



# Soil: Grounding Us in Transformative Systemic Change



*Photo courtesy of Lynn Betts, USDA NRCS.*

**Prepared by the  
Iowa Chapter Agriculture Committee**

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## Soil: Grounding Us in Transformative Systemic Change

The United Nations declared the year 2015 the “International Year of Soils”. This was done for good reason – soil is vital to producing almost all of our food and, in many areas of the world, it is becoming seriously degraded. To feed ourselves and future populations the nutrient-packed food necessary for health and well-being, we need to protect and improve all the world’s soils.

The commitment to healthy soil has been welcomed by many people including farmers and environmentalists, but like so many good ideas and noble efforts, the focus on one aspect of our life-sustaining biosphere has been too easily co-opted by think tanks, elected officials, and agribusiness interests. With exaggerated headlines such as “building healthy soil solves everything” and “soil is key to climate change solution”, and “healthy soil creates beautiful landscapes”, soil health has been reduced to sound bites. Two examples of often-heard prescribed practices are the use of no-till to sequester carbon, despite the use of herbicides and synthetic fertilizers, and the assertion that healthy soil requires biotechnology, both of which are contrary to our own efforts to protect the environment. Furthermore, the single most effective way to improve soil is take livestock out of confined animal feeding operations (CAFOs) and return animals to farms, which will require a challenge to the power structure of the industry.

Thus, soil health has become a distraction, diverting our attention and keeping us from addressing the necessary broader systemic change that we truly need in producing food. We cannot separate out portions of our agriculture system and expect any lasting, effective change. We must keep in mind the complex systems – environmental, cultural, and economic - in which we farm and live as we advocate for policies.

Focusing on soil can, however, draw our attention to something we can all see and touch. Soil can “ground” us as we seek to transform our agriculture system to one in which ecology and nature are at the forefront, and the people who produce our farm products, now and in the future, are valued and respected.



Cover crops on a field in Black Hawk County, Iowa. Photo courtesy Lynn Betts, USDA NRCS

As environmentalists, farmers, and eaters, we recognize that the current system is failing us all. Sierra Club’s priority issues address the harms of genetically-engineered seeds, synthetic fertilizers and toxic agriculture chemicals, and livestock kept in confinements and feedlots. We recognize the loss of biodiversity, destruction of wetlands and woodlands, and pollution of water and air. We see the results of the low prices for farm products - an insecure and stressful situation for Iowa’s farmers as they compete with the corn and soybeans grown where the Amazon rainforest and South American grasslands are being destroyed, depopulated rural communities with more and more CAFOs, and fewer and fewer farmers. Most people in Iowa now have only a slim or no connection to a farm. Genetically-engineered seeds, chemical inputs, and digital technology are taking us even further in that direction.

To address the multiple crises that our biosphere faces, we need to advocate for comprehensive policies that will take us in the direction of restored ecosystems, farms with livestock and ecologically-sound crop rotations, economically secure farmers, and vibrant rural and urban communities. Let’s use soil as the foundation – the grounding we need – to work for systemic change.

## Introduction

Iowa's soils were created over thousands of years through the interaction of wind, water and weather, and further modified by the movement of glaciers and by the presence of various animal and plant species.

In the illustrious conquest of territories through the imperialistic expansion of the United States, Iowa territory was opened to white settlers in the early 1840's, and Iowa became a state in 1846. Thus began the change from prairie to agricultural use of this land between two mighty rivers.

The loss of Iowa's soil from erosion gradually increased over time as acres of prairie, rolling hills, savanna, and wooded river valleys became diversified farms with crops, livestock, orchards, and gardens. As agriculture industrialized, these soils experienced accelerated rates of erosion as they came to be dominated by just two annual crops, corn and soybeans, where even highly-erodible land on hillsides that were once pasture are now producing those two crops. The economic conditions of the free market that ensured low priced feed for the vertically integrated livestock industry and the drive for greater efficiencies, such as the use of confinements in which to raise livestock, together took away most farmers' ability to feasibly raise livestock on their farms. Soil-enhancing and carbon-sequestering rotations with pasture, hay, and small grains are no longer needed.

In 2019, out of the 30.6 million acres of farm land in Iowa, 13.5 million acres of corn and 9.2 million acres of soybeans were planted.<sup>1</sup> As Rick Cruse, Professor of Agronomy at Iowa State University and Director of the Iowa Water Center stated, "If you want to keep soil in place, you're not going to do it by growing only corn and soybeans, no matter how many conservation practices you use."<sup>2</sup>

These soils that were once part of a tall grass prairie ecosystem which featured swaths of flat prairie and also rolling hills and wooded river valleys, can be categorized into at least 450 types of soil all with different properties.<sup>3</sup> These soil types have been identified as 22 groups or associations, according to geographic and characteristic patterns.<sup>4</sup> From the Loess Hills in the western part of the state, built up by soft wind-blown silt, to the heavy black soil of the Des Moines Lobe in central and north-central Iowa to the sandy hilltops of southern Iowa, erosion control and efforts to build healthy soil must take into account the soil types, the geography, and the current use of the land. Solutions will not come in easy one-size-fits-all prescriptions.

The United States Department of Agriculture (USDA) estimates that Iowa loses 5.2 tons of topsoil per acre of cultivated cropland every year due to sheet and rill erosion, in essence water erosion.<sup>5</sup> USDA also

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<sup>1</sup> "Iowa Ag News – 2019 Crop Production", United States Department of Agriculture, January 10, 2020

<sup>2</sup> "Cruse: Cost of soil erosion in Iowa is not a pretty picture", Mason City Globe Gazette, September 6, 2017

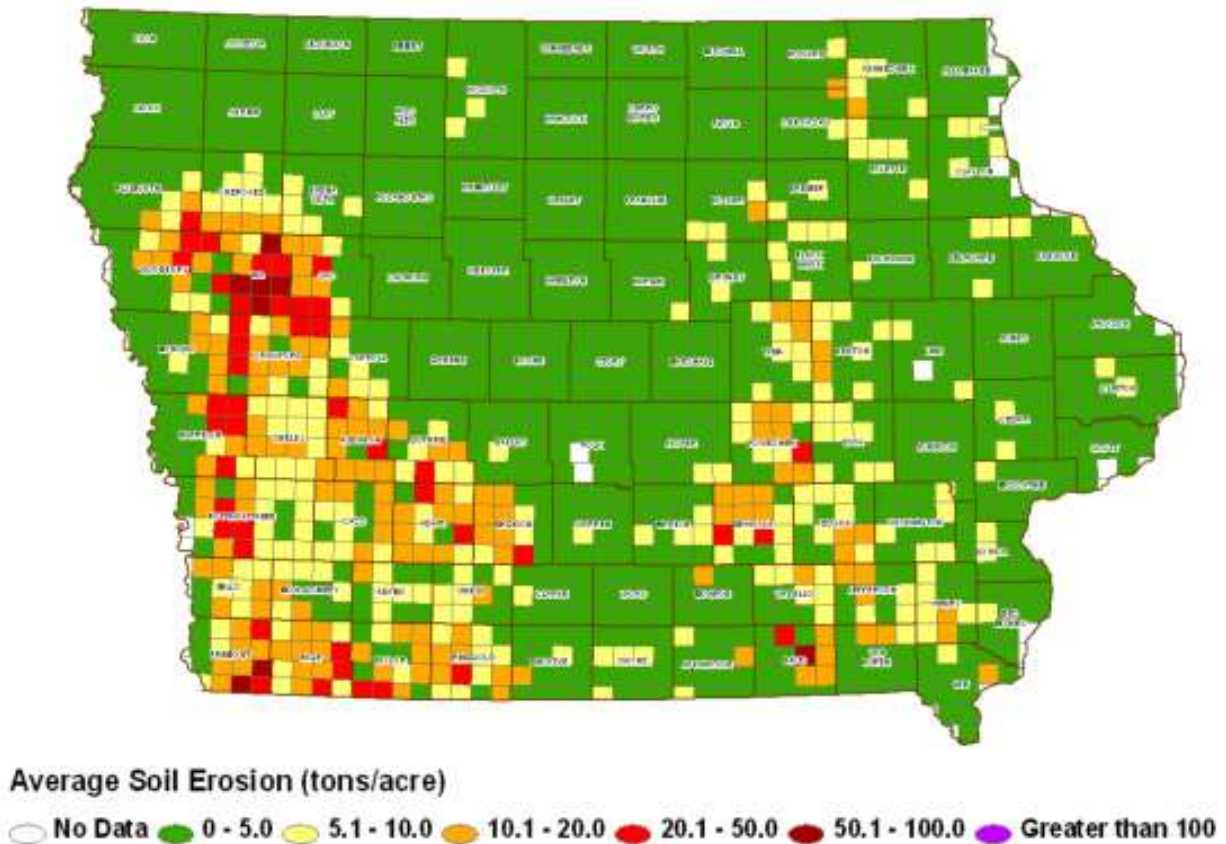
<sup>3</sup> "Iowa Soils", Iowa Pathways, Iowa Public Television

