

# Soil Health Report Card for the Kankakee



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# Soil Health Report Card for the Kankakee

## Why Soil Health?

Soil health is a frequent topic of conversation in agricultural circles – and with good reason. Healthy soils provide economic and operational benefits for farmers.<sup>1</sup>

**America has lost more than 50% of its top-soil to erosion.**<sup>2</sup> By increasing aggregation, healthy soils reduce erosion from water or wind.<sup>3</sup> Healthy soils help defend plants from pests and disease, reducing the need for pesticides.<sup>4</sup> With higher organic matter, healthy soils provide additional nutrients to crops, allowing farmers to reduce their application of fertilizer.<sup>5</sup>

Healthy soils infiltrate water in wet times and hold that water for dry times, letting farmers get into fields earlier and providing more consistent yields and better resilience to changes in weather and climate.<sup>6</sup> Healthy soils grow healthier plants, which can mean healthier, nutrient dense food.<sup>7</sup>

Because of these many benefits for farmers, boosting soil health should increase the value of farmland for a landowner.

Healthy soils also provide many public benefits. Healthy soil absorbs water like a sponge, reducing polluted runoff from farmland into streams, lakes, and wetlands, and improving water quality. Better water quality can reduce

the cost of water treatment to downstream communities. Better surface water quality improves habitat for fish. By holding water in the soil, healthy soils can reduce the volume of floodwaters downstream.

Healthy soil can take large amounts of carbon from the air and store it in the soil.<sup>8</sup> Soil health

ance of beneficial bacteria and mycorrhizal fungi to support healthy plants. Beneficial bacteria, fungi, other microbes, and soil-dwellers like worms and nematodes break down dead plant material, fix nitrogen from the air into the soil, and help plants access nutrients and water and fight off pests and disease.

Maintaining healthy microbes requires a food supply: Organic matter in the soil and exudates (carbohydrates, amino acids, and other compounds) from living plants.<sup>9</sup> Farming practices like intensive tillage, heavy use of chemical fertilizers and pesticides, and over-grazing can reduce organic matter and harm soil health.

**The levels of organic matter in our soil – the combination of dead plant material, bacteria, fungi, and critters – has fallen by half or more since Colonial times.**<sup>10</sup>

The United States Department of Agriculture (USDA), academic experts, and non-governmental organizations have identified key farming practices that can restore and maintain soil health. Combining practices like reducing or eliminating tillage, planting cover crops, diversifying crop rotations, reducing the use of chemical fertilizers and pesticides, managed rotational grazing, and integrating livestock onto cropland can protect and feed the diverse population of microbes and soil-dwelling critters needed for healthy soil.<sup>11</sup>

Lynn Betts, NRCS



*Healthy soils can reduce polluted runoff and flooding.*

practices like planting winter cover crops and rotational grazing provide wildlife benefits as well. When farmers reduce their costs and add resilience to their operations, more of their income stays local, benefitting rural communities.

“Healthy soil” means soil that is biologically active; it has large amounts and the right bal-



# Report Card on Soil Health

This document is a report card on soil health in the Kankakee Watershed in Indiana and Illinois. Assessing recent trends in the use of soil health practices can help us see how fast we are moving to restore soil health, where progress is slow, and the size of the opportunity we have to make changes that will improve the health of the Kankakee's soils.

Because of the lack of adequate data in some areas, this report card is necessarily incomplete. We have recommended that both Illinois and Indiana better assess and collect data annually on the use of soil health practices.

The Kankakee watershed boasts an unusual mix of hydric (wetland), clay and sandy soils that are the legacy of the marshland that once dominated the landscape. More on-farm re-

Rodale Institute



*No-till corn planted into a vetch cover crop helps smother weeds and build healthy soil.*

search would be helpful, but farmers and researchers are proving that soil health practices work well in the Kankakee's soils.

## Two Steps Forward...

Kankakee farmers are making progress in some soil health practices, but not in others. An explanation of these practices, our conclusions, and the data available is included in the body of this report that follows this summary.

Kankakee area farmers have made clear progress in two areas:

**+ Tillage:** From 2012 to 2017 Kankakee farmers shifted over 10% of the area's cropland from intensive tillage to conservation tillage, and one-third fewer farmers reported using intensive tillage on any of their acres in 2017 than in 2012.

However, the Kankakee area lags behind the region in the adoption of no till (25% of acres), and the continued reliance on intensive tillage (30% of acres).

**+ Cover Crops:** Kankakee farmers planted cover crops on more than twice as many acres in 2017 as in 2012. Cover crops were planted on about 6% of the area's cropland in 2017, and 1 in 8 farmers were planting some cover crops. The Kankakee lags a bit behind most other states in the region in the share of cropland planted with cover crops.

Lynn Betts, NRCS



*Conservation tillage was used on 45% of Kankakee cropland acres in 2017.*

## ...One Step Back

The Kankakee watershed appears to have lost ground in one important soil health practice:

**- Rotational Grazing:** The Census of Agriculture collects data on the number of farms using rotational grazing, rather than the number of acres, but the percentage of Kankakee farms with pasture or range that reported using rotational grazing dropped from 21% in 2007 to 20% in 2012 and 18% in 2017.

## Incomplete Picture

There was not adequate analysis available to get a clear picture of progress with respect to two aspects of soil health.

**? Diverse Crop Rotations:** We were unable to find or carry out an analysis of the use of diverse crop rotations in the Kankakee. The share of harvested acres planted to the two dominant crops, corn and soybeans, is very high (95%) and did not change between 2012 and 2017. A shift of acres from corn to soybeans provided a more even balance between the two and likely reflects reduced continuous corn acres.

**? Chemical Inputs:** We did not have adequate data available to draw firm conclusions about recent trends in the amount and kind of chemical pesticides used on Kankakee cropland. The acres of cropland treated for

Lynn Betts, NRCS



*Healthy soils can reduce the amount of chemical*

insects dropped from 40% to 35% from 2012 to 2017, and the acres treated for weeds dropped slightly from 93% to 91%.

Over the past two decades, the increase in

pounds of fertilizer applied to corn, and the significant increase in the acres of soybeans which are now fertilized, are likely signs of increased disturbance of the soil.

## Trouble Ahead

Two other troubling trends also emerge from the data available:

**- Loss of Grasslands:** The Kankakee lost 31% of its private pasture from 2007 to 2017, a loss of over 21,000 acres of grassland. That loss reduced the area's capacity to grow and maintain cattle, sheep and other livestock on grass, by the equivalent of roughly 20,000 to 40,000 head of cattle.

Compounding the loss of pasture was a loss of 3,400 acres of Conservation Reserve Program contracts, most of it grassland, a 6% decline. Together, the two represent a loss of over 38 square miles of grassland on Kankakee farms over a ten year period.

**- Increased Drainage:** The net acres of Kankakee cropland drained by tile (which grew) or ditch (which shrunk) increased by more than 66,000 acres from 2012 to 2017. That represents a net change covering 3% of the area's cropland. By 2017, 72% of Kankakee cropland was drained by tile or ditch.

