetation

One of the questions the STRIPS team is interested in investigating is the dynamics of the plant communities in prairie strips. For example, how does plant community composition change during the first few years of prairie strip establishment and what is the plant community composition of an established prairie strip? To understand to what extent the plant community changes over time and what factors influence the diversity of plant communities across sites, Farnaz Kordbacheh and Lydia English both conducted research on the plant composition of prairie strips across multiple sites. Farnaz revealed that over time, species composition shifted toward higher rates of prairie plant cover and suppressing weed abundance (Figure 1) and that total plant cover and total species richness increased over time (Figure 2).

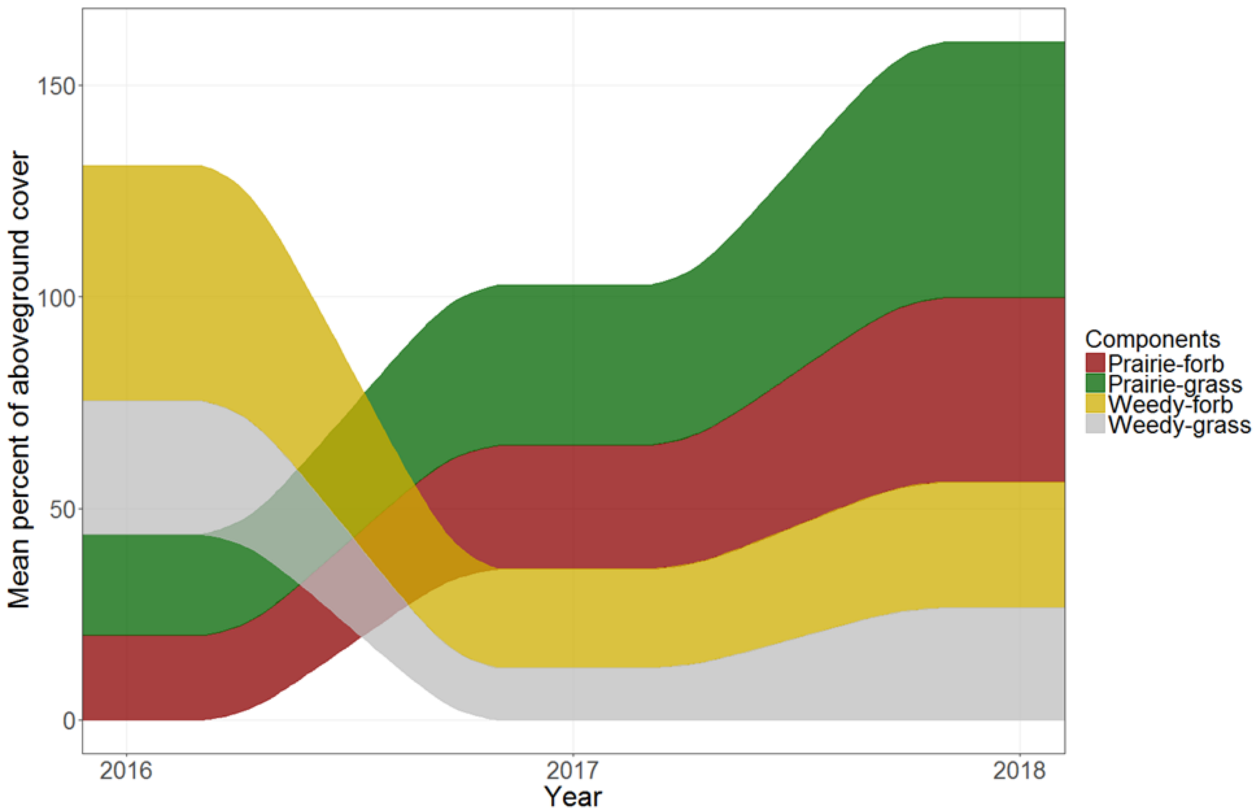


Figure 1. Temporal succession pattern (a turn-over from weedy species to prairie species) in the total plant cover of early established prairie strips from 2016 to 2018. Data averaged across four and six sites in 2016 and 2017-2018, respectively.

A prairie strip during the establishment phase.