<sup>4</sup> "Highway Guide to Iowa Soil Associations", United States Department of Agriculture, Natural Resources Conservation Service

<sup>5</sup> U.S. Department of Agriculture, "Summary Report: 2010 National Resources Inventory", Natural Resources Conservation Service, Washington, DC, and Center for Survey Statistics and Methodology, Iowa State University, Ames, Iowa, page 88

estimates that Iowa loses 0.5 ton of topsoil per acre of cultivated cropland due to wind erosion.<sup>6</sup> On their own, soils form at an average rate of 0.24 tons per acre, with a range of 0.01 to 0.08 tons per acre, per year.<sup>7</sup> Over half of Iowa's topsoil has been lost since the land was first cultivated, and over half of the organic material in the soil has been lost.<sup>8</sup>

The map below shows the average soil erosion across the state.<sup>9</sup>



What this means for Iowa is that cultivated farmland is losing soil at a significant rate every year and that methods need to be introduced to restore the topsoil and to preserve it on the land. Failing to do so will result in a significant reduction in soil fertility, exhausted soil and compacted soil. All of this means that

<sup>6</sup> U.S. Department of Agriculture, "Summary Report: 2010 National Resources Inventory", Natural Resources Conservation Service, Washington, DC, and Center for Survey Statistics and Methodology, Iowa State University, Ames, Iowa, page 101

<sup>6</sup> Rick Cruse, "Soil Erosion – What will the future bring?", Power Point, Iowa State University

<sup>6</sup> Francis Thicke, A New Vision for Iowa Food and Agriculture, Mulberry Knoll Books, 2010, page 8

<sup>7</sup> Rick Cruse, "Soil Erosion – What will the future bring?", Power Point, Iowa State University

<sup>8</sup> Francis Thicke, A New Vision for Iowa Food and Agriculture, Mulberry Knoll Books, 2010, page 8

<sup>9</sup> Catherine DeLong, Richard Cruse, John Wiener, "The Soil Degradation Paradox: Compromising Our Resources When We Need Them the Most", *Sustainability*, 2015, v 7, pages 866-879

the yield of crops will be significantly reduced. The livelihoods of farmers, the vitality of rural communities, and the production of food for generations to come are all at risk.

Bottom line: to reduce soil erosion and improve the overall health of Iowa's soils, we need to have fewer acres in annual row crops. This will take policies that address the structure of our agricultural production system. Federal policies that create a price floor for commodities and manage their supply will flip the profits from the livestock industry and its use of confinements for livestock to a production system in which farmers can profitably raise livestock on the land. Conservation measures for those acres that are in annual row crops are well researched with practices that rejuvenate the soil and build organic matter. These conservation measures will need to be supported. We will explore many of these options in the following sections.

### **It is time to look at restoring Iowa's soil health.**

As residents of Iowa, we all know the ills of the current industrialized agriculture system: soil erosion, polluted water, poor air quality, livestock in confinements and large feedlots, glyphosate and other chemicals in our environment, loss of biodiversity and ecosystems, genetically-engineered crops, and corn and soybean fields stretching for miles and miles. Added to those environmental issues are the deteriorating rural economy, withering towns and disappearing businesses of all types, and increasing rates of stress- and isolation-related mental health illnesses among residents of rural communities.

Through our efforts in the Sierra Club, we are asking for changes to this system. Change is inevitable, either from legislation, from climate change, or from continued corporate domination of our agriculture system - or, all of the above. We need to be out front and set the direction of that change for the better. The legislation and policies that we will be covering in this report will do just that.

A part of this discussion is the important concept of a Just Transition. This Just Transition is a vision of agriculture that focuses on ecologically-sound methods, diversified farms, cooperatives and food hubs, thriving rural communities, respect for the Commons, and a re-established social contract between farmers and non-farmers. This transition must not leave today's farmers out of the picture. It must be as much about farmers as about farms. We need their skills and knowledge and leadership as we move toward this vision.

If we leave out the farmer, we will not be changing the trajectory of this system, but only putting band-aids on the wounds. We might improve our soil and our water, but to what end? Who will be on the land caring for the crops and the community, and be the eyes protecting the environment? Will corporations (and their supporting politicians) dictate what we grow - genetically-engineered crops with organic remaining as the niche? And what we eat? Will we continue to use Iowa's rich resources to produce livestock feed and ethanol, exporting much of what we produce? Will cheap agricultural commodities continue to be turned into expensive "junk foods"? Will our society suddenly realize that they no longer have a connection to our farms?

A Just Transition would create a smooth change rather than create chaos. A Just Transition will ease anxiety that we will all feel about change, especially our farmers who must lead change. If we allow change to be chaotic, the powerful will win, not you and me, nor future generations.



The challenge we have is to figure out how we get there. How do the policies and the legislation for which we advocate get us to a different agricultural system that respects the environment and all that Mother Earth has to share, as well as respects farmers, farmworkers, communities, and future generations?

### Thinking about solutions

The good news is that there are solutions that can be implemented today. Sustainable farms must be ecologically sound and socially responsible as well as economically viable. Sustainable agriculture involves using farming techniques that are economically feasible and that also maintain soil fertility for future generations, protect water resources from pollution and treat livestock animals humanely. A sustainable agriculture must also meet the basic needs of society - including consumers, farmers, members of rural communities. A key feature of sustainable agriculture is that farms must not only meet the need of the present but continue to be productive for generations to come.

In contrast, modern industrial agriculture is based on maximizing production as efficiently as possible, using economies of scale, while externalizing as many costs as possible. This results in short-term economic gains and economic success. Yet, it causes many unintended consequences such as loss of soil fertility; loss of carbon sinks such as wetlands and carbon retained in the soil, prairies and forests; and the inability of the land to accept all of the wastes produced by the farm and to recycle those wastes satisfactorily without polluting the environment. The existing industrial-scale agriculture techniques leach or leak nitrogen from the soil into the water and air, resulting in excessive soil erosion. This nitrogen, along with phosphorus, causes the Dead Zone in the Gulf of Mexico, an area where no living animals can survive in the water because fertilizer-fed algae deprives the water of oxygen. Furthermore, some of the techniques used in industrial agriculture, including storing liquid manure in pits and using synthetic fertilizer, emit large quantities of greenhouse gases into the atmosphere, exacerbating climate change.