Poor drainage can be a symptom of poor soil health, and soil health practices can be a relatively cheap, effective, but often overlooked alternative to the installation of expensive tile drain systems.

## Our Conclusions

*Overall, the information available shows that the Kankakee Basin has been making progress adopting better tillage and planting cover crops, two changes that should improve the health of the area's soils. However, not all signs are positive.*

*The Kankakee has a huge opportunity to restore and maintain healthy soils on 2.4 million acres of farmland, providing economic benefits to farmers and communities and conservation benefits to every resident.*

*Policy-makers, farmers, farm organizations, agencies, universities, and conservation organizations can help the region achieve these benefits through research, education, and policies and programs that speed the widespread adoption of soil health practices.*



Bob Nichols, NRCS

*The Kankakee lost over 38 square miles of pasture and CRP contract lands from 2007 to 2017.*



# Soil Health Recommendations

**Educate Decision-Makers.** Members of Congress, the governors and state agency leaders, state legislators, university administrators, soil and water conservation district officers and other local government leaders – all make decisions that have an impact on the health of the Kankakee’s soils. Knowledgeable farmers, researchers, non-government organizations, and agency experts can better educate decision-makers at every level about the many benefits of healthy soils and the impacts their decisions can have.

**Create a Soil Health Strategy.** Soil & water conservation districts and other stakeholders could create a soil health strategy for the Kankakee that identifies the benefits of

healthy soils, the current state of soil health, barriers to adoption of soil health systems and practices, and strategies for promoting the successful adoption of soil health practices.

By bringing together local farmers using soil health systems; academic experts and other scientists; federal, state and local agency experts; agriculture and conservation organizations and others with expertise in soil health, a soil health strategy could be developed that addresses the Kankakee’s unique blend of soils, climate, and farming systems.

**Increase Support for SWCD’s.** Soil & Water Conservation Districts (SWCD’s) provide ‘boots on the ground’ to help farmers understand and adopt conservation practices. SWCD’s in both Indiana and Illinois are strapped for resources to maintain staff and provide outreach and technical assistance.

Illinois SWCD’s in the Kankakee are using the STAR program (*Saving Tomorrow’s Agriculture Resources*) to help educate farmers about conservation systems, and Indiana SWCD’s are considering adopting a version of the STAR program. Education and assistance can be delivered by SWCD’s, state agencies, Co-operative Extension, and other partners

The Illinois *Fall Covers for Spring Savings* and *Partners for Conservation* programs pro-



Michael Russell, USDA

*Corn and alfalfa are part of this diverse crop rotation that contributes to soil health.*

vide financial assistance to farmers, and both should be expanded in Illinois.

The Indiana Conservation Partnership provides technical, financial and educational help to support better land stewardship, but in 2018 just 3% of the funding for the Partnership came from the state. Additional financial assistance would speed widespread adoption of soil health practices that would deliver water quality, erosion, flood mitigation, carbon storage, and wildlife benefits for the public, and provide economic benefits for farmers, farmland owners, and rural communities.

**Increase Support for Soil Health Research and Demonstration.** Higher education institutions in Indiana and Illinois are leaders in soil health science, but more research is needed to identify the impacts of soil health practices on the unusual mix of soils, farming systems, and growing conditions in the Kankakee. Additional state and federal



Catherine Ulitsky, NRCS

*Healthy soils deliver financial and operational benefits for farmers and many public benefits as well.*



*Infiltration rates are a measure of soil health.*

support for soil health research would increase our understanding of soil dynamics. Federal, state and local support for practical on-farm research and demonstration would help Kankakee farmers test, understand, and adopt practices that will work best on their farms.

**Track Soil Health Trends.** To our knowledge, no federal or state agency is collecting and aggregating widespread data on soil health through direct testing of soil biological health or related components like soil organic matter or infiltration rates. Both states are now estimating and tracking the use of tillage practices and cover crops through an annual transect survey. Data collected in that survey and by the National Agricultural Statistics Service could provide estimates of the use of diverse crop rotations. Both states could do a better job to assess and track diverse crop rotations and other soil health practices.

Where USDA or the states provide financial support for soil health practices, the agencies should include data collection as part of the

agreement. For example, USDA conservation program contracts that support cover crops should include cost-share to carry out annual soil health testing and provide the results to the farmer and USDA.

The USDA Census of Agriculture collects important information on several soil health practices, but only for a few practices and only every five years. Comprehensive annual data on trends in soil health and soil health practices would give farmers better information on the effectiveness of practices and give decision-makers better information with which to make wise policy decisions.

### ***Leverage More Federal Dollars.***

USDA conservation programs provided nearly \$400 million in 2020 to help Illinois and Indiana farmers adopt conservation systems on their farms.<sup>12</sup> More of those funds could be used to provide soil health and related conservation benefits. USDA could focus more of the Environmental Quality Incentives Program funding in the two states on delivering soil health benefits by earmarking a portion of the funds to provide cost-share for farmers adopting combinations of soil health practices.

USDA could prioritize whole-farm soil health systems and rotational grazing for Conservation Stewardship Program funding. State and local governments and non-governmental organizations are developing new Regional Conservation Partnership Program proposals to leverage state, local, and private funds to deliver soil health benefits in the Kankakee.

### ***Actively Promote CCRP and CREP.***

Eligible Kankakee area landowners can enroll in Continuous CRP (CCRP) contracts at any time to take vulnerable cropland out of production and plant buffer strips, filter strips, and windbreaks, restore wetlands, or install other practices that improve water quality and restore soil health. In April 2021 over 745,000 acres were enrolled in these USDA contracts in Illinois and Indiana.<sup>13</sup> State and local agencies and organizations can promote the program and help landowners enroll in the 10-15 year CCRP contracts provided by USDA.

In Illinois, landowners will be eligible for Conservation Reserve Enhancement Program (CREP) contracts once enrollment re-opens. Through Illinois CREP, landowners can obtain a Continuous CRP contract from USDA to restore wetlands or plant buffer strips along streams in targeted watersheds. The state will provide additional payments for conservation practices and offers easement payments to landowners willing to maintain the land in buffers or wetlands permanently. In 2018 and 2019 the Legislature provided funds to re-start the program (which was suspended after state funding lapsed in 2015), and after substantial delay it appears USDA will soon re-open enrollment.<sup>14</sup>

Indiana also has an active CREP program, but the Kankakee watershed is not part of the eligible area. By expanding the Indiana CREP to include the Kankakee, landowners could be eligible for federal and state payments to restore wetlands or plant buffer strips.<sup>15</sup>



# Soil Health Practices in the Kankakee

The Census of Agriculture provides county-level data on selected conservation practices. To provide estimates of the use of soil health practices in the Kankakee watershed, we compiled data from the ten counties that form the core of the Kankakee watershed: Jasper, Lake, LaPorte, Marshall, Newton, Porter, Starke, and St. Joseph counties in Indiana, and Iroquois and Kankakee counties in Illinois.