STRIPS Vegetation Research 2018 Summary

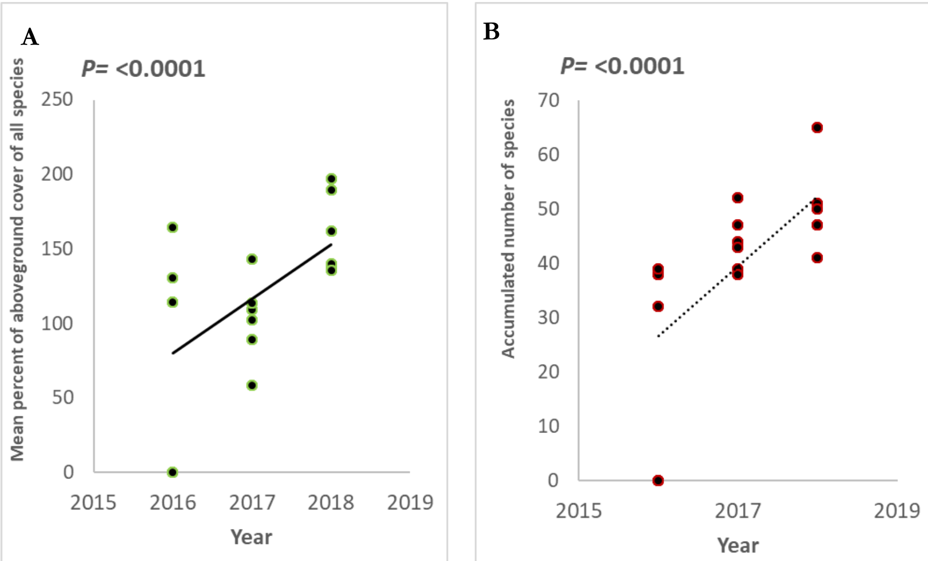
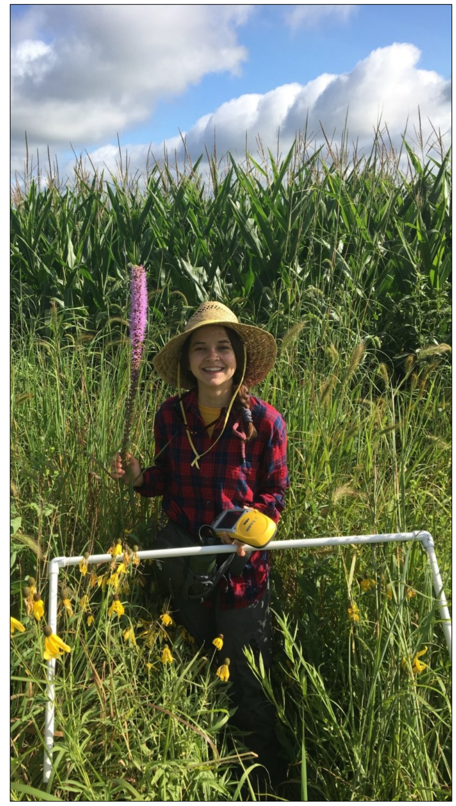


Figure 2. Increase in the percent cover of all species (a) and accumulated number of species (b) found within 26 sampled area (13 m^2) of the entire strips during the experimental period (2016-2018).



Lydia English holds a blazing star and a sampling quadrat.

Table 1. Top 10 most abundant prairie and weedy species, as well as all woody species, found across all sites. For prairie and weedy species ranking was determined by identifying the top 10 most abundant species at each site (based on the total cover they provided), and then identifying those species that were most abundant most often. The total number of sites visited was 21.