*Soybeans planted using no-till agriculture methods. Photo courtesy USDA NRCS, Lynn Betts*

### Transitioning to sustainable agriculture methods

Components of sustainable agriculture include:

- Protecting soil through increasing the amount of soil by restoring organic matter and maintaining organic material in the soil, which increases the soil fertility, and using cover crops to protect the soil from erosion.
- Raising local foods because the farmer is closer to local consumers who share their commitment to caring for the land and taking care of the local environment.
- Encouraging consumption of healthy foods by advocating for eating less processed food as well as more fresh fruits and vegetables.
- Including animal agriculture as part of an integrated system that returns nutrients to the land without polluting streams and endangering the health of the people who live and work in the area.

- Adopting animal-raising techniques that include managed grazing, deep-bedding animals and composting manure.
- Raising animals on grass allows them to spread their own manure and harvest their own feed while reducing the amount of energy spent on farm equipment operation and the amount of greenhouse gas emissions.
- Raising animals alternatively in deep-bedding reduces the release of greenhouse gas emissions into the atmosphere, along with creating litter that can be used as a soil amendment.
- Reducing the need for artificial chemicals - herbicides, pesticides, fungicides - applied to the land.
- Planting nitrogen-fixing crops to put nitrogen in the soil without using commercial fertilizers.
- Growing crops in a rotation that may include the planting of small grains, hay, fruits and vegetables, combined with strips of perennials. The strips of perennials provide cover on the land, build soil, provide wildlife habitat and reduce erosion from the fields.
- Using beneficial insects to reduce pests and pollinate crops.

Once solutions for restoring soil health and fertility are implemented, many other problems are solved:

- reducing nutrient requirements
- mitigating airborne greenhouse gases
- restoring stream buffers and wetlands
- rejuvenating soil
- reducing flooding
- protecting crops during droughts
- improving water quality
- sequestering carbon
- increasing soil fertility
- reducing use of pesticides and fertilizers
- restoring soil microbes
- preventing soil erosion and
- restoring wildlife habitat.



### Soil – it's more than dirt

Soil consists of organic material, sand, silt and clay. Organic material is decomposed plant material, insects, worms, fungi and microbes. Organic material acts like glue holding the soil particles together. Healthy soils have small pockets of air and water interspersed among soil particles.

Organic matter can provide the chemical elements or soil nutrients that plants need to grow. Those elements are released from soil organic materials and made available to plant roots by soil microbes.

When the pockets of air and water are no longer present in the soil, the soil is compacted. When the organic material is no longer present, the soil is exhausted. Without soil microbes, organic material and pockets of air and water, artificial fertilizers must be applied to the land to provide nutrients to the plants.

Rich organic soil results from adding organic materials, including manure, crop residues and compost, and from less tilling of the soil, which releases soil nutrients into the atmosphere. Healthy soils can also sustain

plants when conditions are dryer. They can also absorb more water and slow the flow of water during rains and snow melts, which reduces flooding and flood risks. Organic material also reduces erosion making soils more cohesive. All of this is because “organic carbon holds between four and 20 times its own weight in water. This means that when carbon levels are depleted, the water-holding capacity of the soil is significantly compromised. Low-water holding capacity results in poor structural stability when soils are wet and reduced plant growth when soils are dry.”<sup>10</sup>

Enriching carbon in soils increases water retention, reduces carbon in the air, and increases soil fertility and crop yields. Another benefit is storing carbon, thus keeping it out of the atmosphere, helps to mitigate climate change.

### **Farming the best; idling the rest**

Ground-breaking research looked at how Iowa farmers can benefit from idling least productive land while still making a profit.

A Michigan State University research team led by Dr. Bruno Basso<sup>11</sup> was able to identify specific parts of fields that produce consistently high yields, consistently poor yields, or variable yields. By analyzing satellite images, and then looking at combine harvest sensors, the research team found that

- 50% of the farm land was able to consistently produce high yields
- 25% was consistently producing poor yields
- 25% was variable or unstable, which means there were good yields some years and low yields other years, depending on weather conditions.

The study suggests that farming the best and idling the rest is a good strategy. Therefore 25% of the land would be best suited to idling via the Conservation Reserve Program (CRP), or similar programs, or could be planted in perennial bioenergy crops or agroforestry systems. By idling the land that is least productive, but most expensive for inputs, the farmer can earn a greater profit from the land that is farmed, plus can earn money from the CRP program or the bioenergy or alternative tree crops.

The areas with consistent poor yields are consistent money-losers. Using that information, farmers can idle those areas while investing their time and resources on the most productive areas and make more money in the process. By investing in the most profitable areas of their fields, farmers will save money in seed, fertilizer, and pesticide costs. They will save in labor needed in working the idled fields and reduce fuel costs spent on running equipment.

Since those fields with the consistent poor yields also leak more nitrogen, idling those areas will reduce nitrogen entering our waterways. High yield areas use more of the fertilizer applied to the field; therefore reducing run off into waterbodies.

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<sup>10</sup> Christine Jones, “Soil Restoration: 5 Core Principles”, *Ecofarming Daily, Acres U.S.A.*, October, 2017

<sup>11</sup> Bruno Basso, Guanyuan Shuai, Jinshui Zhang, G. Philip Robertson, “Yield stability analysis reveals sources of large-scale nitrogen loss from the US Midwest”, *Scientific American* 9, Article 5774, 2019

By planting perennials, particularly native prairie, on those least productive areas, the areas become a buffer for holding water, storing carbon, and filtering chemical pollution. Those least productive idled areas become wildlife habitat.

With modern precision agriculture, the areas of high yield, poor yield, and variable yield can be easily identified. That same technology can be used to apply varying rates of fertilizer. Dr. Basso and his team estimated the loss of nitrogen fertilizer in ten Midwestern states cost farmers one billion dollars and created 6.8 million metric tons of greenhouse gases each year, the equivalent of 1.4 million passenger cars. These emissions could be significantly reduced by eliminating the over application of fertilizers on less productive soils.

This study points out a win-win; a win for the farmers and also a win for improved water quality and the environment.

Thinking about idling the least productive areas of a farm leads to several beneficial outcomes.

- It would be helpful to have maps of each farm which indicate areas that should be idled. That obviously requires an investment to create the maps and to educate the landowners.
- The farmer who idles the land should be compensated for that through the CRP program or a similar program.



Soybeans grown without Roundup, field is near Pilot Mound, Iowa

### **A buffer on every stream**

By requiring buffers along every river and stream, Iowa's waterbodies will be protected from runoff laden with soil and agricultural chemicals. What's more, the buffer strips could be planted with native prairie plants, perennial crops or fruit trees, or nut trees. Those buffers could become wildlife habitat and corridors for the wildlife to move across the landscape.

### **Water Quality Plans for Iowa farms**

Many millions of state and federal dollars have been invested to improve Iowa's water quality over the past couple of decades. However, in spite of those extensive investments, there is little evidence that Iowa's water quality has improved, and there are even indications that our water quality has gotten worse.

