NLRS PWG Meeting

Meeting Minutes

Tuesday, April 2, 2024

9:00 am – Noon

At Illinois Department of Agriculture's John R. Block Auditorium

Meeting Summary

Welcome and Policy Working Group member survey results

Joan Cox, Illinois Extension & Trevor Sample, Illinois Environmental Protection Agency

Joan summarized the results from a Policy Working Group Survey. Members are supportive of using a dashboard for reporting, maintaining current interim goals, and revising future strategy updates much abridged from the traditional printed Biennial Report. Results also suggest a need for ongoing discussions about strategy goals through the Performance Benchmark Committee. At this time no new PWG members will be added, and a Point Source Working Group will only be formed if someone steps forward to lead it. Discussions throughout the presentation indicated support for using the Performance Benchmark Committee as a forum to discuss goal updates focused on new data, timelines, and processes. Some members raised concerns that proactive approaches to non-point source problems are needed, hoping for specific discussion in the Agricultural Water Quality Partnership meeting. Members also discussed the importance of transparency regarding taxpayer investments in relation to water quality improvements, urging the Performance Benchmark Committee to explore new types of financial analyses and data showcasing. Members discussed challenges in maintaining original PWG member representation and other members advocated for the inclusion of new members, like the Illinois Soybean Association, to reflect current contributions. Rick Manner stressed the need for a volunteer chair before expanding working groups to form a Point Source Committee.

Phosphorus Research

Dr. Andrew Margenot, University of Illinois

Dr. Andrew Margenot emphasized that not all non-point sources of phosphorus (P) can be attributed to the agriculture sector, highlighting contributions from streambank erosion, legacy phosphorus, and residual phosphorus losses in the Upper Mississippi River Basin. Despite Illinois farmland having a negative phosphorus balance since 1990, a recent five-year annual average of phosphorus loss was reported as 35% above the 1980-1996. The long lag times associated with phosphorus loss complicate pinpointing when and from where phosphorus enters water systems, obscuring the true magnitude and sources of these losses. It's crucial to differentiate between streambank erosion and other non-point sources to avoid misattributing agricultural sources. A study running from 2022 to 2026 aims to quantify the extent of past and present streambank erosion in Illinois and integrate this data to update the state nutrient loss reduction strategy and watershed planning.

Complimenting this, Dr. Margenot's lab is validating P mass balances across Illinois, as this is critical to estimate residual P, or what is building up in soils. Ongoing research is resampling 150-year-old soil archive of 453 locations statewide, with 8% being completed thus far. He remarked he needs more landowner/operator help.

[The solicitation can be viewed and passed onto landowners/operators at: https://aces.illinois.edu/news/researcher-calls-illinois-landowners-participate-historic-soil-analysis.] His team is also analyzing anonymized soil test P data from 98 counties in collaboration with commercial labs, aiming to further valid P mass balances across the state and to clarify phosphorus loss at watershed scales. He is aiming to develop an online tool that would allow farmers to input soil test results to enhance nutrient management, which could improve economic decisions for farmers through enhanced MRTN, MRTP, and MRTK concepts. Moreover, ongoing trials are assessing P application rates and drawdowns to find optimal management levels.

Fall-applied soluble ammonium phosphates, such as monoammonium phosphate (MAP) and diammonium phosphate (DAP), contribute 30-40 lbs of nitrogen per acre and are notable sources of nitrogen loss. Illinois studies reveal a 50% loss rate from fall application to spring planting. Transitioning these applications to spring could significantly reduce nitrogen losses. Ongoing studies from 2022-25 are investigating phosphorus loss through surface runoff and leaching, distinguishing between particulate phosphorus and dissolved reactive phosphorus. This research aims to evaluate the cost-effectiveness of best management practices in curbing phosphorus loss and to furnish data essential for refining models like the Revised Universal Soil Loss Equation (RUSLE) and developing soil phosphorus loss indices.

In additional studies, Dr. Margenot is examining swine manure and grazing to investigate soil health, soil P test levels, and N- versus P-based applications for corn production. A second manure study, running 2022-26 is investigating P leaching from corn stalks and cover crop mixes under grazing and no grazing treatments. So far, evidence support biomass as more important than cover crop species mix, with the critical 0.5 tons per acre biomass threshold met under grazing conditions. Results thus far indicate higher, but variable, P leaching in triticale treatments under both grazing and nongrazing conditions. Results also document a fivefold decrease in N-leaching with cover crops regardless of grazed or not grazed conditions.

Dr. Margenot anticipates recommended updates to the Illinois Agronomy Handbook listing 9 reasons the critical soil test values for P and K need to be updated in Illinois. He noted that soil P testing updates to the Handbook will have direct implications for updating manure management in the Title 35 section 502.635 administrative code in Illinois.

In summary, the research in his lab will provide tools and understanding to manage and monitor nutrients in Illinois, which will also support the Illinois Nutrient Loss Reduction Strategy goals.

Fall Covers for Spring Savings 500K

Kris Reynolds, American Farmland Trust

Kris emphasized the need for increased state investment to accelerate cover crop adoption in Illinois, aligning with the state's NRLS goals. He highlighted the effectiveness of the IDOA's Fall Covers for Spring Savings (FCSS) program in boosting cover crop acreage, which has shown significant environmental benefits such as reductions in nitrogen, phosphorus, and sediment loads. Despite substantial support from federal programs like the Inflation Reduction Act, Kris argued that more state funding is critical to scale up efforts and potentially cover 500,000 acres, vastly increasing the impact on nutrient loss and carbon sequestration. He presented diverse data showing support for the initiative, including projections of the nutrient loss and mitigating CO2 emissions and carbon sequestration under expanded acreage, comparisons of the lower administrative costs of the FCSS, and the opportunity for expanded crop insurance reform datasets. Kris called the members to action in

support of the Fall Covers for Spring Savings Appropriation bill (HB 5757 and SB 3814) in the amount of 3.1 million to allow an expansion of the program to 500,000 acres. He is emphasizing the current bipartisan backing for achieving conservation and climate goals. Dylan Cook distributed copies of a draft letter of support for the initiative, and both he and Kris urged members to sign on in support. Members then discussed strategic growth and the current data collected by the program. Some asked IDOA questions about scaling up the program. Concerns about potential lobbying conflicts were discussed. Overall, the conversation highlighted a unified effort to bolster FCSS and enhance its impact on nutrient loss reduction and soil health. There was strong support for state investment in conservation to achieve environmental goals, with a push for policy support to expand the program's reach and effectiveness by those members that can lobby.