## Tillage

Tillage methods impact soil health and soil erosion. *Intensive* (or “conventional”) *tillage* uses a plow or disk that breaks up crop residue left behind after harvest and mixes it into the soil. Intensive tillage can harm soil health by destroying the beneficial fungi in the soil that help plants obtain nutrients and water and help hold soil together.<sup>16</sup>

*Reduced* (or “conservation”) *tillage* reduces the soil disturbance and leaves more of the crop residue in place. That reduces the harm to beneficial fungi, and the residue helps armor the soil to reduce erosion.

Lynn Betts, NRCS



*Intensive tillage destroys mycorrhizal fungi, promotes soil erosion, and threatens water quality.*

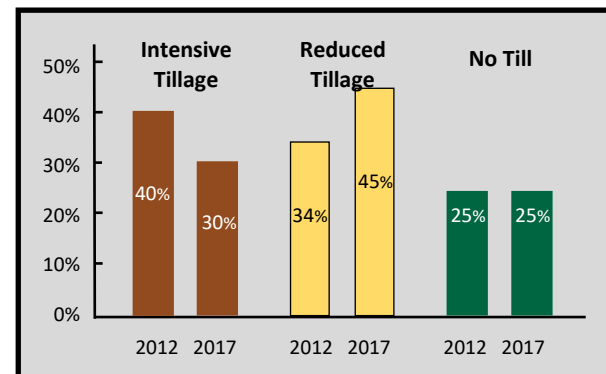
*No till* avoids tilling entirely, leaving all the crop residue in place in the fall and using seed drills to plant through the residue in the spring, reducing erosion and protecting healthy soils even more. Some farmers use different tillage methods on different fields.

In 2017 no till was used on 25% of Kankakee cropland acres that reported tillage, a slight decrease from 2012.<sup>17</sup> Reduced tillage was used on 45% of acres in 2017, a substantial increase from 34% of cropland in 2012.

Intensive tillage was used on 30% of cropland acres in 2017, a substantial reduction from 40% in 2012. That represents a shift of over 200,000 acres in just 5 years towards tillage practices that are better for soil health.

One-third fewer Kankakee area farmers reported using intensive tillage on any of their fields in 2017 than in 2012. That demonstrates clear progress.

Compared to others in the region, in 2017 Kankakee farmers had a ***smaller share of***



***cropland in no till*** (25%) than statewide in either Illinois (29%) or Indiana (41%) or any of the neighboring states, which range from just over 25% in Michigan to 68% in Kentucky. Farmers in the Kankakee had a ***higher share of acres in intensive tillage*** (30%) than statewide in either Illinois (29%) or Indiana (24%) or five of the six surrounding states. Only Michigan (38%) had a higher share of acres in intensive tillage than in the Kankakee.

**There are some notable bright spots.** In Newton County, Indiana, less than 22% of acres were intensively tilled and no till was used on 38% of cropland. LaPorte County, Indiana reported just 24% intensive tillage, and Lake County, Indiana reported no till in use on over 38% of acres.

**No till and conservation tillage are now in common use throughout the Kankakee. Yet despite a strong recent shift from intensive**



tillage to conservation tillage, the Kankakee area lags behind the region in reducing intensive tillage and adopting no till.

As of 2017 intensive tillage was still in use on over 640,000 acres of Kankakee cropland. There is also an opportunity to reduce the intensity of tillage on over 945,000 more acres currently in conservation tillage.

## Cover Crops

Cover crops are typically planted in the late summer or fall and provide living roots in the soil after harvest.<sup>18</sup> Cover crops are an essential element to building soil health. Sugars exuded from their roots feed beneficial bacteria and fungi in the soil when cash crops are not present. If a diverse mix of cover crops is used, they can support more diverse microbe populations.

Cover crops armor the soil, reduce erosion, increase organic matter, and can provide habitat for pollinators in the spring and fall and for other wildlife in the winter. Cover crops can be grazed by livestock in the winter or early spring to provide an immediate return on investment, or left in the field to provide nutrients for future crops. The state nutrient reduction strategies in both Indiana and Illinois identify cover crops as a key solution.<sup>19</sup>

According to the Census of Agriculture, in the Kankakee cover crops were planted on 5.8% of cropland acres, almost 132,000 acres, in

2017. That is more than double the acres planted in cover crops in 2012, when just 2.6% of cropland acres had cover crops. About 13% of farmers in the area reported planting cover crops on part of their cropland in 2017.<sup>20</sup>

The data reflect higher rates of cover crop usage in the watershed's Indiana counties (7.7%) than in Illinois counties (3.2%).

At 5.8% of cropland in 2017, use of cover crops in the Kankakee was more than Illinois statewide (3.0%), Iowa (3.7%), and Missouri (5.4%), but less than Indiana statewide (7.3%), Michigan (8.5%), Ohio (6.5%), Kentucky (6.3%), or Wisconsin (6.1%). Nationally, 3.9% of cropland was planted with cover crops in 2017.<sup>21</sup>

Several counties stand out. LaPorte (14.4%) and Starke (10.5%) counties in Indiana report-



*A mix of cover crops will protect the soil and feed microbes after this corn crop is harvested.*

## Information Sources

USDA carries out a Census of Agriculture every five years, the country's most comprehensive survey of farmers and farm operations. In recent years the Census of Agriculture asked farmers questions about their use of cover crops, tillage, and other practices that provide data down to a county level on several key soil health practices. Unless otherwise noted, the data in this report come from the 2017 Census of Agriculture.<sup>22</sup>



ed the highest rates of cropland planted in cover crops, while Kankakee (1.9%) and Iroquois (3.8%) counties in Illinois reported the lowest.

**Cover crops are a critical element in restoring healthy soils. Kankakee numbers show clear progress: more than twice as many acres of cover crops were planted in 2017 as in 2012. But the Kankakee lags a little behind most other states in the region, so there is much opportunity for improvement. To achieve the full benefits of healthy soils, Kankakee farmers will need to add cover crops to 2 million acres of land.**

Lynn Betts, NRCS

## Rotational Grazing

Management intensive rotational grazing – *rotational grazing* for short – involves moving cattle, sheep, or other ruminants from one pasture or paddock to the next frequently, often daily, in response to the growth stage of the forage. This strategy gives plants time to rest and recover, builds healthier soils, and grows plants with deeper root systems and greater forage production capacity.<sup>23</sup>

The Census of Agriculture collects data on the *number of farms* that use rotational grazing, but not on the *acres* under this kind of management, so we must extrapolate from available data. The percentage of Kankakee farms with pasture that reported using rotational grazing slid from 21% in 2007 to 20% in 2012 and 18% in 2017.<sup>24</sup>



Duane Hovorka, IWLA

*Rotational grazing boosts productivity and improves soil health.*

Rotational grazing is widely recognized as a more productive and profitable way to manage grasslands, and it has recognized soil health benefits.<sup>25</sup> Less profitable grasslands are also more vulnerable to conversion to cropland, urban development, or other uses. Conversion to cropland almost always results in a loss of soil organic matter, more erosion, and a decline in soil health.