A new approach is needed to ensure that progress is being made to reach Iowa's water quality goals that are delineated in the Iowa Nutrient Reduction Strategy (INRS). Lessons for how to ensure progress in water quality improvement can be learned from progress made in the past with soil conservation.

The Dust Bowl of the last century spurred research into farming practices to conserve soil on farms in Iowa and across the country. That research was put into a soil erosion model called the Universal Soil Loss Equation (USLE). Using the USLE, farmers could input their individual farming and conservation practices into a mathematical model, and the model would predict how much erosion would be expected on specific fields when those practices were used. The set of farming and conservation practices constituted a farm's Soil Conservation Plan, and a requirement of a Soil Conservation Plan was that it reduce soil erosion on farm fields to a tolerance level, called "T." T was the estimated "tolerance" level of erosion that would allow the soil to maintain its current productivity. If the farming and conservation practices chosen by a farmer did not reduce erosion to T, the farmer was required to choose additional or alternative practices in order to bring the predicted erosion down to T in order to qualify for government programs.

There are parallels between Iowa's water quality crisis today and the Dust Bowl of last century. Today we have a lot of research data on the water quality effects of farming and conservation practices, as described in the Science Assessment of the Iowa Nutrient Reduction Strategy.

Conservation practices such as cover crops and prairie strips play a significant role in restoring soil health. It is the soil health that increases the soil's capacity to absorb more rainfall, preventing more runoff, and therefore, water pollution. Bringing our soil back to life is the goal of reducing tillage, including cover crops and increasing biodiversity. These practices increase the sustainable productivity of soils as well as protect water quality.

Like with the USLE, current water quality research data could be compiled into a "Universal Water Quality Equation" (UWQE) model, which could be used to predict the nitrogen and phosphorus (the two major nutrient pollutants) loss from farm fields to lakes, streams and rivers.

Similar to the USLE, "T" (tolerance) values could be established for both nitrogen and phosphorus in the UWQE model. Those T values would be based on the goals of the INRS for agriculture—a 41% reduction in nitrogen loading and a 29% reduction in phosphorus loading—normalized to a farm field level.



Application of nitrogen fertilizer on a no-till field. Photo courtesy USDA NRCS, Lynn Betts

Using the UWQE to create a Water Quality Plan, farmers could learn what predicted levels of nitrogen and phosphorus loss would be expected under the practices they are currently using, and what additional practices could be used on their farms to reduce nitrogen and phosphorus loss to the T values. Like with Soil Conservation Plans, Water Quality Plans would allow farmers the flexibility to choose practices that fit their farming operations, as long as they met the T values for both nitrogen and phosphorus.

In conclusion, water quality plans will help Iowa make real progress on reducing the nitrogen and phosphorus in Iowa's rivers, streams, and lakes. The mechanism for creating water quality plans provides a tool for landowners to measure their own progress in reducing nutrients leaving their farmland.

What's more, the plans acknowledge that every farm is different and one size does not fit all. Farmers would be able to implement those techniques that apply and fit best specifically to their own farms. If every farm in Iowa adopted and implemented a water quality plan that met the T values for nitrogen and phosphorus, the aggregate effect would be that we would meet Iowa's statewide water quality goals for agriculture expressed in the INRS, a 41% load reduction for nitrate-N and a 29% load reduction for phosphorus.

### **Agriculture Climate Adaptation Plan**

Climate change presents challenges and great opportunities to farmers and landowners.

The Iowa Department of Agriculture and Land Stewardship (IDALS) is at the forefront of establishing agriculture policies for the state. IDALS also provides technical assistance to farmers across the state. As part of that leadership, IDALS is in the best position to develop an Agriculture Climate Adaptation Plan. While the most severe impacts of climate change so far have occurred beyond the Midwest, Iowans most certainly are dealing with its effects. Iowa's farming systems will need to change in order to effectively adapt to the climate changes that are already occurring and that are predicted to occur in the near future. A number of states have already created plans to adapt to climate change, including neighboring states of Minnesota and Wisconsin. Iowa also should create an agriculture climate adaptation plan.

The kinds of strategies that need to be included in an Agriculture Climate Adaptation Plan include:

- Managing changes in precipitation with additional production practices and crop rotations, including perennials, to preserve soil and to reduce and control loss of fertilizers
- Revising grazing strategies with specific attention to mitigation of climate change
- Providing technical support to landowners to implement climate change adaptation strategies
- Developing methods and policies for incentivizing "carbon sinking" on farms.
- Anticipating new and resistant weeds, pathogens, and insect pests and responding with Integrated Pest Management (IPM) or National Organic Program (NOP) methods
- Restoring the natural landscape and providing wildlife habitat
- Developing a financing strategy to assist landowners in transitioning to new "climate smart" farming techniques, practices, and whole-farm systems
- Promoting regenerative, sustainable farming systems as a means of mitigating or potentially helping to reverse climate change
- Assisting farmers in transitioning livestock from confinements to humane, pasture-based methods of production



Prairie plants. Photo courtesy Lynn Betts, USDA NRCS

## Farmers are already dealing with climate change

Iowa farmers are already dealing with the evolving weather patterns from climate change. In the future, farmers will need to make significant adaptations. We have all heard the saying that “if you wait long enough, the weather in Iowa will change.” Even so, there was a time when one could predict certain things to happen during certain months of the year. Lately that predictability has been changing. Weather has become more volatile and less predictable. The changes include:<sup>12</sup>

- Precipitation has increased about 10 percent since the 1940s. More rain falls in the first half of the year, leading to wetter springs; the rain comes in downpours. Eastern Iowa has experienced a greater increase in precipitation than other parts of Iowa.
- Floods are more frequent and more severe. Since the turn of the century, there have been significant floods in all of Iowa’s major rivers, including the Mississippi River, Iowa River, Upper Iowa River, Turkey River, Maquoketa River, Wapsipinicon River, Shell Rock River, Winnebago River, Des Moines River, Raccoon River, Cedar River, Rock River, Big Sioux River, Skunk River, Missouri River, and others.
- Dew-point temperatures are rising, meaning there is more moisture in the air, particularly during the summer.
- Stronger storms are occurring.
- Stream flows have increased since the 1940s.
- Soils remain closer to saturation points in the spring.
- Over the last 30 years, wind speeds have declined.
- Nighttime temperatures are rising more than daytime temperatures and winter temperatures are increasing more than summer temperatures. There are five more frost-free days per year since 1950. The growing season has been extended.

Consequently, the United States Department of Agriculture updated its Plant Hardiness Zone Map to reflect warmer temperatures. For example, the planting zone for most of Iowa moved from zone 5a to 5b, while the northwest and northeast corners of the state are now in zone 4b. This means that some perennial plants that once were not able to tolerate Iowa’s colder temperatures can now safely grow in Iowa. The maps are based on the coldest temperature in the region in the past 30 years.<sup>13</sup>

Researchers have chronicled that the boundary of the Great Plains has moved to the east. Historically the eastern boundary of the Great Plains followed the 100<sup>th</sup> Meridian. The 100<sup>th</sup> Meridian runs north and south along the eastern borders of North Dakota and South Dakota, down through Nebraska, Kansas, Oklahoma, and Texas. That dividing line separated the arid Great Plains found in the western portion of the United States and the more-moist Midwest and the eastern areas of the United States. Iowa sits in the moist eastern portion of the country. According to researchers, the boundary has moved 140 miles

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<sup>12</sup> Material is compiled from:

“Iowa Climate Change Adaptation and Resilience Report,” 2011, United States Environmental Protection Agency pilot project, pages 17, 41, 42 and 44