Precision Conservation Management

Megan Dwyer, Illinois Corn Growers Association

Megan Dwyer provided updates on various initiatives, including the availability of nitrate testing kits, conservation-focused lease addendums, and support for biofuel incentives, greenhouse gas reduction strategies, and Endangered species Act mitigation. Precision Conservation Management (PCM), responding to the Illinois NLRS assists farmers in adopting conservation practices economically. PCM has notable impacted by serving 519 farmers covering 513,893 acres, resulting in significant reductions in nitrate, phosphorus, and sediment losses. Megan highlighted PCM's effectiveness through survey results showing high participant intention to apply conservation techniques like reduced tillage, nitrogen management, and cover cropping, underscoring the importance of direct engagement, economic perspectives, and tailored advice in promoting sustainable agriculture.

ISAP Resources for NLRS

Jean Brokish, Illinois Sustainable Agriculture Partnership

The Illinois Sustainable Agriculture Partnership (ISAP), incorporated as a non-profit last year, promotes soil health and water management to help meet sustainability targets related to the Illinois NLRS. ISAP developed a Theory of Change in 2020, focusing on elevating farmer recognition of the economic benefits of conservation practices and serving as a key educational resource. Despite providing essential information, ISAP acknowledges that overcoming structural, financial, and social barriers is crucial for real change. Through educational events, actionable data, and resources like the NLRS 2-Page fact sheet, ISAP encourages farmers to reflect, learn, and act to enhance soil health and sustainability.

Meeting Minutes

In attendance: Megan Baskerville, The Nature Conservancy; Aubree Basso, American Bottoms Regional Wastewater Treatment Facility; Erin Bauer, Illinois State Water Survey; Dennis Bowman, University of Illinois Extension; Jean Brokish, American Farmland Trust; Amelia Cheek, Illinois Farm Bureau; Amanda Christenson, University of Illinois Extension; Dylan Cook, American Farmland Trust; Albert Cox, Metropolitan Water Reclamation District of Greater Chicago; Joan Cox, University of Illinois Extension; Rachel Curry, University of Illinois Extension; Chris Davis, Illinois Environmental Protection Agency; Megan Dwyer, Illinois Corn Growers Association; Emma Eldridge, Illinois Extension; Albert Ettinger, Mississippi

River Collaborative; Nicole Haverback, University of Illinois Extension; Robert Hirschfeld, Prairie Rivers Network; Liz Hobart, GROWMARK; Shibu Kar, University of Illinois Extension; Natalie Kerr, IDOA - STAR Program; Corey Lacey, Illinois Soybean Association; Richard Lyons, Illinois Association of Drainage Districts; Rick Manner, Urbana and Champaign Sanitary District; Andrew Margenot, University of Illinois Crop Sciences; Whitney Miller, AIM ; Raelynn Parmely, Illinois Farm Bureau; Kristen Ragusa, IDNR CREP; Justin Ramey, Illinois Department of Natural Resources; Brian Rennecker, Illinois Department of Agriculture; Kris Reynolds, American Farmland Trust; Trevor Sample, Illinois Environmental Protection Agency; Dan Schaefer, Illinois Fertilizer & Chemical Association; Sanjay Sofat, Illinois Farm Bureau; Steve Stierwalt, Association of Illinois Soil and Water Conservation Districts; Hannah Tomlin, IDOA- AIM Initiative; Helen VanBeck, American Farmland Trust / ISAP; Michael Woods, Association of Illinois Soil and Water Conservation Districts;

Welcome and Policy Working Group Survey Results

Joan Cox, Illinois Extension

Joan reviewed results from a Policy Working Group Survey launched March 1-15 where 24 of 29 members responded. The survey gathered perspectives on the NLRS dashboard, the traditional printed Biennial Report, a strategy update, a dashboard executive summary, and the working groups. Results indicate the steering committee will initiate a move to a dashboard with the next steps being to seek PWG input on metrics and data accessibility. The strategy's interim goals will not change, nor will a goal year be identified for the strategy's long-term goals, until more data is available. More discussion will be needed on goal setting and strategy updates through the Performance Benchmark Committee and PWG. Future strategy updates will be published separately from the dashboard and much abridged from the traditional printed Biennial Report. Executive summaries should be composed periodically in coordination with dashboard updates. The PWG membership will stay closed to new members to maintain the original balance of representation. There may be future conversations if current members are identified as inactive or if member perspectives change. If desired in the future, Steering is willing to coordinate invitations and meeting minutes for a Point Source Working Group, but a member must be willing to chair, set goals and agendas, and moderate. Future NLRS reporting will aim to showcase flow-normalized Water Quality data and baseline Publicly Owned Treatment Works (POTW) point source data alongside the traditional data displays. Joan reviewed each question, member responses, steering committee interpretations, and requested comments for discussion throughout the presentation.

Discussion:

Updating Strategy Goals Discussion:

- Sanjay Sofat: Support discussions about interim and long-term goal updates using the Performance Benchmark Committee as a forum.
- Albert Cox: Also, supports conversation for goal updates within the Performance Benchmark Committee.
- Trevor Sample: What do you think about the timeline and process? Dashboard and Strategy update are two separate things. We don't have the capacity to do both in parallel. How about finishing the dashboard first and then work on the strategy update in 2026 depending on how much of a strategy update is desired.
- Sanjay: What do we want to change in the strategy and what data do we need? Timing is not as important as process.

- Richard Lyons: Are we continuing to kick the can down the road or are we going to do something to get the problem solved? One segment is making progress, and the other is not making progress. Are we just waiting for ag regulation? Non-point sources need to be more proactive.
- Trevor: We will discuss these topics in the Agricultural Water Quality Partnership meeting this afternoon.

