FOOD, LAND AND WATER: MOVING FORWARD

Food · Land · & Water
Toward a Sustainable Wisconsin

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Fellow Citizens:

Over the past two years, the *Wisconsin Food, Land and Water Project* has brought Wisconsin civic leaders together for a serious, in-depth discussion about the future of Wisconsin's food, land and water. There was much to talk about. The discussion was sobering, and even disturbing at times; but it was also stimulating and hopeful.

Wisconsin has been a state for just 169 years – the equivalent of just two human lifetimes. In that short time, our population has grown from 300,000 to nearly 6 million (and counting). Our food needs have grown dramatically, and our natural environment has been radically transformed. More changes are on the way, and the pace is accelerating.

Food, land, and water are inseparable. Wisconsin agriculture is the state's largest land user, and it is profoundly intertwined with our natural environment. Our dairy and food processing industries are pillars of our state economy, but their supply chains rest on a vulnerable natural resource foundation. Every one of us depends, in thousands of ways, on our precious land and water resources; but we also affect those resources in powerful, and potentially destructive, ways. Now, more than ever, we need to pay attention and plan ahead. We need to think clearly and work cooperatively, if Wisconsin is to thrive.

We invited Wisconsin stakeholders of all kinds to look forward *together* – to take a strategic look at Wisconsin's food, land, and water resources, and the human demands that will affect them in the decades ahead. It was a chance for our civil society to look beyond the demands and divisions of the moment, and think about our shared resources in a more systematic, nonpartisan, and collaborative way.

We asked leaders from agriculture, business, government, academic institutions, and civic and environmental organizations to sit together at the same table, and they did. We asked them to talk candidly but respectfully about important but often divisive issues, and they did. We asked them to listen to each other, and they did. We asked them to find common ground, and they did. We asked them to envision a more sustainable future, and they did. To an impressive degree, they even charted a practical, step-by-step path for getting there.

These public-spirited citizens (we might almost say patriots) have created something special, and we thank them for it. They have provided a fresh new vision that is worthy of this great state. Equally important, they have shown that we *can* overcome narrow divisions, reach across traditional dividing lines, and work together for the common good. But now, the real work begins. We hope that through your active partnership the goals laid out here can be achieved. Future generations will thank you for your effort.

On, Wisconsin!

Jim VandenBrook, Executive Director
Wisconsin Land and Water Conservation Association

ACKNOWLEDGMENTS

WI Land+Water thanks all of the workgroup members for their time, vision, and outstanding collaborative work throughout this *Food, Land and Water* project. The workgroup discussions were not without disagreements and tension at times, but they remained civil, productive, and forward-looking.

The workgroup co-chairs deserve special thanks for helping to guide the workgroup process, and for reviewing agendas, minutes, procedures, and draft reports throughout the process. The workgroup facilitators kept participants engaged, and kept the meetings moving.

The *Food, Land and Water Project* steering committee provided high level (and high quality) project leadership and guidance. The steering committee provided wise, knowledgeable, and helpful counsel, without being intrusive. We thank the steering committee members for their generous service, and for lending their support to this project.

Steering Committee Co-Chairs:

Pat Leavenworth – Retired NRCS
Tom Lyon – Retired CEO, Cooperative Resources International (CRI); past president, UW Board of Regents

Steering Committee Members:

Bill Berry – American Farmland Trust Wisconsin
Ron Brooks – Dairy and Grain Farmer
Kenn Buelow – Dairy Farmer
Mike Carlson – Gathering Waters
Mark Cupp – Lower Wisconsin Riverway Board
Andy Diercks – Potato Farmer, DATCP Board Member
Scott Froehlke – Wisconsin Institute for Public Policy and Service
Bill Hafs – New Water
Jim Hebbe – Hebbe Farms
John Holevoet – Dairy Business Association
Angela James – AAJ Legal LLC
Paul Kent – Stafford Rosenbaum LLP
Matt Krueger – Wisconsin River Alliance
Dick Lamers – Tainter Menomin Lake Improvement Association
Jim Matson – Retired DATCP
Karen Nenahlo – Milwaukee Metropolitan Sewerage District
Clay Norrbom – Juhl Renewable Assets Inc.
Randy Poelma – HoChunk Nation
Jessica Schultz – Fox-Wolf Watershed Alliance
John Umhoefer – Wisconsin Cheese Makers Association
Jim VandenBrook – Wisconsin Land+Water
Maria Woldt – Dairy Business Association
Paul Zimmerman – Wisconsin Farm Bureau