“Climate Change Impacts on Iowa, 2010,” Iowa Climate Change Impacts Committee, article by Eugene “Gene” S. Tackle titled “Climate Changes in Iowa,” January 1, 2011, pages 8 to 13

Gene Tackle Prepared Testimony, Exhibit Sierra Club-GT-1, Iowa Utilities Board, Docket No. HLP-2014-0001, In Re Dakota Access LLC, October 12, 2015

<sup>13</sup> Daniel P. Finney and Yvonne Beasley, “As Iowa winters warm up, gardeners see more options,” *The Des Moines Register*, January 26, 2012

to the east, putting portions of western Iowa into the drier portion of the country. If climate change is allowed to continue, western Iowa is predicted to become drier and more like eastern Nebraska, which will affect crops that can be grown as well as trees and landscaping plants.<sup>14, 15</sup>

These noticeable changes are part of the pattern of climate change. Climate change is more than glaciers melting and the permafrost in the Arctic thawing; climate change is affecting Iowa farmers and Iowans in general.<sup>16</sup>

### **Agricultural practices produce and reduce greenhouse gas emissions**

As of 2018, 30 percent of the greenhouse gas emissions in Iowa were from the agriculture sector.<sup>17</sup> Changes in agricultural processes can reduce (or even increase) greenhouse gas emissions. Agriculture is in a unique position with respect to greenhouse gas emissions. A number of agricultural practices can solve some of the problems of excess carbon dioxide and other greenhouse gases through sequestering carbon in the soil. Changing on-farm practices, including livestock production practices, to those that are more sustainable can also reduce the amount of greenhouse gases that are emitted.



Swine in a concentrated animal feeding operation (CAFO). Photo courtesy USDA NRCS, Jeff Vanuga

### **Sources of agriculturally produced greenhouse gas emissions in Iowa**

The three main greenhouse gases emitted by agricultural practices are carbon dioxide, methane and nitrous oxide. Airborne greenhouse gases are responsible for the effects of climate change.

- Carbon Dioxide - Carbon dioxide is emitted by farm equipment moving across the farm's fields during tilling, planting, the application of pesticides and fertilizers, and harvest. The more passes across the farm field, the more carbon that is emitted. Another source of carbon dioxide is the shipment of foods and grains from the fields to the markets.

<sup>14</sup> Richard Seager, Jamie Feldman, Nathan Lis, Mingfang Ting, Alton P. Williams, Jennifer Nakamura, Haibo Liu, Naomi Henderson, "Whither the 100<sup>th</sup> Meridian? The Once and Future Physical and Human Geography of America's Arid-Humid Divide. Part I: The Story So Far", *Earth Interactions*, Volume 22 (2018)

<sup>15</sup> Richard Seager, Jamie Feldman, Nathan Lis, Mingfang Ting, Alton P. Williams, Jennifer Nakamura, Haibo Liu, Naomi Henderson, "Whither the 100<sup>th</sup> Meridian? The Once and Future Physical and Human Geography of America's Arid-Humid Divide. Part II: The Meridian Moves East", *Earth Interactions*, Volume 22 (2018)

<sup>16</sup> Donnelle Eller, "Study: Climate change could hammer Iowa ag, manufacturing", *Des Moines Register*, January 23, 2015

<sup>17</sup> Iowa Department of Natural Resources, [www.iowadnr.gov/Environmental-Protection/Air-Quality/Greenhouse-Gas-Emissions](http://www.iowadnr.gov/Environmental-Protection/Air-Quality/Greenhouse-Gas-Emissions)



- Methane - Methane is one of the gasses emitted from the digestive tracks of ruminant animals (cattle, sheep, goats, buffalo) in a process called enteric fermentation. Manure is another source of methane. If the manure is composted, there is little methane produced. Animals that are allowed to pasture produce little methane. Deep-bedding of animals also produces little methane. The largest source of animal-produced methane is in the liquid manure stored in lagoons, manure storage structures, and holding pits used in swine concentrated animal feeding operations (CAFOs).
- Nitrous oxide - Nitrous oxide is emitted into the air from soils, particularly those soils not covered with plants. The largest source of nitrous oxide is from synthetic fertilizer. Legumes are also responsible for nitrous oxide emissions. Likewise, livestock manure, particularly from confinement operations, is a source of nitrous oxide.

### A solution to reducing greenhouse gases – carbon sinking

Plants and soil hold carbon which reduces the amount of carbon dioxide in the air. Increasing the amount of carbon held in soil and plants will mitigate the effects of greenhouse gases. Soil loses carbon when it is tilled and when it is devoid of crops. When wetlands are filled, forests are felled and prairies are plowed, they no longer are able to sequester carbon and the carbon is released into the air.

A carbon sink is a long-term storage reservoir for carbon, such as soil, wetlands, prairies, forests. By increasing the amount of carbon stored in sinks, less carbon will remain in the atmosphere. This is also called carbon sequestration. The soil carbon cycle is shown below:

Plants extract carbon from the atmosphere in the photosynthesis process



The carbon is stored in the plant tissues including leaves, stems, branches, trunks, roots, and seeds



Plants die, shed leaves, develop and drop seeds (such as pods, nuts, fruits)



The plant material turns into organic material in the soil



Eventually the carbon stored in organic material returns to the atmosphere

Techniques to increase or maintain carbon in the soil include:

- No-till agriculture. Keeping crop residues on the land and leaving the earth largely undisturbed during planting. Adopting no-till farming also reduces the number of times equipment crosses the fields.
- Conservation tillage. Farmers practicing conservation tillage leave 30 percent of the crop residue on the fields.
- Biochar. Also called charcoal, biochar can be put into soil to increase its fertility and to allow it to hold water. Biochar stays in the soil for long periods of time, thus sequestering carbon in the soil. It is produced by heating organic material (manure or plant leaves, stalks, roots, husks, shells, seeds) in a low oxygen environment.
- Compost. This organic material, such as leaves, stalks and roots that have decomposed, is added to soil as a fertilizer and to rejuvenate soil.
- Integrated crop-livestock systems. Farms that include livestock on the landscape as well as crops are more beneficial in returning carbon to the soil and maintaining healthy soils.
- Managed grazing. Managed grazing is a practice where grazing land is divided into segments, called paddocks, with the grazing animals (cattle, sheep, goats, chickens, turkeys) moved from paddock to paddock every few days. The forage grasses, both introduced and native grasses and forbs, are allowed to rejuvenate while the paddock is resting between grazing periods. This results in less soil erosion. It also results in higher quality grasses and a greater output of grasses. Although labor is required to move the animals from paddock to paddock and to reconfigure fences and water sources for the move, the resulting grasslands are much healthier.
- Use of cover crops. Cover crops are planted with the intent to prevent soil erosion after the primary crop has been harvested. Side benefits include improved water quality, reduced need for fertilizers, reduced soil compaction and increased soil fertility due to the carbon held in the cover crop. Cover crops are also called green manure.
- Manure application. Manure consists of organic material. When manure is properly applied to and incorporated, manure will increase the amount of carbon held in the soil.
- Reducing the application of synthetic chemicals. Synthetic chemicals can and do destroy soil microbes, which reduces soil health, and slows or precludes long-term carbon sequestration.
- Organic farming. Organic farmers do not use pesticides and artificial fertilizers but instead use organic fertilizers and natural pesticide control. These techniques include the use of compost, manure and cover crops – techniques that enhance the biological health of soils and increase carbon retained in the soil.