Dashboard Executive Summary Discussion:

- Robert Hershfield: I think taxpayers should know what they get for the dollars spent.
- Megan Dwyer: It would be interesting to see where the money is coming from and private investments and know more about hurdles to overcome in the financial aspect. We should correlate where money is coming from and what it is going towards.
- Joan: This may be referring to different types of analyses than have been done in the past. The Performance Benchmark meeting last year attempted to serve as a forum to discuss options for new types of analysis and data showcasing. No one brought forth ideas at that time. If members have ideas for new types of analyses, they are always welcome to bring those to the attention of NLRS partners via meetings or the Steering Committee. They would need to identify the steps of the analysis, who will do it, and who will pay for it.

Policy Working Group Member Discussion:

- Michael Woods: Have we ever assessed the engagement of current Policy Working Group members. If there are groups that are not active, does that dilute the proportional representation?
- Joan: We do have one group that has not attended in 2 years. We are looking at this.
- Corey Lacey: What is proportional representation?
- Trevor: Proportional representation isn't necessarily solid. This is proportional to the initial group at the beginning of the NLRS.
- Helen VanBeck: Do we know if the people who want to join are from one sector?
- Joan: The new member requests are primarily coming from the ag sector.
- Corey Lacey: We have moved from building-a-strategy phase with the initial PWG members to the implementation-phase, so we should look at membership composition again. I think that there are groups, like Illinois Soybean Association, that have contributed lots of staff time and millions of dollars specifically to these objectives. To say that ISA does not have a seat at the table is something that should be reconsidered. It is challenging to accept this as the status quo.
- Albert Ettinger: If Corey would like to sit at the table, we have space next to me here. The original proportion was set up organically. I certainly support including ISA at the table. We wanted to have a fair smattering of sectors. We don't vote.
- Erin Bauer: Folks want recognition if they are not at the table but are contributing.
- Joan: Currently the PWG survey results are reading strongly to keep the group membership as is and not allow new members. Perhaps there will be more discussion about this in the future if current members are identified as inactive or if member perspectives change.

Point Source Committee Discussion:

- Rick Manner: Speaking as an IAWA member, we are saturated with NLRS and IAWA meetings. If someone wants to step up and chair a point source committee that is fine, but we will need a volunteer to do the work.

Phosphorus Research

Dr. Andrew Margenot, University of Illinois

Dr. Andrew Margenot began by saying that we cannot compare non-point sources to point sources and we cannot equate all non-point sources to agriculture. While agriculture does contribute, there are also non-point sources from streambank erosion.

His University of Illinois Crop Science phosphorus research funding came from Illinois NREC, US Science Foundation, United Soybean board, Illinois Pork Producers, SIU Carbondale, Illinois Farm Bureau, University of Minnesota, Iowa State University, AARHUS University.

The Upper Mississippi River Basin (MRB) has nearly double the average P loss compared with the MRB overall, and corn belt states overall tend to contribute more. He then introduced some terminology to distinguish Phosphorus (P) sources. Both legacy P and residual P matter for the Illinois Nutrient Loss Reduction Strategy (NLRS). Legacy P is reference to P that in and transferred across the watershed system from the past regardless of source, which continues to contribute to the system. Residual P is from a previous application of fertilizer or manure and remains in the soil independent of timescale. The challenge of legacy P within a watershed is that it might take 5-15 years to exit the stream channel even if we do everything right in the farm fields.

Dr. Margenot shared a brief overview of his article in the Journal of Environmental Quality, discussing streambank erosion. It states that streambank erosion contributes phosphorus to streams and rivers across the MRB. However, the majority of MRB , “Streambank erosion and phosphorus loading to surface waters: Knowns, unknowns, and implications for nutrient loss reduction research and policy” at doi/10.1002/jeq2.20514, synthesizes the next steps. Undercutting riverbanks causes erosion and this is a natural process, and tile drainage can have a negative or positive impact. Meandering streams in flat topography are especially prone to erosion. Soils eroded into streams contains P, mostly from native parent material and not from fertilizer. About 2-3% of the P may be from fertilizer if the streambank was farmed.

The legacy or residual form of P is often overlooked but entails lag times. Only a small percentage of the P eroded with streambanks dissolves into stream with most of the eroded P taking years to decades or more to exit the stream channel. Illinois farmland has had a negative P balance since 1990 as shown by work from David and Gentry (2000) Journal of Environmental Quality 29:494. Yet the last 5-year average shown in the 2023 Biennial Report records Illinois as having a ~35% increase in P loss since the 1980-96 baseline. Legacy P in the water systems have lag times and it can take up to 1000 years to flush from the system. Lag times for eroded sediment P to manifest as dissolved reactive P (DRP) can be substantial. Measured N or P export, from watershed to state, may not reflect when the nutrient load was lost from fields or when it entered waterways. This confounds attribution of magnitudes with sources because “how much” loss cannot necessarily tell us “from where.”

Dr. Margenot reviewed NLRS strategies throughout the MRB and most of them do not account for soil bank erosion in their strategy. Why does this matter? Consider how non-point source loads are calculated. Total P export is calculated using network of USGS super gages and point source P calculated based on cumulative discharges of the roughly 210 point source facilities. Non-point source loads are generally measured indirectly

by subtracting the point source calculation from the total P export. This makes partitioning of multiple non-point sources challenging since many sources are lumped together as non-point. It is crucial to differentiate streambank erosion from other non-point sources in nutrient loss strategies, as failing to do so may lead to the erroneous attribution of these losses from agricultural sources. Contributions of streambank erosion to surface water P loads are relatively unquantified and typically unaccounted for in many nutrient loading assessments and policies. The consequences of this missing of information are that agricultural P contributions are overestimated, and a potentially manageable portion of non-point source of P is unaddressed in reduction strategies. As a result, resources may be misdirected and reduction strategy expectations may not be realistic. For example, implementing cover crops is not going to address streambank erosion processes.

Some ask whether agriculture could influence streambank erosion via increased stream "flashiness" from modified hydrology and tile drainage effects? Dr. Margenot asserted that P from eroded streambanks is not due to agriculture directly (e.g., fertilizer). The net effect of tile drainage on stream flashiness and potentially on streambank erosion depends on several factors including the depth of the water table, slope, soil texture, and antecedent soil moisture. A meta-analysis shows streams with higher base flow are less prone to flashiness and streams with a lower base flow are more prone to flashiness. There is mixed evidence that tile drainage can be a solution or can be part of the problem, and current research is trying to understand net effect of tile drainage.