Three Indiana counties bucked the trend. From 2007 to 2017 the share of farms with grass using rotational grazing grew from 12% to 17% in Starke county, 14% to 22% in Newton county, and 17% to 29% in Porter county.

**Despite these bright spots, it is very concerning that over the past decade the number and share of farms with pasture using rotational grazing dropped in the Kankakee. Just one in six farms with pasture are using management intensive rotational grazing, so the Kankakee likely has an opportunity to improve grazing management on over 38,000 acres of pasture, improving soil health and boosting on-farm profits.**

## Diverse Crop Rotations

Diverse crop rotations support diverse soil microbe populations, which improve water infiltration and nutrient cycling while reducing disease and pests. In general, the more diverse the rotation the better for soil health.<sup>26</sup>

A corn-soybean rotation is better than continuous corn; a corn-soybean-small grain rotation is better still. A rotation that includes multiple

crops and two years of grass or alfalfa should be even better for soil health.

The USDA National Agricultural Statistics Service collects annual data on crops planted that might be used to assess and track changes in crop rotations.<sup>27</sup> Illinois and Indiana collect crop information in annual transect surveys



Duane Hovorka, IWLA

*95% of harvested cropland acres in the Kankakee watershed in 2017 were planted to corn or soybeans.*

used to estimate tillage and cover crops usage which might also be analyzed to provide trends on crop rotations.<sup>28</sup> We were unable to find such an analysis and did not have the capacity to carry one out, but that kind of analysis would be useful in tracking change.

Corn and soybeans remain the dominant crops in the Kankakee. The share of harvested acres planted to corn dropped from 58% in 2012 to 51% in 2017, while the acres of soybeans rose from 36% to 44%, reflecting a more even balance and perhaps less continuous corn.<sup>29</sup>



Together, the acres of corn and soybeans represented 95% of harvested cropland in the Kankakee in 2012 and 2017. Wheat was planted on just over 1% of harvested acres in 2017, and forage was harvested on just over 2% of cropland in 2017.

**Based on the numbers, at most some 10-15% of cropland acres in the Kankakee could be using a resource-conserving crop rotation of at least 3 or 4 crops, and our best guess is around 5%.<sup>30</sup> There was no significant change in the share of acres growing the two dominant crops, corn and soybeans (95%), from 2012 to 2017.**

**There is substantial opportunity to diversify crop rotations beyond the standard continuous corn or corn-soybean rotation, and that could provide a financial payoff in soil health. However, diversifying crop rota-**

Lynn Betts, NRCS



*Research shows that a 1% increase in soil organic matter levels can reduce the nitrogen fertilizer needed to get the same corn yield by one-third or more.*

**tions will likely require more robust markets to make that third or fourth crop more profitable – crops like wheat, sorghum, or hay. The absence of diverse crop rotations also highlights the importance of using a diverse mix of cover crops that can support a more diverse mix of soil microbes.**

## Reduce Chemical Inputs

The NRCS soil health principle of “minimizing soil disturbance” includes minimizing disturbance from the use of pesticides and chemical fertilizers. Herbicides, insecticides, fungicides and other pesticides can harm soil microbes as well as worms and other beneficial soil dwellers. Chemical fertilizer provides nutrients to crops, but can interrupt the function of mycorrhizal fungi which otherwise help plants access nutrients and water.<sup>31</sup> By feeding the crops, farmers who use chemical fertilizer can inadvertently enable plants to starve some soil microbes.

Reducing the use of fertilizers and pesticides is one way to boost soil health by minimizing chemical disturbance. Healthier soils need less chemical fertilizer and pesticides, so reductions in use can also be a sign that soil health is improving.

Lynn Betts, NRCS



*Integrated Pest Management includes pest scouting to reduce pesticide use.*

The Census of Agriculture collects data on the number of acres treated for insects and weeds, but not on the amount or type of pesticide applied.<sup>32</sup> Changes in acres treated for insects and weeds is a very rough measure because of the year to year differences in pest problems and substantial differences in the impact of different pesticides on soil health. The acres of Kankakee cropland treated for insects dropped from 40% in 2012 to 35% in 2017, and the acres treated for weeds dropped slightly (from 93% to 91%) during that period.<sup>33</sup>

The Census of Agriculture also collects data on the number of acres on which farmers applied chemical fertilizer. Based on that data, the percentage of Kankakee crop acres fertilized dropped to 80% in 2017 from 82% in 2012, likely reflecting the shift from corn to soybeans during that time.

The USDA Economic Research Service has compiled additional fertilizer data from some states in some years, but sporadic data collection makes it difficult to draw conclusions about trends over the past 5-10 years. Based on longer term data, over the past 25-30 years Illinois and Indiana farmers have maintained or increased their application rates of phosphate, nitrogen, and potassium on corn acres. Farmers continued to apply nitrogen to 98% of corn acres, while increasing the pounds of nitrogen applied per acre in both states.<sup>34</sup>

With respect to soybeans, Illinois and Indiana farmers are applying nitrogen and other fertilizers to substantially more crop acres today than 20-25 years ago, even though soybeans host microbes that fix nitrogen from the air.<sup>35</sup>

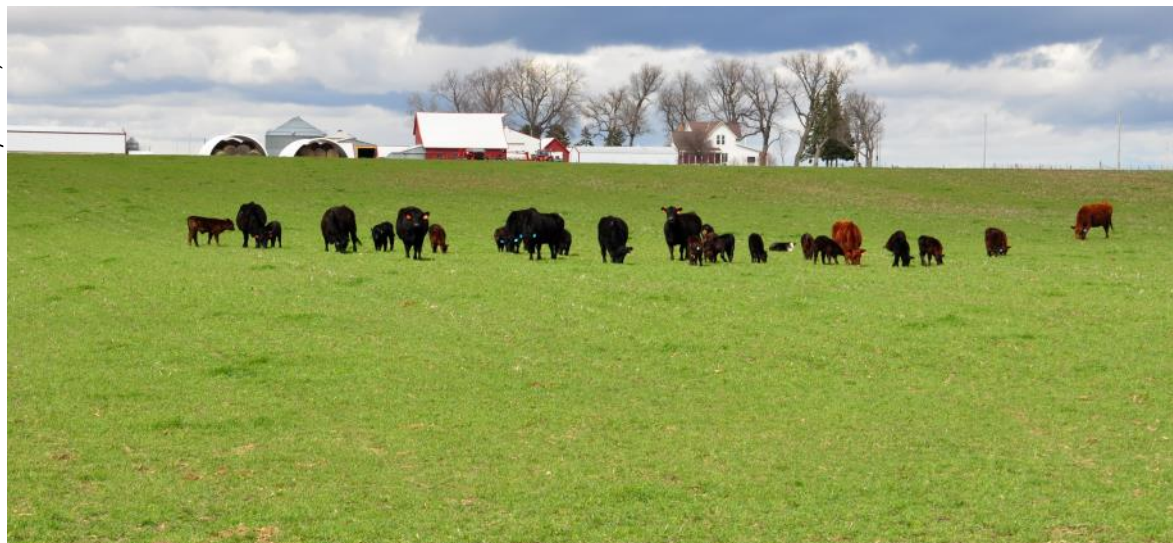
From a soil health perspective, those numbers are moving in the wrong direction.