Workgroup Committee Members:

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Groundwater Quantity, *page 55*
Working Lands, *page 71*

Many thanks also to the staff and county members of WI Land+Water who performed the vital tasks of note taking and recording. The Wisconsin Institute for Public Policy and Service (UW Marathon) was especially helpful in the early stages of the project, and provided continuing assistance to the Groundwater Quantity Workgroup. Special thanks to Kate Brunner, who handled meeting logistics, document handling, and general project coordination for WI Land+Water. Lastly, and with great appreciation, WI Land+Water is indebted to Jim Matson for his help envisioning this project, his background research on all the topics, and his prodigious writing and editing skills. The project would not have happened without him.

SUMMARY OF THE FOOD, LAND AND WATER PROJECT

OVERVIEW

Over the past two years, the *Wisconsin Food, Land and Water Project* has brought Wisconsin civic leaders together for a serious, in-depth discussion about the future of Wisconsin's food, land, and water. This was a chance for stakeholders of all kinds to come together, look beyond the present moment, see the big picture, and think about our shared resources in a more systematic and collaborative way. The result is a collective call to action to address the conservation challenges and possible solutions developed by workgroups on four critical topics related to our food system and environment:

- Surface Water Quality
- Groundwater Quality
- Groundwater Quantity (Central Sands)
- The Future of Wisconsin's Working Lands

The workgroups involved a wide range of stakeholders, including representatives from agriculture, business, local communities, civic and environmental groups, government, and academia. Federal and state government representatives participated as advisors.

Each workgroup met four times. The discussion was lively, but respectful. In the end, the workgroups reached a surprising degree of consensus, and developed some very impressive recommendations. The workgroup recommendations represent the general consensus of each workgroup. While not every workgroup participant agreed with every recommendation, fundamental disagreements were rare.

Workgroup recommendations are briefly summarized below. Complete workgroup reports, including key issues, goals and strategies, are provided in Chapters A through D. We think the reports make for compelling reading, and provide a strong foundation for collaborative action. We hope that you will agree.

SURFACE WATER QUALITY WORKGROUP

The Surface Water Quality Workgroup focused on one of Wisconsin's most critical water quality problems – namely, phosphorus pollution from farms. This is a problem that highlights the powerful, and often troublesome, connections between food, land, and water.

Phosphorus (P) is one of the most widespread pollutants of Wisconsin lakes and streams. High P concentrations play a decisive role in algae blooms, lake eutrophication, and "dead zones" like the one in Green Bay. Algae blooms now degrade hundreds of Wisconsin water bodies, including drinking water sources such as Lake Winnebago and Lake Michigan. In some cases, algae blooms can be toxic to people and pets. Wisconsin has set watershed cleanup targets (but no deadlines), but has a long way to go to meet those targets.

Farm runoff is the largest statewide source of P loading to surface waters (although it is not the only source). P is an important crop nutrient. Farmers apply P to crop fields, in the form of fertilizer and manure, to ensure abundant crop yields. But this "good" crop nutrient becomes a "bad" water pollutant when it runs off of farm fields and into surface water. Farm runoff is a complex problem, and solutions can be costly. Not surprisingly, there are differing views about who should pay. Current funding for conservation practices falls far short of statewide conservation compliance needs. Wisconsin has thus far made limited headway in reducing P runoff from farms; and, in some ways, we are going backwards.

Goals

The workgroup came to consensus on the following goals:

1. Reduce statewide farm P runoff by at least 30% by 2035 (reductions may vary between watersheds), and make steady interim progress toward that goal.
2. Meet all watershed Total Maximum Daily Load (TMDL) targets (combined P loading from farm *and nonfarm* sources) within 20 years, or within 20 years of TMDL approval, whichever date is later, and make steady interim progress toward those targets.
3. Meet P concentration standards for P-impaired waters, so as to remove 90% of all P-impaired waters from the Wisconsin impaired waters list by 2050.