Streambank erosion contributes substantial riverine suspended sediment and Total Phosphorus (TP) export. Globally, bank erosion accounts for an average of 40% riverine suspended sediment export and 31% riverine TP export. Studies in Iowa estimate 31% of P can be attributed to streambank erosion (Schilling et al., 2021). This is not negligible. It is 30% or more of non-point P. Only 51 peer-reviewed studies have measured streambank erosion contributions to P loads in the MRB. These studies are mostly less than 15-year assessments using erosion points (41%) or aerial imagery (31%). They are also bias to the western part of the MRB, as eastern part of the corn belt is missing evaluations. Average P loads via bank erosion (0.7 lbs/ac) align with the average non-point loss in the MRB.

Dr. Margenot and partners are working to fill the gap on streambank erosion contributions to P loading for Illinois. A study from 2022 – 2026 will estimate the extent and magnitude of past streambank erosion, quantify present fine-scale streambank erosion at sentinel watersheds, develop estimates of statewide P loading via streambank erosion at the HUC-8 scale, and integrate results to update Illinois NLRS and to support watershed planning. He is soil sampling banks and using terrestrial laser scanners and LiDAR scans to reveal channel bank migration. He is scaling bank assessments with historical aerial imagery using AI and using erosion pins to ground validate. The research is covering nine HUC-8 watersheds, capturing diversity in Major Land Resource Areas, and monitoring 306 sites by erosion pins in 65 stream reaches of first-to-sixth order streams. The average monthly streambank recession rate is 8mm with the average bank height at 2.9 m. A tool is being developed that can be used on phones to scale and monitor streambank erosion.

Understanding mass balances is critical to estimate residual P, or what is building up in soils. Inputs can come from intentional or unintentional sources. Intentional agronomic sources include fertilizer, manure, irrigation, and seed, while unintentional inputs include atmospheric and erosional deposition. The internal cycle of the system includes movement from soil to biomass, to organic P, to solution. Outputs of this system are again intentional and unintentional. Intentional agronomic outputs include biomass removal and manure, while unintentional outputs include run-off, leaching, and erosion. Residual P is calculated as the difference between P inputs and outputs.

Residual P can be built up in a few years or decades. The Morrow Plots were established in 1876 and have a large positive P mass balance that has accrued over 145 years with the majority added within one 15-year span from ~1905-1920 with the use of Rock phosphate fertilizer. These plots present a unique opportunity to evaluate the form of legacy or residual soil P. Residual P in soils can contribute to non-point P losses. Dr. Margenot shared some data on soil P hotspots from former barns partly (24-46%) explaining higher DRP loads from tiles. Balances suggest 4.85 billion lbs of residual P are in Illinois cropland soils. This large positive balance appears to have accumulated over a 25-year period between 1965 and about 1989, where an average of 203 lbs P per acre can be seen across Illinois croplands. 203 lbs/ acre is an average and some locations may have been negative, and some may have been 1000 lbs P per acre. Dr. Margenot uncovered historic soil samples, 3-4 feet pedons, from all over Illinois on the UIUC campus dating back to 1861. His lab has been working to curate these with NREC funding over the last 3-4 years. They are now working to validate mass balances by re-sampling the same locations across Illinois at 453 locations. So far, they have e worked with 120 landowners on 34 samples. Outreach is being done to identify and resample the remaining plots. He emphasized that he needs landowners to help complete this research effort. The solicitation can be viewed at: https://aces.illinois.edu/news/researcher-calls-illinois-landowners-participate-historic-soil-analysis. He remarked that this soil archive is the oldest one in the world and that it was amazing someone had the foresight to sample and store them. This project will give us a sense of streambank contribution and amount of residual P built up in soils, and it may explain the lag effect of P loss.

Dr. Margenot has some recommended P management updates for the Illinois Agronomy handbook. He stated that there are at least nine reasons why soil test P and K Critical Soil Test Value (CSTV) for Illinois need an update. First, we have changed how we test for soil P. Commercial labs have shifted from Bray for P to Mehlich-3 as a universal extractant. Mehlich-3 ICP values are now the norm for P testing, as the committee that informs CAFO regulations in Illinois switched to this test. Soil P is now measured as mg P per kg soil, or ppm, not as lb/acre. Soil test P values based on Bray or Mehlich-3 colorimetric values do not give the same numerical values as Mehlich-3 ICP. Reasons two through seven of why soil test P and K Critical Soil Test Value for Illinois need an update are as follows. Crop-specific needs because corn, soy, wheat all have different needs. There have been changes in crop management, plant populations, modern hybrids, tillage practices, fertilizer placement have all changed and current CSTV assumes broadcast application with conventional tillage for full incorporation. There have also been changes in how we model the CSTV from field trial data. Also, current recommendations do not account for soil types, but the distinct geologies of Illinois entail 57 soil “associations.” A new update could allow more transparency & open-access data, as there was not much transparency in how things were developed in the original handbook. Updating this could open better understanding and communication of results. Another reason an update is needed is that these soil tests do not account for economics. For example, as grain prices decrease, P applications are less profitable and few fields ‘merit’ application. Why not develop a Phosphorus version of MRTN, called MRTP to communicate profit-maximizing values in addition to yield CSTV? Like MRTN, the economic optimum is measurable as a dollar per acre return. The residuality of P and K complicates this and there are still questions about P and K stock valorization to be investigated. Unlike MRTN, MRTP would not be about rate response so much as longer-term maintenance. The last reason we need this update is to improve the accuracy of subsoil P supply power. P beneath top 12” of soil can contribute to crop needs. Currently, Illinois CSTV for P depends on the “subsoil P-supply power” region. The key takeaway is that we may find lower CSTV in a “High” supply power region and 25% greater CSTV in “Low” supply region. The 1970s map in the Illinois Agronomy Handbook is a good starting point but has not been ground-truthed. There may not be consensus of the soil P stocks with soil P supply power. There has been anecdotal evidence of this shared by farmers for years and there is some support for what they have said. . Also, CSTVs tell us when we should fertilize, but not how

much. Dr. Margenot encourages us to move towards correcting the maintenance-based recommendations to a slightly lower maintenance rate and to move away from build-up based recommendations as a blanket recommendation. " Currently there are rate and drawdown trials in Illinois to understand how to safely draw down P application rates.