A second indicator of inorganic pesticide and fertilizer use is the growth in organic production, which avoids non-organic fertilizer and pest control methods. County-level data are incomplete, but it appears organic production in the Kankakee grew by over 50% from 2012 to 2017. However, in dollars and acres organic still appears to represent less than 1% of the Kankakee's agricultural production.<sup>36</sup>

**The shortage of data makes it difficult to draw firm conclusions about the recent trends in the amount and kinds of chemical pesticides used in the Kankakee. The increase in pounds of fertilizer applied to corn, and the significant increase in the acres of soybeans which are now fertilized in Illinois and Indiana are likely signs of increased disturbance of the soil.**

**What is also clear, given the widespread use of inorganic fertilizer and pesticides in the area, is that employing soil health practices could reduce the \$288 million farmers in the Kankakee spent on fertilizer and pesticides in 2017.<sup>37</sup> Practices that rebuild and maintain soil health can substantially reduce both fertilizer and pesticide use.**

Lynn Betts, NRCS



*Cattle graze on a mix of cover crops, providing financial return while supercharging soil health on cropland.*

## Other Trends

Two troubling trends emerge from the Census of Agriculture data with respect to soil health.

### Loss of Grasslands

In the decade from 2007 to 2017 the Kankakee watershed lost nearly 31% of its pasture – a loss of over 21,000 acres or about 33 square miles of pastureland.<sup>38</sup> Most was likely converted to cropland or urban development.

By 2017 just 47,111 acres, less than 2% of the 2.4 million acres of farmland in the Kankakee, remained in pasture.<sup>39</sup> Conversion of grassland means increased soil erosion, more polluted runoff, reduced water quality, loss of wildlife habitat, and a reduction in soil health.

The substantial reduction in acres of pasture has also reduced the watershed's capacity to maintain cattle, sheep and other livestock on grass by roughly 20,000 to 40,000 head of cattle (depending on assumptions about the soil and how the land is managed).<sup>40</sup> That is significant in an area that reported about 100,000 cattle and calves and nearly 4,000 sheep and lambs in 2017.<sup>41</sup> Livestock can super-charge soil health because they cycle nutrients and their manure and urine help feed and diversify the bacteria in the soil.

In a typical integrated grassland/cropland operation, cattle are born and weaned on grass, spend the growing season on grass, and can be moved onto cropland to glean crop residue and graze cover crops over the winter. Without the base of grassland to support cattle (or sheep)



during the growing season, the opportunities to integrate livestock onto nearby cropland to graze cover crops or glean crop residue declines. That reduces the opportunity to supercharge the rebuilding of soil health on cropland, and it precludes the opportunity to boost the potential economic value of growing cover crops by using it as forage.

The continuing loss of grassland also hurts grassland-dependent birds, which are in sharp decline in Illinois and Indiana. The *State Wildlife Action Plans* in both states identify loss of native prairie and other grassland as a significant concern, and the Illinois plan sets a goal to reestablish 1 million acres of grassland.<sup>42</sup> The loss of grassland is exacerbated by the declining share of farms using modern rotation grazing systems on remaining grasslands.

One bright spot in the Kankakee is Newton County, Indiana, which saw a net increase of 2,858 acres of pasture over the decade. In 2017, 4.9% of Newton County farmland was



William McCoy, US FWS

*The Kankakee watershed lost 33 square miles of pasture from 2007 to 2017.*

still in pasture and 22% of those farms were using rotational grazing systems.

**The large loss of private grasslands is a very troubling trend. If it is not stemmed and ultimately reversed, the capacity of Kankakee area farms to gain the soil health benefits of integrating livestock into cropland management will continue to decline. The loss of grasslands also has important implications for soil erosion, water quality, and wildlife habitat in the watershed.**

## Loss of Conservation Reserve Program Acres

In addition to the loss of pasture, the Kankakee lost over 3,400 acres of Conservation Reserve Program (CRP) lands from 2007 to 2017, a 6% decline.<sup>43</sup> That left the Kankakee with just 56,300 acres of CRP contracts in September, 2017. The decline has likely continued as both Indiana and Illinois have lost CRP acres since 2017.<sup>44</sup>

Most remaining CRP acres are in grassland, although some are in restored woodlands, wetlands, or a mix of grassland and trees or shrubs. With the large loss of pasture and wet meadows in the Kankakee, CRP acres provide grassland habitat that is critical to grassland birds and other wildlife.

***In 2017, there were more acres in the Kankakee area in CRP contracts (56,300) than acres remaining in pasture (47,111), an indication of how critical CRP acres are to maintaining grassland in the watershed.***

The decline in CRP acres in Illinois and Indiana has paralleled the reduction in CRP acres nationally and in the region as Congress reduced the size of the program and USDA reduced rental and incentive payments — a decision that USDA recently reversed.<sup>45</sup>

There are bright spots. Iroquois, Kankakee, and Jasper counties all increased their CRP acres from 2007 to 2017. CRP acres are clus-

Duane Hovorka, IWLA



*Conservation Reserve Program acres in the Kankakee declined by 6% from 2007 to 2017.*

tered in Iroquois and Starke counties, which together had 61% of all CRP acres in the ten core Kankakee Basin counties.

When CRP contracts expire, landowners have a ready-made option to put the land into grass-based livestock production. Well-managed, rotationally grazed grassland maintains many of the soil conservation, water quality, and wildlife benefits that resulted from the land being placed in the CRP. For organic produc-

ers, an expiring CRP contract can provide the opportunity for a fast transition to organic livestock or crop production if the land has not had chemicals applied to it for at least 3 years.

Since 2007, both Illinois and Indiana have seen substantial declines in General CRP enrollment (typically whole fields planted to grass), while seeing an increase in Continuous CRP enrollment (typically partial-field contracts like conservation buffers, filter strips, and restored wetlands, including Conservation Reserve Enhancement Program contracts).<sup>46</sup>

USDA can enroll landowners in Continuous CRP contracts where they agree to install high-value practices like buffer strips along streams, restored wetlands, or windbreaks, and eligible landowners can enroll at any time without waiting for USDA to hold a General CRP signup.<sup>47</sup>

The Illinois Conservation Reserve Enhancement Program (CREP) is a partnership between USDA and Illinois that targets Continuous CRP contracts for wetland restoration or buffer strips in the Kankakee watershed and other parts of Illinois.<sup>48</sup> Indiana also has a CREP program, but it currently does not cover the Kankakee watershed.<sup>49</sup>

In the Illinois CREP, USDA provides annual rental payments and a share of the cost of installation, and the state provides technical help and offers landowners payment for a permanent conservation easement to ensure the land remains in conservation. The program was put on hold after state funds for the partnership

lapsed in 2015 due to state budget cuts, but the legislature restored state funding in 2018 and 2019. Hopefully, the USDA Farm Service Agency will soon reopen enrollment in the Illinois CREP.