An example of managed grazing, where cattle are feeding in the left paddock while the paddock on the right of the fence is resting. Photo courtesy USDA NRCS, Jeff Vanuga

Iowa's soils have a lot of potential for storing carbon. Dan Anderson, associate agriculture professor at Iowa State University, indicated "we probably have somewhere in the neighborhood of 100,000 pounds

of carbon in the top foot of our topsoils. If you go back to when we were a prairie, we probably had 200,000 pounds of carbon, so we have reduced the amount of carbon by half.”<sup>18</sup>

### **A word about methane digesters**

Methane digesters, also called manure digesters or anaerobic digesters, are expensive to install and complicated to manage. Those installed to date have required significant government support. Maintaining an anaerobic digester on an ongoing basis requires knowledge in wastewater and electrical generation, a skill that the concentrated animal feeding operation (CAFO) owner would need to acquire. Otherwise, the CAFO owner would need to hire or contract with an expert which would significantly increase production costs. Given the cost of an anaerobic digester, it is doubtful that a CAFO owner will voluntarily install an anaerobic biodigester unless the CAFO is raising a large enough quantity of animals to make hiring a full-time digester manager financially viable.

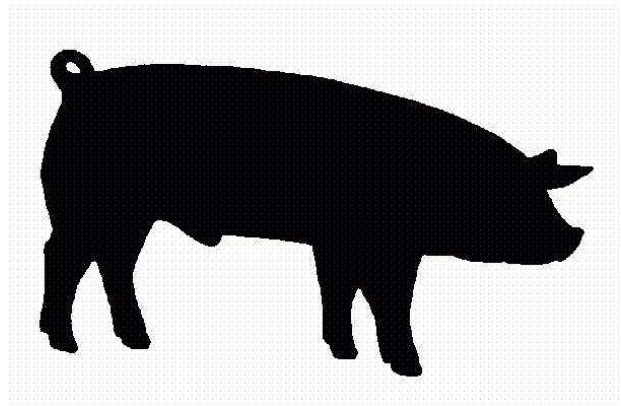
Alternatively piping wastes to a central location has higher up-front expenses while transporting wastes to a central location adds to costs. Any transfer of the wastes into manure tankers would result in gases being vented into the outside air. In addition, the sludge or residual remaining after the digestive process still contains many of the potential chemical and biological toxins that were in the manure and still must be disposed of by one means or another.

The bigger issue is that the method of raising animals in concentrated animal feeding operations results in copious quantities of waste product and profuse amounts of odors and toxic gases emitted into the air.

A better, more sustainable model to raise animals is by using managed grazing or deep-bedded housing. This model is more humane to the animals, does not rely on sub-therapeutic doses of antibiotics to promote growth and to prevent illnesses, allows animals enough room to exercise and results in better tasting meat and eggs. Although methane recovery systems to capture the methane, either on-site or an aggregated facility handling the manure from several neighboring CAFOs are appealing, the CAFO model needs to be replaced with a better one.

### **Animals are part of the outdoor landscape**

As we move to more sustainable farming practices, returning animals to the landscape is key. It also means removing animals out of confinements (CAFOs).



### **It is time for a CAFO Moratorium**

It's time for a moratorium on building new confined animal feeding operations (CAFOs) and expanding existing operations.

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<sup>18</sup> George C. Ford, "Moving forward: Ideas from the 2019 Iowa Ideas Conference", *The Cedar Rapids Gazette Iowa Ideas*, October 27, 2019, page 12

Across the state, lowans feel they are under siege from an industry that is polluting the air, polluting the water, and destroying peaceful existence in rural areas. That industry is confined animal feeding operations.

The current way most of the animals producing meat, milk, and eggs are raised is in industrial livestock production facilities. Thousands of animals live under the roof of a production facility, never seeing sunlight, never breathing fresh air, and never having an opportunity to exercise outdoors. Others are kept in feed lots too small to allow vegetative ground cover to grow or for animals to escape living in their own wastes. Currently livestock production involves raising as many animals as possible, as quickly as possible, in as small a space as possible, with the least outlay of money, with minimal labor and attention, with as little regulation as possible. Consequently the current state of industrial agriculture can be characterized as:

- Regulations are non-existent, lax, or favorable to the CAFO industry because of political influence.
- CAFOS have direct environmental consequences, including polluted waters across the state and high bacteria levels in Iowa's lakes which lead to advisories recommending not swimming in those lakes.
- The animals are raised via methods better suited to a manufacturing plant that is making inanimate objects than raising live animals.
- There has been a significant loss of opportunity for independent farmers who want to raise animals but don't want to raise them in industrial livestock factories.
- The industry has been overtaken by a few very large corporations that extract most of the profits from livestock production.
- The current industrial technology is simply not compatible for raising animals in a socially responsible, environmentally sound, sustainable way.
- County Boards of Supervisors have no control over the siting of a CAFO, as long as it meets current inadequate state regulations.
- Neighbors and the public have almost no recourse to challenge the proposed siting of a CAFO.

The neighbors complain of stench so bad that they cannot hang laundry outside, they cannot open their windows, and they cannot sit outside. With the stench from the CAFOs next door, the neighbors know that the property they own is less likely to be purchased at a fair price should they sell it. Significant reductions of residential property values near CAFOs have been widely documented, with the reductions dependent on direction and distance for CAFOs, prevailing wind direction, and other specific locational variables. It's clear, no one wants to live next door or even very close to a CAFO.

Although CAFOs are not designed or supposed to discharge manure into water bodies, significant discharges are documented as happening in Iowa several times a year. The fines are so low that they are not a deterrent to discourage other operators from doing the same thing. About half of Iowa's waterbodies tested each year are so polluted with nutrients, which are chemicals in manure, that their water has been placed on Iowa's Impaired Waters list, which means that the water does not meet water quality standards.

None of the CAFO manure is actually treated, unlike human sewage, even though the manure is laden with pathogens, antibiotics, heavy metals, and hormones.

It is time for a moratorium on building new CAFOs and expanding existing CAFOs.

## A word about money

As you read through this document, it should be obvious that many of the solutions will require an investment of private money and public funds. Many of the suggestions will require additional money being allocated to existing budgets.

## Resource Enhancement and Protection (REAP)

Resource Enhancement and Protection (REAP), a state law enacted in 1989, provides the framework for funding to protect Iowa's natural areas, soil conservation, water quality and historical resources. Twenty percent of the money allocated by the legislature to REAP is spent on the soil and water enhancement program. REAP funds other programs, such as parks and recreation.

Although statutorily mandated at \$20 million annually, the Iowa legislature determines the actual appropriation each year. The governor must then either agree or veto the appropriation. Unfortunately for a number of years, REAP has been funded at several million dollars less than \$20 million. REAP funding is generated from the sale of natural resource license plates and from the Environment First Fund (which is funded with gambling receipts).



Compost made of manure and other organic solids. Photo courtesy USDA NRCS

REAP is set to expire on June 30, 2023, and must be reauthorized if it is to continue into the future, with no changes in the funding formula. REAP is a good investment. REAP provides jobs, encourages tourism, protects historical and cultural resources, provides recreation opportunities and protects Iowa's soil and water.

## Natural Resources & Outdoor Recreation Trust Fund

In 2010, 63 percent of Iowa voters gave overwhelming support to a constitutional amendment that would allow increased investment in Iowa's parks, recreation and clean water. Article VII Section 10 of the Iowa Constitution created a Natural Resources & Outdoor Recreation Trust Fund (Trust) that is to be supported by a sales tax of 3/8 of one cent. This trust fund is to be used "for the purposes of protecting and enhancing water quality and natural areas in this State including parks, trails, and fish and wildlife habitat, and conserving agricultural soils in this State."