Dr. Margenot recommends that we develop and Illinois P Sorption Index (PSI) to estimate how much of the soluble P bindings sites are 'filled up' with phosphate-P. Iowa has done similar research on PSI based on soil types. PSI can be easily measurable from any commercial lab using Mehlich-3 extraction. Updates to Illinois Agronomy Handbook on CSTVs for P will also help with developing an Illinois PSI. Soil test P is not just for agronomy, it is also for nutrient loss risk estimation. PSI indicates that more binding sites in the soil are saturated with phosphorus. This saturation can provide a farmer with an assessment of the risk of phosphorus loss. If a farmer continues to add P to already saturated soils, the excess phosphorus is likely to be lost. PSI is highly scalable, and this data is already being collected. Calibration can be done with run-off from field and lab experiments to establish P loss thresholds and it can be used with soil type and slope to provide specific recommendations.

Tracking soil test P trends at the county level would be helpful for Illinois and would further validate P balances across Illinois. Tracking these trends would also link absolute values and changes in soil test P and PSI with HUC-8 P load values and changes. Dr. Margenot is working with commercial soil testing labs to analyze anonymized, county-scale soil test P data across 98 counties. This work can help explain P loss at watershed scales. He is also hoping these data will help in the development of an online tool for P management that accounts for soil contributions of N and P and subsoil P and K to crop uptake. This could be where farmers can enter their soil test values after a lab test, so it could lead to improving MRTN and building the MRTP and MRTK concepts to help farmers make better economic decisions. The best management practices for P can also provide N loss reductions. This has been a bit of a blind spot for some of our N losses. Much of our monoammonium phosphate (MAP) and diammonium phosphate (DAP) is fall applied in the corn belt and these represent a major share, 8-10%, of global fertilizer applications. These are considered to be only a P source by the USDA, most land grant universities, and crop advisors. Dr. Margenot highlighted a section of the article *Mitigating Nitrous Oxide Emissions from Corn Cropping Systems in the Midwestern US: Potential and Data Gaps* by Charlotte Decock. It stated that USDA-ARMS data did not take into account fall application of DAP, MAP or ammonium polyphosphate, which are sometimes perceived as just phosphorus fertilizers. Application of fall-applied soluble ammonium phosphates is likely a major contributor to N losses since applications are putting on 30-40 lbs of N per acre with applications of MAP and DAP. However, there is little data on N losses from ammonium phosphates as discussed in Dr. Margenot's article, *The fate of nitrogen of ammonium phosphate fertilizers: A blind spot* (Margenot & Lee 2023 Agric. Environ. Letters 8:e20116). For fall application, the N of ammonium phosphates presents a nitrate-N loss risk. Assuming that 50% of the 11 million IL acres at the start of a corn-soybean rotation in 2017 received 200 lbs ac-1 of fall-applied DAP, this means that 198 million lbs N is co-applied with P which is 11% more than Illinois' annual reduction target of 178 million lbs Nitrate-N from non-point sources. Two peer-reviewed studies in Illinois demonstrate that 60-100% of N of fall-applied MAP and DAP is lost by planting time in the spring. At a 50% loss rate, then (198 * 0.5 = 99) - 99 million lbs of nitrate-N would be lost annually via MAP, DAP, and TSP (triple super-phosphate). Thus, application of fall-applied soluble ammonium phosphates is likely a major contributor to N losses. He asserted that switching from fall to spring application could be an easy and rewarding action to take. These losses could also be mitigated by using the right source of fertilizer, the right rate a crop needs, the right time for those nutrients to be available, and applying them only in the right places.

From 2022-2025, Dr. Margenot is also involved in a 72-run-off plot network field trials to test how much P is lost via surface runoff and how losses are impacted by tillage, cover crop and nutrient practices, and landscape type. They aim to determine how much particulate P is lost versus DRP losses and to determine the total P runoff and leaching that is occurring. They aim to deliver a cost or value per pound of P loss reduced by BMPs, provide data for modeling (e.g. RUSLE), and help with the calibration of soil P loss indices.

While Illinois is not considered a "livestock" state, it is one of ten states investigating the nitrogen source of manure, funded by the National Pork Board. This study is being done in conjunction with U of I Crop Sciences and Animal Sciences. It investigates P-based manure management at the Orr Agricultural Research and Demonstration Center to test whether manure deposition leads to hotspots and nutrient losses. This study uses swine manure trials which aim to demonstrate N- versus P-based application for corn production and evaluate soil health and soil test P levels.

A second manure study is investigating livestock integration at the Dudley-Smith Farm from 2022-2026. This study uses a strip plot-split block design in a 40-acre field. Variables include cattle grazing (with or without grazing) and five types of cover crop treatments including no cover crop, cereal rye, triticale, rye and crimson clover, and triticale and crimson clover. IN 2020-21 season, the rotation was corn, then cover crop, then soybean. So far, they are finding that the cover crop biomass is similar among species and species mixtures. So far, the research is consistent with evidence that total biomass, not diversity, of cover crops matter most. Also, grazing reduces cover crop biomass by five times and the benefits of cover crops are achieved at about 0.5 tons per acre above ground biomass That 0.5-ton/acre requirement is met under grazing, meaning the cover crop benefits were achieved even with grazing. Grazing consistently decreased phosphate-P leaching across treatments, including no cover crop treatment with corn residues only. They found higher but variable P leaching for the triticale treatment grazed and not grazed. Higher P leaching without grazing could reflect corn P residues. Based on 200 bushels per acre corn, there is roughly 5.2 lbs P per acre in residues. Approximately 2-5 lbs P per acre were leached without grazing. The magnitude of mitigated P leaching with grazing aligns with corn residue removal. How do corn residues increase P leaching? It is possible that cattle temporarily immobilize P in corn stalks, resulting in a net benefit of grazing corn stocks to P and leaching losses. They found a five times decrease in nitrate- N leaching with cover crops regardless of grazed or not grazed plots. Updates to the Illinois Agronomy Handbook on soil P testing have direct implications for updating manure management. The handbook currently stated that "livestock waste shall not be applied to land where the Mehlich or Bray P1 soil tests for elemental phosphorus is greater than 300 lbs. per acres for the top 7 inches of the soil profile," but Mehlich and Bray aren't the same, being easily 25% different in value.