Congress authorized an increase in CRP acres in the 2018 Farm Bill, expanding the program's authorization to 27 million acres by 2023 from 24 million acres in 2018. But during the General CRP signup in 2020, the first since the new Farm Bill was enacted, USDA accepted 108,555 acres from Illinois and 18,494 acres from Indiana<sup>50</sup>—substantially less than the acres of land in CRP contracts that expired in 2020 in Illinois (138,409) and Indiana (34,611).<sup>51</sup>

**Taken together, the loss of pasture and fewer Conservation Reserve Program acres represent the loss of over 38 square miles of grassland in the Kankakee area from 2007 to 2017.**



Stephen Ausmus USDA ARS

Peter Van Metre, USGS



*Illinois farmers installed drain tile on nearly 575,000 acres of farmland from 2012 to 2017.*

## Drainage

Drainage ditches and drain tiles are installed to carry water off of fields, allowing them to dry out sooner in the spring or after a rain. Typically tile drains convey the water directly to a nearby stream. Ditch systems can carry the water to larger ditches which in turn convey the water to a stream. Control structures, when installed, can modulate when the water is released.

Drain tile installation is sometimes a response to the symptoms of unhealthy soil. When soil loses its structure and organic matter and soil health declines the soil infiltrates far less water. For example, healthy Illinois cropland soil with 5% organic matter may be able to absorb a 3" rain in a short time; that same type of soil degraded to just 2% organic matter may only



be able to absorb a 1" rain.<sup>52</sup> Once the top layer is saturated, additional precipitation runs off or ponds in low-lying areas, drowning plants or making planting difficult. Landowners then install drainage tile because their soil is no longer infiltrating precipitation.

When drainage systems carry runoff directly to a stream, they can also carry nitrogen, phosphorus, and manure from cropland.

The acres of Kankakee area cropland drained by tile grew by 90,781 acres from 2012 to 2017, representing new tile installations on 4% of the area's cropland in five years. That increase was offset in part by a reduction of 24,854 acres drained by ditch as ditch systems were abandoned or converted to tile drainage. The net increase of almost 66,000 acres of land actively drained represents almost 3% of the area's cropland. By 2017, 72% of Kankakee cropland had a drainage system installed.<sup>53</sup>

Soil health practices can reduce and often eliminate the need for drain tile, by helping soil infiltrate and hold more precipitation, eliminating ponding on the surface. During the extensive spring flooding in the Midwest in 2019, farmers who had planted cover crops reported getting into their fields to plant several weeks earlier than their neighbors who did not plant cover crops.<sup>54</sup> Healthy soils can also reduce the need for fertilizers and pesticides, reducing the risk that the chemicals will be vulnerable to runoff.

At \$1,000 to \$1,500 per acre to install,<sup>55</sup> intensive tile drainage systems are very expensive,

especially when compared to the net cost of soil health practices like no till, cover crops, and integrated pest management.<sup>56</sup> A \$1,000 investment could plant 40 years worth of cover crops per acre, likely addressing the problem and providing many additional benefits.

Assuming \$1,000 per acre, the 90,781 acres of drain tile installed on Kankakee cropland from 2012 to 2017 cost the area's farmers over \$90 million. Had that same amount been invested in planting cover crops for 5 years at \$25/acre/year, it would have planted cover crops on over 725,000 acres of cropland, increasing infiltration rates, reducing erosion, and improving yield and resiliency on that land.

**Where tile or ditch drainage is already installed, including over 1.6 million acres of Kankakee farmland, soil health practices can reduce the pollutants conveyed directly to a stream through the tile lines or ditches.**

**On the 628,000 acres of Kankakee cropland that was not tile or ditch drained in 2017, much smaller investments in soil health practices can help farmers reduce or avoid the lack of infiltration, ponding, and related problems that prompt farmers to invest large sums to install expensive tile or ditch drainage systems.**

**Communities downstream should also see benefits from those soil health investments, and could avoid the damage that can result when farmland drainage overwhelms the capacity of streams and floodplains downstream to absorb floodwaters.**

## Conclusion

**Taken together, the data available shows that the Kankakee watershed has been making progress in improving the health of its soils in two practices, tillage and cover crops, but not all the signs are positive.**

**The data available also identify the huge opportunity in the Kankakee to restore and maintain healthy soils on 2.4 million acres of farmland, providing economic benefits to farmers and farm communities and conservation benefits for all residents.**

**Policy-makers, farmers, government agencies, educational institutions, farm organizations, and conservation organizations can help achieve these benefits through education and outreach, research and demonstration, and by enacting policies and programs that speed the widespread adoption of soil health practices on Kankakee farmland.**



Ray Weil, U. of Maryland

## End Notes

<sup>1</sup>Lori Sallet, *New American Farmland Trust-NRCS Case Studies Show Soil Health Practices Increase Farm Profitability*, American Farmland Trust, 30 July, 2019.

<sup>2</sup>Jenny Hopkinson, *Can American Soil be Brought back to Life?*, POLITICO, 13 September, 2017.

<sup>3</sup>Willy Verheye, editor, *Soils, Plant Growth and Crop Production - Volume 1*, page 111.

<sup>4</sup>USDA Natural Resources Conservation Service, *What Can We Conclude?* [www.nrcs.usda.gov/wps/portal/nrcs/detailfull/pa/soils/health/?cid=nrcseprd1204810](http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/pa/soils/health/?cid=nrcseprd1204810)

<sup>5</sup>Emily Oldfield, et al, *Global Meta-analysis of the Relationship Between Soil Organic Matter and Crop Yields*, SOIL, Volume 5, issue 1, 15 Jan 2019.

<sup>6</sup>Bill Spiegel, *Investing in Soil Health Pays*, Successful Farming, 18 March, 2016.

<sup>7</sup>Steve Solomon, *The Intelligent Gardener: Growing Nutrient-Dense Food*, 2013, New Society Publishers.

<sup>8</sup>Dr. Rattan Lal, Ohio State University, says restoring soils of degraded ecosystems could store 1 to 3 billion tons of carbon annually, see Schwartz, Judith, *Soil as Carbon Storehouse: New Weapon in Climate Fight?* YaleEnvironment360, 4 March 2014.