By statute, 20 percent of the funds will be allocated to soil conservation and water protection, 14 percent of the funds will be for watershed protection, and 13 percent of the funds will be for the REAP program.<sup>19</sup>

<sup>19</sup> See Iowa Code Chapter 461 for more details.

All that is needed is for the sales tax to be approved, with no changes in the funding formula.

### Consumers can play a big role

The foods you purchase determine what farming techniques are used to raise the food. If you want to support sustainable agriculture, you can do that by buying locally grown foods.

You can support small family farms near you by purchasing at farmers markets, roadside vegetable and fruit stands and self-pick farms; buying locally marketed foods; and participating in community-supported agriculture programs.

Additionally you can raise your own food, in backyard gardens, in patio pots, or in neighborhood food plots (community gardens).

Eating locally grown foods is a healthy and environmentally friendly way to eat. The advantages of buying locally grown foods include:

- Fresher foods. The closer you can get your foods from the garden or the barnyard, the fresher the food. When foods are picked closer to the time they are purchased and eaten, they can be picked when they are riper.
- A shorter travel distance to the markets and to your home. Significant greenhouse gas emissions are emitted when food is shipped long distances.
- Reduced food waste. Foods are destroyed when they are exposed to temperature extremes and changes in humidity. Fresh fruits and vegetables can be bruised during transportation, warehousing, and distribution cycle, which leads to food waste.
- Local foods boost the local economy. Buying locally supports local jobs, puts money in the pockets of local farmers, and even attracts tourists.
- Increased local soil health. Locally grown fruits and vegetables can be grown in rotation with other crops, which improves soil fertility. Farmers who use organic methods do not use pesticides and artificial fertilizers, thus protecting air quality and water quality.



Photo courtesy USDA NRCS, Stephen Kirkpatrick

Further, by purchasing foods from a local farmer, you have an opportunity to get to know the farmer. That increases the sense of community which makes our state more livable.

Iowa grows very little of the food its residents eat, particularly vegetables and fruits. Iowa has great potential to expand local foods.<sup>20</sup> By supporting local farmers, even more of the fruits, vegetables, meats, and animal products can be produced in Iowa.

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<sup>20</sup> Dave Swenson, Selected Measures of the Economic Values of Increased Fruit and Vegetable Production and Consumption in the Upper Midwest, Leopold Center, Iowa State University, March, 2010

Your food choices can improve water quality, air quality, soil health, carbon emissions, the local economy, and even your own health. You vote three times a day when you choose the foods you eat. So cast the vote by eating locally grown foods.

While Iowa consumers can and should vote with their dollars for the kind of farms and food production systems they want, they must also vote in local, state, and national elections and referendums. If we are depending on voting only with our dollars, those with many dollars will determine the kind of food system those with few dollars will have to tolerate and depend on their food—regardless of their preferences or their rights to clean water, clean air, and safe, nutritious food. Markets can work for the good of all only when government ensures economically competitive markets, levels the economic playing field, and ensures the basic rights of all.

### A word about eating meat

The Iowa Chapter believes that animals are a key part of sustainable agriculture. Because industrial-scale animal production contributes a large quantity of greenhouse gas emissions, which lead to climate change, some people choose to reduce the amount of meat that they consume as a means to reduce their personal carbon footprint. Options may include Meatless Mondays where only a plant-based diet is consumed on Mondays; eating a vegetarian diet that includes dairy products and eggs but not meat; and vegan diets where no animal products or meats are eaten. Farm animals are an essential component in the regenerative, whole-farm systems that show the greatest promise for mitigating climate change while meeting the food needs of both current and future generations. However, a regenerative agriculture would likely require far fewer farm animals than are in confinement operations today.



A field showing no-till agriculture. Soybeans were planted without plowing the cornstalks into the ground. Photo courtesy Lynn Betts, USDA NRCS

### Representative government – talking to candidates and running for office

Have you ever wondered why the political candidates, legislators, and the governor don't talk about these issues? One reason could be that no one is talking to the candidates and office-holders about these issues. If they do not hear from their constituents and potential voters, they do not know that the voter is concerned about them. "Representative government is a two-way street. Elected representatives need your help to identify problems and solutions. You must communicate your position. Otherwise, they may rely on public opinion polls or the lobbyists of well-financed special interest groups. Take the initiative."<sup>21</sup>

As a voter, you can educate the candidates for elective offices by talking to them or writing letters to them. The process does not stop at the ballot box; you must continue the communication with your elected officials throughout the year. Perhaps most importantly, talk to your friends, neighbors, and relatives about the candidates and the issues. Our opposition isn't afraid to talk about issues and we shouldn't be afraid.

<sup>21</sup> Caryl Terrell, "Keys to Effective Lobbying," Sierra Club

Another reason that the issues you care about are never brought up by elected officials is that people who share your values are not running for office. Consider running for office yourself. There are lots of places where you can make a difference – school board, city council, board of supervisors, county agriculture extension council, drainage district, soil and water conservation district commissioners, and the legislature.

### **County Supervisor**

County supervisors are elected for four-year terms. They run under political parties. Supervisors can have a significant impact on the agricultural areas in their counties.

Supervisors play a role in controlling urban sprawls that threatens to swallow farmland. Supervisors can adopt county-wide zoning, which helps protect farmland. Supervisors must approve or deny economic development grants in the form of tax-increment financing for development projects in the rural areas. For the largest confinements (CAFOs) built in the state which are covered under the Master Matrix, the supervisors are called on to recommend approval or denial of the building permit. Supervisors across the state have been signing onto letters asking for a moratorium on building new or expanding existing CAFOs.

### **County Agriculture Extension Council**

Every Iowa county has an Iowa State University Extension and Outreach Council; Pottawattamie County has two Councils. Members are selected by the public during the general election. They serve four-year terms. Each Council has nine members, with four or five members elected at a time. They take office in January.

The qualification for a candidate to the Council is that a person must be a registered voter in the Council's district. The seats are not affiliated with a political party. It is a volunteer position. The Council has a nominating committee that recruits candidates for the Council. Candidates must obtain 25 signatures in order to be placed on the ballot.<sup>22</sup> You can contact your county extension office if you are interested in running for a seat on the Council.

The Extension and Outreach Councils connect Iowans with Iowa State University research and resources. Educational programming is a combined effort of Iowa State, United States Department of Agriculture, and local citizens. Members of the Council make policy, are responsible for hiring extension staff, are involved with programming decisions, and manage a budget for extension work at the county level. They can also influence and recommend training programs.

The Iowa Code, in Section 176A.9(1) lays out the duties of the extension council as:

The extension council has for its sole purpose the dissemination of information, the giving of instruction and practical demonstrations on subjects relating to agriculture, home economics, and community and economic development, and the encouragement of the application of the information, instruction, and demonstrations to and by all persons in the extension district, and

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<sup>22</sup> See Iowa Code Chapter 176A for more details.



the imparting to the persons of information on those subjects through field demonstrations, publications, or other media.

### **Soil and Water Conservation District Commissioners**

Every Iowa County has a Soil and Water Conservation District which is overseen by a board of commissioners, plus Pottawattamie County has two districts. The five commissioners meet each month.