In summary, quantifying legacy and residual P contributions to P losses is needed to refine nutrient source apportionment and reduction timelines. Dr. Margenot has multiple Illinois-wide projects which aim to deliver information on streambank erosion P loads and residual soil P at HUC-8 scale. He is working to quantify run-off losses as particulate-P versus dissolved reactive phosphorus under various BMPs. Dr. Margenot is also looking at P fertilizer and manure management and updates to CSTV and rates for the Illinois Agronomy Handbook. He is working to develop an online P management tool which incorporates mean return to P (MRTP), Critical values (CSTV), application rates, and P sorption index. Last, he is looking at manure and residue grazing studies, which may be small but serve as an important start. In the coming 2-5 years, these research projects will provide tools and understanding to manage and monitor P in Illinois and will support meeting P loss reduction goals of Illinois NLRS.

Discussion:

- Megan Baskerville: This is exciting research on streambanks and managing hydrology. How do we detain some of the water to reduce flashiness and help reduce streambank erosion?
- Andrew Margenot: Good question. How do manage the watershed to manage flashiness? We need research on the watershed scale to see what locations are the largest contributors to flow.
- Albert Ettinger: What are the implications of the 300 lbs per acre of residual P?
- Andrew: That is a very high level. What is the land use? This goes back to the need for P sorption index. We don't really know what that P loss would be in that case.
- Albert Cox: Regarding MRTP as a tool compared to MRTN, crop response to nitrogen is more sensitive than phosphorous. Could you speak to the utility of MRTP compared to MRTN?
- Andrew M: It would be similar in economic evaluation. It is different because P is residual, and N is temporary. A lot of farmers test their soil every few years and could better tailor their management. That makes me optimistic about MRTP.
- Megan Dwyer: Will this be integrated into Certified Crop Advisors programs?
- Andrew: We hope to have a sister website and platform to make this useful for farmers. We need to double-check that the recommendations make sense through advisory groups.
- Dick Lyons: Will the new method of PSI become a part of nutrient management?
- Andrew: I have not thought that far.
- Robert Hirshfield: This is a lot of information to digest. It sounded like you were pointing to a 30-40% P loss from the streambanks. Is that roughly in the ballpark?
- Andrew: Probably, but do not have the data yet. We are like Iowa so it should be roughly similar to their numbers, but they likely underestimated. We will know in about 2 more years.
- Rick Manner: Will you know the P loss from erosion from fields versus that from streambanks?
- Andrew: Depending on where you are in the landscape, P can be completely from fields or from streambanks. The 31% that we are discussing is from the streambank alone.

Fall Covers for Spring Savings 500K

Kris Reynolds, American Farmland Trust

American Farmland Trust (AFT) is a national membership-based nonprofit organization, and its mission is "Saving the land that sustains us, protecting farm and ranch land, promoting sound farming practices, and keeping farmers on the land. NO FARMS NO FOOD."

Kris started with a slide comparing NLRS ag scenario NP8 cover crop acreage goals to current levels of cover crop acres in Illinois. He explained 2015-2023 data from several sources, including NRCS programs, IDOA's Fall Covers for Spring Savings (FCSS) program, the Pandemic Cover Crop Program (PCCP), FSA certified acres, the USDA ag census, CTIC OpTIS 3.0. FSA-certified acres have increased due to the Pandemic Cover Crop Program (PCCP) and FCSS. The 2022 USDA ag census data recorded 1M acres of cover crops compared to just under 600k in 2017. CTIC OpTIS 3.0 data show 1.4M acres of cover crop in 2022, with 2019 being a high year, likely due to the prevent plant policy that year. Adoption is happening, but not at the scale necessary, and nowhere near the amount needed to reach the NP8s goals by 2035. Kris expressed an urgent need for more significant State of Illinois investment to increase the pace of cover crop adoption to appropriately scale the adoption of cover

crops. While the Inflation Reduction Act funding through NRCS is historic, he noted, it only represents a fraction of what is needed.

Kris asserted that state investment in IDOA's FCSS is the best mechanism. FCSS goals and benefits include increasing cover crop adoption in Illinois and improving water quality to meet NLRS goals. This program frames cover crops as a risk reduction tool that reduces erosion and improves soil health, carbon sequestration, and climate resiliency. The program also has lower administrative cost than current cost-share programs.

FCSS completed its first 5 years offering 50,000 – 160,000 acres per year. In 2024, the program cost-shared on 140,000 acres across 87 counties. It resulted in 410,121 lbs/year nitrogen reduction, 34,652 lbs/year phosphorus reduction, and 148,837 tons/ year sediment load reduction from Illinois statewide.

An expansion of FCSS could help meet NLRS goals. Kris shared projections for FCSS 2025 under an expansion scenario to 500,000 acres, noting the possibility of an exponential reduction of nutrient loss. He explained that the projected distribution of the 500,000 acres was based on the 2023 PCCP county distribution and the unfunded FCSS application acres concentrated within priority watersheds. He noted that 2025 outcomes were modeled using a Project-by-County Outcomes Calculator (PCOC) Tool that incorporated data from the 2019 NLRS Science Assessment, the geospatial data gateway, IDOA's T-transect survey, and the 2022 Ag Census. Kris put the administrative costs of the program in perspective by noting that NLRS Scenario NP8 estimates the Net Equal Annualized Costs (NEAC) for agriculture as $14/acre, while the FCSS operates at $6 per acre, or less than 40% of NEAC. He concluded stating that both IEPA's Gulf Hypoxia Task Force Funds and the newly awarded USDA Partnership for Climate-Smart Commodities iCover program have the potential to add 100k acres to the program.

U.S. Climate Alliance agrees that cover cropping is the natural climate solution with the greatest carbon gain potential in IL, estimating the potential to mitigate 7.41 million tons of carbon dioxide per year (Mt CO2). Raising the total to 500,000 acres enrolled in FCSS would reduce greenhouse gas emissions from working lands by an estimated 180,000 Mt CO2 per year, which is the EPA's estimated equivalent of removing 37,830 cars from the road for a year. Kris advocated that, like other industry investments, IL should invest in the agriculture, our state's #1 industry, to support the capital and operational changes necessary to meet our climate goals. The cost of carbon sequestration per ton is highly competitive with other investments, currently at $17 per ton according to the NRCS Comet Planner tool and the state budget.