<sup>9</sup>Hainan Lu, et al, *The Role of Artificial Root Exudate Components in Facilitating the Degradation of Pyrene in Soil*, Scientific Reports, 2 Aug 2017.



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<sup>10</sup>Dr. David Montgomery, *Growing a Revolution: Bringing Our Soil Back to Life*, W.W. Norton & Co., 2017.

<sup>11</sup>Jay Fuhrer, *Soil Health*, USDA Natural Resources Conservation Service North Dakota, [www.nrcs.usda.gov/wps/portal/nrcs/main/nd/soils/health/](http://www.nrcs.usda.gov/wps/portal/nrcs/main/nd/soils/health/)

<sup>12</sup>Izaak Walton League of America, *The Farm Bill and Indiana*, and *The Farm Bill and Illinois*, 2020.

<sup>13</sup>U.S. Department of Agriculture, *Conservation Reserve Program Monthly Summary – April 2021*, USDA Farm Service Agency, page 11.

<sup>14</sup>For up to date information on the Illinois CREP, see [www2.illinois.gov/dnr/conservation/CREP/](http://www2.illinois.gov/dnr/conservation/CREP/)

<sup>15</sup>For information on the Indiana CREP, visit [www.in.gov/isda/divisions/soil-conservation/conservation-reserve-enhancement-program/](http://www.in.gov/isda/divisions/soil-conservation/conservation-reserve-enhancement-program/)

<sup>16</sup>Zahangir Kabir, *Tillage or No-tillage: Impact on Mycorrhizae*, Canadian Journal of Plant Science, 2005, 8(1).

<sup>17</sup>USDA, *2017 Census of Agriculture*, Table 41, National Agricultural Statistics Service. Percentages are based on the share of cropland (or farms) for which tillage practices were reported (no till, reduced tillage, or intensive tillage), which represented 94% of all cropland and 98% of harvested cropland acres reported in 2017 for the 10 Kankakee counties.

<sup>18</sup>Farmers also plant cover crops in the spring or summer in an area that was too wet to plant a cash crop, which can provide soil health and other conservation benefits. That practice can confound the interpretation of trends in NASS cover crop data.

<sup>19</sup>*Illinois Nutrient Loss Reduction Strategy*, July 2015, page 3-32, and *Indiana's State Nutrient Reduction Strategy—Milestones and Action Items Table*, December 2018.

<sup>20</sup>USDA, *2017 Census of Agriculture*, Table 41, National Agricultural Statistics Service. The reported acres of cover crops represent 5.8% of all cropland, or 6.1% of harvested cropland. We used 'all cropland' as the basis for comparison because some cropland acres too wet to be planted to a cash crop (and thus not harvested) were likely planted to cover

crops in 2017. An Environmental Working Group analysis using satellite imagery provided cover crops estimates for Illinois and Indiana in 2017 similar to the Census of Agriculture numbers, see *Cover Crops: Reducing Farm Runoff While Saving Soil*, Environmental Working Group, May 2019.

<sup>21</sup>USDA, *2017 Census of Agriculture*, Table 41.

<sup>22</sup>USDA National Agricultural Statistics Service, *Census of Agriculture*, [www.nass.usda.gov/AgCensus/](http://www.nass.usda.gov/AgCensus/)

<sup>23</sup>Heather Smith Thomas, *Ranching 101: Rotational Grazing Offers Many Benefits*, Beef, 6 May 2019.

<sup>24</sup>USDA, *2017 Census of Agriculture* Tables 8 and 43, *2012 Census of Agriculture* Tables 8 and 43, and *2007 Census of Agriculture* Tables 8 and 44. The figures represent the number of farms that reported they "practiced rotational or management-intensive grazing" divided by the number of farms that reported having "pastureland, all types" (which includes permanent pasture and range, pastured cropland, and pastured woodland).

<sup>25</sup>Ken Tate, *Grazing Management to Improve Soil Health*, UCRangeLand, University of California, 9 April 2018, [rangelands.ucdavis.edu/grazing-management-to-improve-soil-health/](http://rangelands.ucdavis.edu/grazing-management-to-improve-soil-health/).

<sup>26</sup>Rodale Institute, *Crop Rotations*, [rodaleinstitute.org/why-organic/organic-farming-practices/crop-rotations/](http://rodaleinstitute.org/why-organic/organic-farming-practices/crop-rotations/)

<sup>27</sup>The USDA National Agricultural Statistics Service collects data on crops planted on an annual basis, see [nassgeodata.gmu.edu/CropScape/](http://nassgeodata.gmu.edu/CropScape/)

<sup>28</sup>Illinois and Indiana collect annual data on tillage practices, cover crops, and the crop grown using a visual survey of established transects. An analysis of multiple years of data might provide insight into recent crop rotations. See [www2.illinois.gov/sites/agr/Resources/LandWater/Pages/Illinois-Soil-Conservation-Transect-Survey-Reports.aspx](http://www2.illinois.gov/sites/agr/Resources/LandWater/Pages/Illinois-Soil-Conservation-Transect-Survey-Reports.aspx) (IL) and [www.in.gov/isda/2383.htm](http://www.in.gov/isda/2383.htm) (IN)

<sup>29</sup>USDA, *2017 Census of Agriculture* and *2012 Census of Agriculture*, Table 24 and 25, National Agricultural Statistics Service.



<sup>30</sup> Definitions of what constitutes a ‘conservation crop rotation’ differ. For our purposes, we considered a minimum three-crop rotation (e.g. corn-soybean-small grain, or corn-soybeans-alfalfa/grass) to meet the definition of a conservation crop rotation that would build soil health and break up pest cycles. We did not consider a corn-soybeans rotation, even with cover crops, to meet the definition.

<sup>31</sup> Philip Gruber, *Carbon at Crux of Soil Health*, Lancaster Farming, 10 Mar 2017.

<sup>32</sup> USDA, *2017 Census of Agriculture*, Table 40, National Agricultural Statistics Service.

<sup>33</sup> USDA, *2017 Census of Agriculture*, Table 40, National Agricultural Statistics Service.

<sup>34</sup> USDA Economic Research Service, *Fertilizer Use and Price*, last updated 30 October 2019, at [www.ers.usda.gov/data-products/fertilizer-use-and-price/](http://www.ers.usda.gov/data-products/fertilizer-use-and-price/). ERS data is compiled from multiple sources, which for Illinois includes data for 1994-1998 and for 2014, 2016, 2017, and 2018, and for Indiana includes data for 1989-1993 and 2014, 2016, and 2018.

<sup>35</sup> *ibid.*

<sup>36</sup> *ibid.*, Table 42, and *2016 Certified Organic Survey-Illinois*, USDA National Agricultural Statistics Service, September 2017. The Census of Agriculture withheld sales data from 4 of the 10 core Kankakee-area counties in 2012 and 3 counties in 2017 to avoid disclosing proprietary data, making firm estimates difficult.

<sup>37</sup> USDA, *2017 Census of Agriculture*, Table 3, National Agricultural Statistics Service.