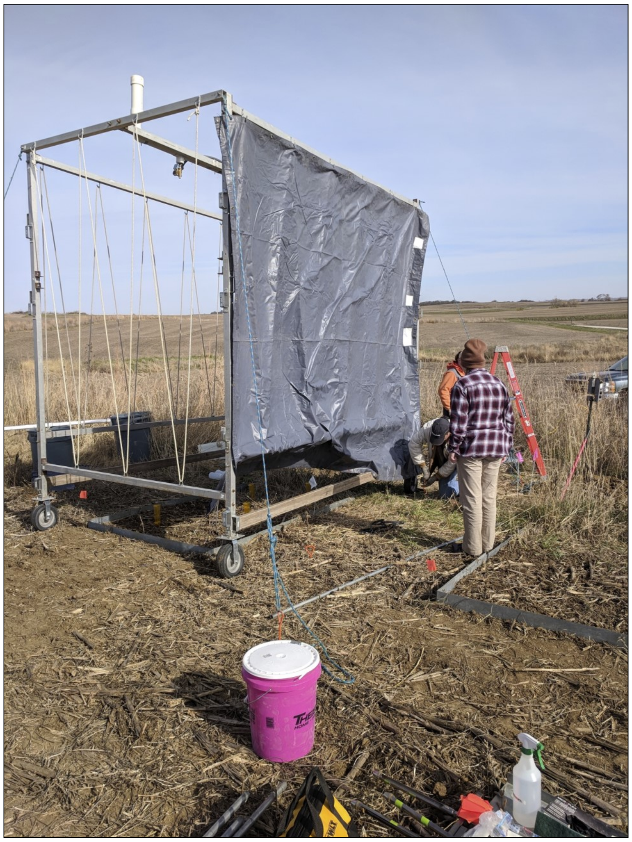
Prairie Species	**# of sites where species is present**	**Weedy Species**	**# of sites where species is present**	**Woody species**	**# of sites where species is present**
Grey-headed coneflower	21	Dandelion	19	White mulberry	8
Indiangrass	19	Canada thistle	15	Riverbank grape	6
Canada wild rye	18	Kentucky bluegrass	15	Common cotton-wood	3
Big bluestem	21	Giant foxtail	17	Red maple	2
Wild bergamot	19	Smooth brome	19	Honey locust	2
Oxeye sunflower	18	Marestail	16	Wild black cherry	2
Virginia wild rye	10	Yellow foxtail	15	White ash	1
Switchgrass	15	Quackgrass	14	Green ash	1
Canada goldenrod	16	Red clover	13	Red mulberry	1
Black-eyed Susan	18	Prickly lettuce	11	Smooth sumac	1

In 2018 we visited 21 farms that had planted prairie strips sometime between 2012 and 2016. Across all sites we found 76 prairie species, 76 weedy species, and 10 woody species. The top 10 most abundant prairie and weedy species, as well as all the woody species, can be found in Table 1. We will sample the vegetation again in the summer of 2019, hopefully working with the same 21 sites. *-Lydia English*

STRIPS Resistance Genes Research 2018 Summary

Resistance Genes

What is the impact of prairie strips on mitigating the spread of antimicrobials, antibiotic resistance genes, and antibiotic resistant bacteria to the environment? This is the question we set out to answer by setting up an experiment that is evaluating prairie strips ability to mitigate resistance gene dissemination from manure-amended fields. We set up a rainfall simulator and over the course of three days we simulated rain on plots that contained either a section of non-manured crop with a prairie strip, a section of manured crop with a prairie strip, or a section of manured crop with no prairie strip. Each of these test plots we took measurements three times for a total of nine plots. During these rainfall simulations swine manure from a farm in Alden, Iowa that utilizes tetracycline and tiamulin antibiotics was applied. Water sampling and soil sampling was then conducted.



The crew sets up a rainfall simulator.

-Laura Alt and Jared Flater

2018 Progress

During plot runoff, six runoff water samples were taken at 5-minute intervals for microbial processing. Samples were also collected for 1-minute intervals to calculate runoff rate. Samples from the tank containing rainwater and samples of the manure were also taken to measure any organisms that were already present. DNA extraction was carried out on all samples and will be utilized for sequencing and molecular detection of DNA, which will help us identify which organisms are present. Water samples were combined from each of the nine plots and then tested for fecal indicator bacteria, tetracycline, and tylosin-resistant bacteria whenever possible.

In addition to water sampling, we measured soil by collecting 15 cm deep soil samples from all plots prior to simulating rainfall, immediately following the rainfall simulation, and again 2 and 14 days after the rainfall simulation. All soil samples were extracted for DNA and will be sequenced and molecular detection of DNA will be conducted to identify functional genes present. Soil samples were also tested for fecal indicator bacteria, tetracycline and tylosin-resistant bacteria.

-Laura Alt and Jared Flater

A view of the sampling set up under a rainfall simulation.

Preliminary Results

We have not processed many samples yet, but so far we have not observed tetracycline or tylosin-resistant bacteria on plots where manure was not applied but we have seen a decrease in tetracycline and tylosin-resistant bacteria in plots that did not have prairie strips compared to plots that did have prairie strips. Currently, we are anticipating carrying out a similar rainfall simulation in 2019 utilizing cattle manure instead of swine manure. Sequencing results from the 2017 and 2018 rainfall simulations will be available to us sometime in 2019.