Another co-benefit of the program is that cover crops can be used as a risk reduction strategy. Data from the AGree Coalition already indicates that across the 6-state region, consistent use of cover crops and no-till resulted in a 24% reduction in the odds ratio of prevent-plant loss in 2019. Increasing acres in FCSS will provide the needed data on varying conditions, such as weather patterns and topography, building the necessary datasets to inform crop insurance reforms.

Kris noted that if we do nothing and continue at our current cover crop adoption rate, then we will not reach our Scenario NP8 cover crop acre goal until 2135, a century late. He advocated that we can do better! AFT asked the Policy Working Group to support the Fall Covers for Spring Savings Appropriation bill (HB 5757 and SB 3814) in the amount of 3.1 million to allow an expansion of the program to 500,000 acres. He noted this program already has significant bipartisan legislative support and there are no administrative hurdles since this program is already offered through IDOA. He added that 17 government and nongovernment ag partners in Illinois are already committed to promoting and making this program a success, with more partners added each time AFT delivers this presentation. Dylan Cook, the AFT Midwest Policy Manager, handed out copies of a letter of

support for the appropriations request addressed to the governor. Kris asked that the Policy Working Group support this appropriations request and sign the letter, either as a whole NLRS Policy Working Group or individually by each organization represented on the PWG. Contact Kreynolds@farmland.org if you have any questions.

Discussion:

- Megan Dwyer: This group worked on FCSS together. This is an opportunity to see a substantial increase in the rate of cover crop adoption in the state. Also, this is an easy incentive for FSA-reported cover crops. Looking at this, we also see the gain in environmental outcomes and the co-benefits of the data we can glean for crop insurance reform. What could be learned from these data?
- Megan Baskerville: The data should be underlined. Are we collecting data on date planted, seed type, etc.? On the current application, what data are we collecting? And do we know what kinds of data would be helpful?
- Brian Rennecker: The current application asks, "Are you new to cover crops?" and "How many acres are you planting?" It uses FSA's 578 form to collect data on 4 different categories of cover crop and planting dates. We are seeing a huge increase in reporting to FSA.
- Dick Lyons: How quickly was this allotment filled this past year?
- Brian: 2024 was the first time we issued a pre-enrollment period opening 10 days prior to the enrollment opening. This gave producers an opportunity to fill out the application and double check their data accuracy. It also offered us the opportunity to see pending application trends prior to the opening date. Then, when the program opened on Dec. 1, within 38 minutes we had enrolled 140,000 acres gross. As the data was coming in, we found some duplication of about 16,000-20,000 acres. By Dec 15 we had eliminated duplication and filled the program. So hopefully, it will be a good fall to do cover crops. This year we identified issues during pre-enrollment where people were losing data. We are now going to build a save-as-you-go feature so applicant data will not be lost. We are also working on overall efficiencies and accuracy with RMA cover crop information from USDA Risk Management Agency. So far, we are 93-94% accurate, and Illinois is the most accurate state with data on RMA. Overall, we are working on streamlining the process and reducing errors in applications.
- Dick Lyons: I did not put the date on my calendar and didn't activate my IFB Challenger membership in tie. Therefore, I saw it a day late and didn't make the application deadline. Our Policy Working Group should get behind a change in the FCSS policy to help reach our cover crop goals for NLRS. This is only a fraction of what we need but is going in the right direction. As a group, I am asking you all to sign this letter.
- Robert Hirshfield: According to the last report we reported 51 million of public and private funding for nutrient loss reduction. This $3 million ask from the state is a lot less than the funds being used thus far. This seems like a good use of public funds.
- Michael Woods: We know that conservation is important and that cover crop adoptions is one of the mechanisms to reach the water quality goals. Does anyone have hesitation to support this bill? We want to address any concerns or hesitations regarding this.
- Kris: One concern I have heard is that it is not enough acres; the bill doesn't ask enough. However, we are looking at sustainable, strategic growth for the program. A program has never been a large driver of cover crop adoption before. There are a lot of farmers trying cover crops for the first time. If we show that our state is investing in conservation, this may encourage farmers who haven't considered cover crops in the past.

- Michael Woods: The pride that we have in filling up this program quickly might also work against us because it is leaving people out and possibly discouraging people from applying. What are the limitations in expanding the program from 100k to 500k?
- Brian: Yes, there are limitations. We have 1.5 FTE staff now. The largest hurdle is getting your own funding line. If we go down the path of 500K, everyone who signs the letter must continue to push for the ask until the program is filled. For example, if we have a wet fall and don't make the 500K this year, the state could cut funding the next year. The concern of spending it all on time is always part of the conversations for PFC and other state funds.
- Corey Lacey: The Illinois Soybean Association has been a big proponent of this bill. I encourage all members to sign onto this bill's support letter. I am happy to answer questions about this. I have talked to every supportive legislator on this list that Kris showed during his presentation. The General Assembly is in support of this because they want to show that Illinois cares about conservation. It is huge that we are all on the same page. There will always be negotiation on the budget. If we keep pushing, we can have success. Thank you IDOA for administering and supporting the program. How can we make this better and stronger? We need broad support.
- Liz Hobart: Policy Working Group is not a lobbying group. Does this open us up to being a lobbying group?
- Kris: We are a non-voting body. Are we willing to support this if it doesn't conflict with non-lobbying efforts?
- Dick Lyons: If you are concerned about this, give me your letter.
- Albert Ettinger: The first questions are, "Who are we?" and, "What is our role here?" Maybe it makes more sense for individual groups to send a letter rather than a single letter signed by multiple groups.
- Joan Cox: What is the timeline for this letter?
- Dylan Cook: Before May, or in a couple of weeks is best.

Precision Conservation Management

Megan Dwyer, Illinois Corn Growers Association

Megan's presentation listed several Illinois Corn Grower Association updates, including availability of nitrate texting kits, developed conservation focused Lease Addendums, resources and support on the Post Application Coverage Endorsement (PACE) and the 508(h) process, and ICGA's Cover Crop Coupon program. ICGA continues to stay informed and involved in incentive discussions and capacity building with regards to Sustainable Aviation Fuel, the 45Z tax credit coming to biofuels, Illinois' proposed low carbon fuel standard, public greenhouse gas reduction goals, and mitigation requirements under EPA's Endangered Species Act proposals.