Any eligible voter can run in the general election to be a commissioner. The positions are non-partisan. Up to two commissioners can be from a given township. Elections are held in even-numbered years. Commissioners serve for four years. The Soil and Water Conservation District Commissioners are not paid for their services, but are reimbursed for expenses.

Soil and Water Conservation Districts are responsible for conducting research into soil erosion and the prevention and control of erosion. The District staff disseminate the information to the farmers and tenants within the district. They can conduct demonstration projects. They have funds to disseminate for projects that reduce soil erosion, protect watersheds, and prevent flooding. Each district is tasked with developing comprehensive plans for the conservation of soil resources.<sup>23</sup>

### **So what is holding us back?**

We need to begin implementing good policies.

As we think about what the future holds, it is clear that more knowledgeable, thoughtful, caring people must be working, tending, and managing Iowa's farms, ensuring that soil health is restored in order to regenerate and sustain the productivity of Iowa agriculture. Restoring the viability of independent family farms will restore and sustain the viability of rural communities. This will require removing barriers to purchasing land, including loans for beginning farmers, educational programs for all farmers, programs that support sustainable farming practices, building markets for crops other than corn and soy. It also will require reconsidering and replacing government programs that force farmers into bigger and bigger operations. Farm programs of the future should ensure that those engaged in full-time farming can make a living from their farms. All of these things can be done by people working together, including working together through government.



Photo by Francis Thicke

It means advocating good policies to decision-makers. And it means electing public officials who share our values and holding those officials accountable.

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<sup>23</sup> See Iowa Code Chapter 161A for more details.

## Policy recommendations

The following policies would improve Iowa's soils so that they remain fertile for future generations of Iowa farmers.

### State-wide policy initiatives

1. Increasing funding for the Leopold Center for Sustainable Agriculture, at Iowa State University, so it can carry out its responsibilities in researching sustainable agriculture practices, soil health, improved water quality, and allowing farmers who engage in sustainable agriculture to make a profit.
2. Establishing a healthy soils advisor at the Iowa Department of Agriculture and Land Stewardship. The advisor and his or her staff would make policy decisions on improving Iowa's soils. Additionally the advisor would educate farmers and landowners on techniques that would improve and maintain Iowa's soils.
3. Developing an Agriculture Climate Adaptation Plan. The plan would serve as a guide to dealing with the adverse effects of climate change, avoiding and mitigating climate change, and benefiting from strategies such as carbon sinking.
4. Incenting farmers to develop water quality plans that will help Iowa make real progress on reducing the nitrogen and phosphorus in Iowa's rivers, streams, and lakes.
5. Encouraging a review and the subsequent revision of state laws that are barriers to the expansion of sustainable farming practices.
6. Initiating anti-trust actions against the largest companies and other actions to make the markets more competitive. Iowa's attorney general can initiate the anti-trust actions.
7. Establishing a moratorium on new CAFOs and expansion of existing CAFOs.
8. Reauthorizing Resource Enhancement and Protection (REAP), beyond 2023, fully funding REAP At \$20 Million, and retaining the funding formulas as they are.
9. Implementing the Natural Resources & Outdoor Recreation Trust Fund – the three-eighth cent sales tax – which will fund conserving agricultural soils and enhancing water quality, with no changes in the funding formula.
10. Developing maps of each farm which indicate areas that should be idled plus tools to educate the landowners.
11. Requiring buffers along every stream.
12. Requiring water quality plans for each farm.
13. Providing adequate funding for projects to improve water quality in Iowa. Iowa has begun investing in practices that improve the levels of nutrients entering our water bodies, but the levels of investment are not nearly large enough to solve the problem. The projects that would be funded include installing stream buffers, bioreactors, and saturated buffers; planting cover crops; and installing grassed waterways and prairie strips.
14. Establishing numerical standards for nutrients for Iowa's rivers, streams, and lakes, including a reasonable date for each water body to meet the standards.



Photo courtesy USDA NRCS,  
Stephen Kirkpatrick

15. Regularly monitoring each of the major watersheds and lakes for nutrients throughout the year. Currently 88 percent of the land in Iowa drains into a location with water quality sensors<sup>24</sup>; this needs to reach 100 percent.
16. Supporting programs that assist in building small, community-scale processing plants for fruits and vegetables.
17. Providing access to slaughterhouses for small-scale farmers who sustainably raise animals.
18. Creating local farmer-seller cooperatives so groups of farmers can collectively move their products to market, including storage, processing, transportation, and marketing services.
19. Creating local farmers markets where locally grown, sustainable products can be sold and purchased.
20. Providing preferences for local, sustainable foods when government institutions, such as schools and hospitals, purchase foods.

### Helpful federal policies

1. Creating a federal agency to deal with climate change. The duties of the agency would include advocating for policies for reducing greenhouse gas emissions, adapting to climate change, mitigating the effects of climate change, and educating the public.
2. Encouraging a review and the subsequent revision of state and federal laws that are barriers to the expansion of sustainable farming practices.
3. Improving the federal farm bill to support and encourage sustainable farming practices.
4. Supporting fair price supports, including a higher price floor.
5. Building farmer-owned strategic grain reserves.
6. Developing programs to provide improved and non-discriminatory access to credit that can be used to farm sustainably.
7. Initiating anti-trust actions against the largest companies and other actions to make the markets more competitive. Currently many of the markets are controlled by a few companies, including seed, fertilizer, and livestock processing. The net result is that costs for inputs are high while the prices paid to farmers remain low. It is time to bring the market back into the marketplace.
8. Breaking the vertical integration in the farming industry, where one company can own all of the steps in producing a food product, such as owning the animals, owning the feed mills, and owning the slaughterhouses.
9. Developing a program to pay farmers and landowners for addressing climate change on their land.
10. Funding the Conservation Reserve Program to adequately compensate farmers who are idling their land.
11. Modifying the federal crop insurance program so that farmers using conservation practices are rewarded. Ultimately, the goal is to reduce the need for crop insurance.
12. Amending the Clean Water Act to effectively regulate CAFOs.

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<sup>24</sup> “Summary of Progress of the Iowa Nutrient Reduction Strategy, 2017-18 Reporting Period”, Iowa Department of Agriculture and Land Stewardship, Iowa Department of Natural Resources, and Iowa State University College of Agriculture and Life Sciences

## Conclusion

Soil health is the capacity of soil to sustain plants, hold water, provide nutrients to the plants, and maintain soil microbes. In measuring soil health, some of the considerations are depth of topsoil, water infiltration, organic carbon content, nutrient content, and biological diversity of the soil microbes.

With the loss of Iowa's topsoil on farms across the state, Iowa farmers are reaching a point where they must restore soil health if they expect to continue to produce crops. All things are pointing to major changes in the crops that are raised and how they are raised.

Iowa has 30.6 million acres of land that is being farmed, 85.5 percent of the landmass.<sup>25</sup> Fifty-five percent of the farmland is leased; the rest of it is operator-controlled.<sup>26</sup> The average farm size is 355 acres.<sup>27</sup> Sixty percent of the farmland is owned by people over age 65.<sup>28</sup> That means that much of Iowa's farmland will be transferred to younger owners over the next 10 to 20 years. That also opens the door to transitioning to new farm policies and farming techniques.

The clock is ticking, but it is not too late to work on enhancing soil health.

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<sup>25</sup> Deb Kozel, "Livestock Inventory Historical Trends", Legislative Services Agency, November 4, 2019, page 5

<sup>26</sup> Thomas Friestad, "Iowa by the numbers – farmland cash rental rates", *The Gazette Iowa Ideas*, August 25, 2019

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