<sup>38</sup> USDA, *2017 Census of Agriculture*, *2012 Census of Agriculture*, *2007 Census of Agriculture*, Table 8.

<sup>39</sup> USDA *2017 Census of Agriculture*, Table 8.

<sup>40</sup> A rule of thumb provided by grazing experts in Indiana is that typical cattle stocking rates range from 1 animal unit/acre to as high as 2/acre with well-managed rotational grazing on high quality soil.

<sup>41</sup> USDA, *2017 Census of Agriculture*, Tables 11 and 13, National Agricultural Statistics Service.

<sup>42</sup> Illinois Department of Natural Resources, *2015 Implementation Guide to the Illinois Wildlife Action*

*Plan*, page F&P 23, and Indiana Department of Natural Resources, *Grasslands for Gamebirds and Songbirds Initiative*, [www.in.gov/dnr/fishwild/9467.htm](http://www.in.gov/dnr/fishwild/9467.htm).

<sup>43</sup> U.S. Department of Agriculture Farm Service Agency, *Conservation Reserve Program Monthly Summary – September, 2017*, page 9, and U.S. Department of Agriculture Farm Service Agency, *Conservation Reserve Program Summary and Enrollment Statistics, FY 2007*, page 14.

<sup>44</sup> U.S. Department of Agriculture Farm Service Agency, *Conservation Reserve Program Monthly Summary -- April 2021*, page 11.

<sup>45</sup> In 2021 USDA announced it would update the CRP to have higher payment rates and new incentives, see [www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program](http://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program)

<sup>46</sup> USDA FSA *CRP Monthly Summary*, Sept. 2007 and Sept. 2017.

<sup>47</sup> General CRP contracts are awarded by USDA in a competitive process where landowners apply for a CRP contract and USDA awards contracts based on the environmental benefits and cost of each application. For more information on the kinds of CRP enrollment, visit [www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/index](http://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/index)

<sup>48</sup> Illinois State Department of Natural Resources, *2019 Annual Report, Illinois Conservation Reserve Enhancement Program*.

<sup>49</sup> Indiana State Department of Agriculture, Division of Soil Conservation, *Indiana Conservation Reserve Enhancement Program 2019 Annual Report*, December 2019.

<sup>50</sup> USDA Farm Service Agency, *CRP Signup 54 Offered and Acceptable Acres*, March 2020.

<sup>51</sup> USDA Farm Service Agency, *Conservation Reserve Program Monthly Summary – January 2020*, Page 16

<sup>52</sup> Estimate is based on the increase in water holding capacity of a 1% increase of soil organic matter of about 20,000 gallons of water, confirmed by on-farm experience on an Illinois farm.

<sup>53</sup> USDA *2017 Census of Agriculture*, Table 41, National Agricultural Statistics Service.

<sup>54</sup> Randall Reeder, *Planting Green: Is there an Advantage in a Wet Spring?* Ohio’s Country Journal, 4 June 2019.

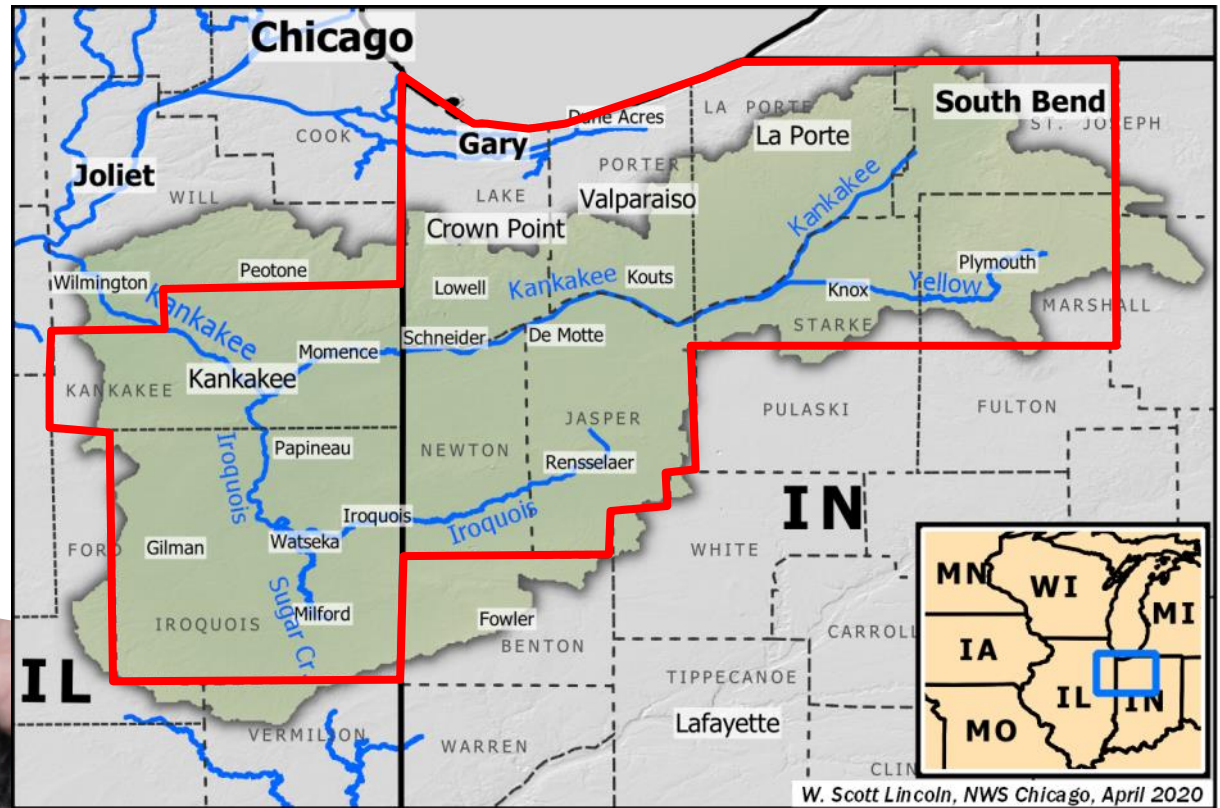
<sup>55</sup> Ernest Moody, *Why Spend \$1,000 per Acre on Drain Tile?* Farm Progress, 10 July 2017; and Ag-Talk, *Drain Tile Cost Per Acre?*, see [talk.newagtalk.com/forums/thread-view.asp?tid=737258](http://talk.newagtalk.com/forums/thread-view.asp?tid=737258).

<sup>56</sup> Tom Driscoll, *What Can Farmers Do About Climate Change? Soil Health and Drainage*, National Farmers Union, 11 December 2017, [nfu.org/2017/12/11/what-can-farmers-do-about-climate-change-soil-health-and-drainage/](http://nfu.org/2017/12/11/what-can-farmers-do-about-climate-change-soil-health-and-drainage/)



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# The Kankakee Watershed



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County-level Census of Agriculture data included in this report.