Precision Conservation Management (PCM) started in response to the NLRS and aims to help farmers adopt and scale up the use of conservation practices in a financially responsible way. PCM served 519 Farmers, 8,573 Fields, and 513,893 Acres. Total impacts for 2023 included the Nitrate-N Loss Reductions of 1,154,702 lbs, Phosphorus Loss Reductions of 174,983 lbs., and sediment Loss Reductions of 258,963 tons. PCM Acres reported 247,391 acres with reduced tillage, 257,009 acres with nitrogen management, and 84,614 acres with cover crops. PCM staff also participated in a central Illinois farmer meeting with about 40 participants and a northwestern Illinois farmer meeting with about 200 participants. Megan shared some preliminary data from a PCM Survey and discussed why boots on the ground matter. The survey indicated that the top 3 most important conservation program factors were payment rate, flexibility in practice standards, and a simple contract. Results showed that 92% of participants agreed or strongly agreed that they will apply information from their

personalized Resource Analysis & Assessment Plan within the next 12 months. Of those participants currently not using no-till or reduced till on their whole farm, 70% reported are likely to adopt either practice based on the information they'd received. Of those participants currently not doing cover crops on their whole farm, 68% reported they are likely to try cover crops or expand cover crop usage based on the information they'd received. Of those not already utilizing MRTN, 65% agreed they are likely to switch to using MRTN rates based on the information they'd received. Any questions should come to Megan Dwyer, Certified Crop Advisor and Director of Conservation & Nutrient Stewardship, at mdwyer@ilcorn.org or 309-557-3257.

ISAP Resources for NLRS

Jean Brokish, Illinois Sustainable Agriculture Partnership

The Illinois Sustainable Ag Partnership is a non-profit made up of 15 member organizations working collaboratively to promote whole-system conservation solutions focused on soil health and water management to reduce nutrient losses and meet sustainability goals. Last year ISAP was incorporated as a non-profit organization. ISAP's history and evolution are tied to the NLRS, with its origins rooted in 2015 release of Illinois' strategy. Founding members understood that our efforts would be stronger if we worked together to leverage our resources and share clear and consistent messages for farmers and farm advisors. Much of our current work focuses on soil health and water quality management practices and outcomes.

ISAP developed its Theory of Change in 2020. They looked at how to increase their impact and decided to work toward increasing farmer recognition of the economic value of conservation practices, serving as a clearing house for soil health and conservation draining education, and accelerating the adoption of conservation practices that improve soil health, carbon cycle balance, and water quality. What is needed to bring about change? Farmers and advisors need to have access to data and view ISAP as a trusted source of information. All ISAP education is action-oriented, fosters knowledge transfer, and motivates change in the landscape. ISAP members and partners are using consistent messaging to inform and engage key audiences. They focus on policies and funding priorities that yield the greatest benefits for water quality and climate impact. ISAP's long-term goal is to help Illinois agriculture voluntarily meet NLRS goals and benefit from being part of the climate solution.

ISAP is applying the information gap theory to decision-making. We often assume that information leads to action and people will change if they just have the right information. Real-life observation tells us that information does not equal action. There are still gaps, or barriers, such as financial limitations, societal norms, and peer pressure. While true that information alone does not always lead to action, successful action relies on a foundation of good information that is supplemented with dialogue, resources, support, and tools.

ISAP's role is to coordinate field days and other educational events, foster peer networks, provide expertise through our collaborative partnerships, and serve as a platform to disseminate science-based information & relevant resources. ISAP released the NLRS 2-Page fact sheet for farmers with key findings from the Biennial Report, statewide nutrient loads and practice adoption, and suggestions for what farmers can do. The goal with this document was to distill information into actionable items for farmers, farm advisors, and conservation professionals working with farmers. This document acknowledges that Illinois is NOT on track to meet NLRS interim 2025 goals. The monitoring data illustrates that nutrient loads are above baseline values. Levels of conservation practice adoption have increased in some cases, but not at the pace or scale needed to meet NLRS targets.

Farmers are encouraged to take a moment to reflect, learn, and act. They should reflect on their farming practices by evaluating their farming practices regarding soil health, tillage, nutrient management, and land suitability for conservation. It is important to consider factors like unbuffered streams, drainage ditches, and untreated tile outlets. Farmers are encouraged to learn more about agricultural conservation by accessing resources such as ISAP's website, subscribe to "The Aggregate," explore the digital library, attend field days or join the Illinois Cover Crop On-Farm Network (ICCON) for discussions, recordings, and resources on cover crops. Farmers are encouraged to act by utilizing ISAP's conservation story map to connect with experts across the state to search for farmers, CCAs, ag retailers, researchers, and service providers. You are also encouraged to add your expertise to the map and explore the Cover Crop Seed Dealer Directory for supplies and services. People may access financial programs and incentives through provided directories, with an expansion planned for public and private programs in June.

ISAP provides tools and resources addressing challenges such as compaction, erosion, flooding, and weeds. Folks are encouraged to stay updated for upcoming Illinois On-Farm Cover Crop Network (ICCON) calls and events, with the next call focusing on applying soil health tests. A guidebook on soil health practices is available, incorporating technical information, research data, and farmer testimonials on cover crops, no-till / strip-till, and nutrient management. ISAP is extending out an invitation to enroll in the Soil Health Leadership program, an 18-month classroom and field-based training with no cost to participate. They ask that graduates share information with others, agree to be listed on our the story map, and generally serve as ambassador for ISAP and soil health programs. Please apply by May 31 for the next course is starting in August.

For questions, contact Helen VanBeck, ISAP Manager at hvanbeck@farmland.org or Jean Brokish at jbrokish@farmland.org, ilsustainableag.org, hello@ilsustainableag.org, or 872-250-8771.

Partner updates

NRLS PWG members

- Raelynn Parmely: Look at the IFB website for the upcoming Nutrient Stewardship Field Day schedule.
- Megan Dwyer: The Leopold conservation award application is open. If you know someone, please have them apply. The winner gets $1k.
- Steve Stierwalt: SWCDs are working to help train the 40 Conservation Planners, branded through the AIM initiative. The STAR program all relates to what farmers are doing for NLRS.
- Rachel Curry: Emma Eldridge from Illinois Extension was hired recently to serve the phosphorus-priority watersheds, the Embarras and the Little Wabash.