-Laura Alt and Jared Flater

A day ends after setting up the rainfall simulator.

STRIPS 2018 Tile Investigation Summary

Informal Interviews

The Tallgrass Prairie Center (TPC) conducted informal interviews with Natural Resources Conservation Service field staff, tiling contractors, and members of the Iowa Land Improvement Contractors Association. The purpose of these conversations was to learn what NRCS field staff and, especially, tiling contractors are encountering in their work on property where drainage tiles exist under mature prairie.

The TPC's primary takeaway from numerous conversations: There have been few, if any, instances where the roots found blocking a tile were confirmed to be prairie roots. As the STRIPS team and others have noted, live cottonwood, mulberry and other tree roots are confirmed culprits, while dead cover crop roots are beginning to create business for tilers shortly after cover crops are sprayed. One eastern Iowa tiling contractor said: "In the last two years [tiles plugged with cover crop roots] have accounted for a third of all our tile fixes in the spring. It's a new market for us that may increase with more cover crop use."

In a few conversations, landowners told the TPC they suspected prairie roots were the cause of a blocked tile. Further questioning however revealed that the perennial planting under which the tile passed was either not prairie, or was a native planting that had been significantly invaded by reed canary grass.

A more formal survey of landowners and tiling contractors, along with ground truth follow up and possible lab analysis of root material found in tiles, would be beneficial.

-Ashley Kittle

Tile Line Camera Inspection

The TPC, as well as the STRIPS team and others, recognize the importance of additional tile-line camera work, to complement and add to information learned from the 2017 STRIPS video. To that end, the TPC partnered with a landowner near Rowley for an early-fall video inspection of a 5" perforated field tile running under a contour prairie strip planted in 2012. There have been no noted issues with this tile line.

A brome waterway bisects the prairie strips on the farm near Rowley. To facilitate the TPC's work, the landowner broke into the tile at the edge of the waterway and installed a permanent 5" pipe extended at a 45-degree angle down to the field tile. This facilitated access for the video camera and will allow the TPC to re-inspect the field tile as needed.

The 2018 tile inspection occurred on October 15, just a few days after harvest. Some of the video – at the beginning and end of the footage – was under corn; approximately 75' was under the six-year-old prairie.

The TPC has shared the video with the ISU STRIPS team and other collaborators. Roots were prevalent along the entire 200' of videoed tile. While the roots were more dense in some areas than others, the density under the corn and prairie was similar. Though root biomass was present, the tile was functioning properly; about 1" of water was draining freely.

-Ashley Kittle

2019 Plans

The TPC hopes to inspect the line again in the spring to see how much live root biomass exists under the prairie after the winter season. Prior to the spring inspection, the tile line will be located and marked above ground so the beginning and end point of the prairie strip can be definitively identified in the tile video, and so instances of excessive root density can be inspected above ground.

The spring inspection will also allow the TPC and landowner to look for evidence of cover crop roots in the tile. Additional inspections at the farm near Rowley later in the season are a possibility.

-Ashley Kittle

Ashley Kittle, Prairie On-Farms program manager at the Tallgrass Prairie Center, inspects a tile with tiling contractors.

A screenshot of a tile investigation.

Don't hesitate to contact our partners at the Tallgrass Prairie Center!

Ashley Kittle
Prairie On-Farms Program Manager
Tallgrass Prairie Center
(o) 319-273-3828
ashley.kittle@uni.edu
2412 West 27th Street
Cedar Falls, IA, 50614

STRIPS 2018 Water Quality

Water Quality

The STRIPS team continues to ask how prairie strips affect surface water quantity and quality and how, if at all, prairie strips affect shallow groundwater levels and quality. To answer those questions, we are comparing small drainage areas of farmed fields with prairie strips installed (treatment or "TRT") to nearby similar fields without prairie strips (control or "CTL", see Table 1 for areas and slopes). We are calling these paired comparison sites, and are monitoring 7 of them across the state of Iowa. At each of these 7 sites, surface water runoff volume and water quality is being measured by means of automated water samplers and hydrologic flumes located at the spot where runoff is exiting the monitored drainage area (Figure 1).

Shallow groundwater wells were installed at a depth of 15 feet to monitor depth from ground surface and water quality. In the treatment fields, wells were installed at the upper and lower edge of the lowest prairie strip. In the control field, a single well was installed near the hydrologic flume (Figure 1). Groundwater depth measurements and samples are collected on a monthly basis and analyzed for concentrations of Nitrate-N, and orthophosphate.

Table 1. Paired comparison sites' areas and slopes. Control (CTL) drainages do not have prairie strips and the treatment (TRT) drainages do have prairie strips.

Monitored drainages	Area (acres)	Slope (%)
ARM CTL	16.5	6.5
ARM TRT	17.8	6.6
EIA CTL	11.2	5.1
EIA TRT	23.3	4.9
MCN CTL	24.1	2.9
MCN TRT	6.1	4.4
RHO CTL	6.75	4.7
RHO TRT	8.27	4.6
SPL CTL	21.8	4.8
SPL TRT	33.7	4.3
WHI CTL	13.9	8.5
WHI TRT	11.1	10.2
WOR CTL	13.43	3.3
WOR TRT	14.09	3.9

2018 Progress

Surface runoff monitoring began in late April. This is a little later start date than usual, but was delayed due to a relatively cool spring which saw temperatures consistently dipping below the freezing mark. Our probes that measure water depth in the flumes can't be exposed to freezing water. Generally speaking, end of monitoring season rainfall totals were higher at the sites than the previous two years. This wetter season lead to a greater number of water samples collected, and therefore more water quality data for us to examine.

Preliminary Results

Our preliminary surface runoff results indicate that surface runoff volume is usually less in the drainages with prairie strips (Table 2). One notable exception is the MCN site and there are at least two contributing factors to why measured runoff is greater in the treatment as opposed to the control field. Firstly, we have had some difficulty getting all of the runoff to flow through the flume for measurement on the control field, as some runoff is failing to enter the grassed waterway where the flume is installed. Secondly, there is a side slope seep in the treatment field that we believe contributes to greater runoff volume as well as reduces infiltration of rain into the soil. The effects of prairie strips on surface runoff water quality is less obvious when looking at end of year export totals for nutrients and total suspended solids (Table 3). In hopes of gaining a better understanding of these data, we plan to take a closer look on an individual storm event basis in the future. We are still waiting on lab results of the shallow groundwater nutrient analyses for 2018.

Looking forward in 2019

We are planning to be back monitoring all of our sites except for the EIA site. Due to airport expansion plans that involved moving into our monitored drainage areas, we had to remove our monitoring equipment there.

-Chris Witte

Figure 1. Water quality monitoring locations the ARM site.

Table 2: 2018 Rain and surface runoff end-of-year totals for each monitored site. Fields without prairie strips are the "control", while fields with prairie strips are the "treatment". Treatment fields tend to have less runoff than the control fields with the exception of MCN, which has side slope seeps in the treatment field and had issues with runoff being diverted around the monitoring equipment in the control field.

		Runoff (in.)	
Site	**Rain (in.)**	**Control**	**Treatment**
ARM	26.50	0.14	0.05
EIA	31.26	3.10	1.79
MAR	14.21	0.04	0.46
MCN	16.89	0.56	4.87
RHO	31.54	4.60	1.76
SPL	11.85	0.58	0.55
WHI	23.86	2.54	1.62
WOR	28.58	3.41	2.49

Table 3: 2018 Nutrient loss end-of-year totals for each monitored site. Fields without prairie strips are the "control", while fields with prairie strips are the "treatment". There are inconsistent results based on the entire season's totals. Further investigation is needed at the single runoff event scale.

	Nitrate-N (lbs/ac)		Orthophosphate (lbs/ac)		Total Suspended Solids (lbs/ac)	
Site	**Control**	**Treatment**	**Control**	**Treatment**	**Control**	**Treatment**
ARM	0.00	NA	0.00	NA	0.43	NA
EIA	0.36	0.06	0.05	0.03	22.77	69.47
MAR	0.00	NA	0.00	NA	0.06	NA
MCN	0.02	0.26	0.03	0.13	8.99	107.81
RHO	0.17	0.64	0.24	0.07	106.95	33.88
SPL	0.52	0.08	NA	NA	42.54	9.80
WHI	0.00	0.19	0.02	0.03	113.54	48.04
WOR	0.17	0.16	0.06	0.05	74.70	110.40

Figure 2: A major runoff event flowing through the treatment H-flume at the EIA site on June 21st, 2018.