The Workgroup believes that, by achieving these goals, we can dramatically improve water quality in Wisconsin's lakes, rivers, and streams.

Objectives and Strategies

In order to achieve the above goals, the workgroup proposes the following objectives:

1. Meet current state agricultural performance standards on all farms in P-impaired watersheds by 2027, and on all Wisconsin farms by 2035.
2. Design and implement clear strategies to meet TMDL targets in P-impaired watersheds.
3. Create strong farm conservation incentives, and provide enough resources to get the job done.
4. Address acute local manure and bio-solids management challenges.
5. Improve data collection and monitoring.
6. Work together as a community.

The Workgroup Report spells out specific strategies for achieving these objectives (see full report in Chapter A). Success will require a coordinated statewide effort, and strong public and farm support.

GROUNDWATER QUALITY WORKGROUP

Two-thirds of Wisconsin residents get their drinking water from groundwater sources. But in many parts of the state, groundwater has been contaminated – often as a result of common agricultural practices. Key contaminants include nitrates and pathogens. The Groundwater Quality Workgroup focused on these critical problems.

Nitrate contamination is Wisconsin's most pervasive groundwater pollution problem. Nitrate comes from many sources, but nitrogen-rich farm fields are the primary source. Nitrate contamination is a significant public health concern, and a costly problem for private well owners and local communities. In some heavily farmed areas, 20-30% of private wells exceed state standards for nitrate. Heavy applications of nitrogen fertilizer and manure increase nitrate contamination risks.

Pathogens are microorganisms, such as bacteria and viruses, which can contaminate drinking water and cause water-borne disease. Pathogen contamination from agriculture appears to be growing, although it is less widespread than nitrate contamination. Pathogen contamination can occur when manure is applied to fields with shallow soils and fissured karst bedrock (such conditions exist in parts of Wisconsin, such as Kewaunee County). In those areas, there is a risk of rapid, unfiltered manure runoff to groundwater. Excessive or inappropriate manure applications can increase pathogen contamination risks.

Goals

The Groundwater Quality Workgroup came to consensus on the following goals:

1. Ensure safe drinking water for all Wisconsin residents.
2. Reduce nitrate and pathogen contamination of groundwater.
3. Maintain compliance with state groundwater standards where those standards are currently being met, and accelerate efforts to restore compliance where the standards are not being met.
4. Keep Wisconsin agriculture and rural communities vibrant and economically sustainable, while achieving our groundwater quality goals.

Objectives and Strategies

In order to achieve these goals, the workgroup proposes the following objectives:

1. Increase groundwater monitoring and research.
2. Meet current state nutrient management standards on all Wisconsin farms, but especially in key areas of concern.
3. Address acute regional nitrate contamination problems.
4. Address acute regional pathogen contamination problems.
5. Expand assistance to well owners affected by groundwater contamination.
6. Understand the connection between land use practices and groundwater quality.
7. Find the will and resources to get the job done.

The Workgroup Report spells out specific strategies for achieving these objectives (see full report in Chapter B). Success will require a coordinated statewide effort, and strong public and farm support.

GROUNDWATER QUANTITY WORKGROUP (CENTRAL SANDS)

The Groundwater Quantity Workgroup focused on the pumping of groundwater for irrigated agriculture in Wisconsin's Central Sands. Irrigation has allowed very high agricultural production, and has boosted the whole Central Sands economy. But it is also affecting the region's groundwater and surface water resources.

There are now about 3,000 high capacity wells in the Central Sands, compared to just 100 in 1950, and pumping demand continues to grow. Most of the pumping demand is for irrigated agriculture; but municipal and industrial wells, where present, also have an important impact. Conflicts over pumping rights and surface water impacts are increasing, and have sparked litigation and high profile legislative battles. Conflicts may grow as the Central Sands population and economy expand, and as Central Sands agriculture continues to intensify.

Groundwater pumping is not depleting the overall supply of groundwater in the Central Sands. But it *is* affecting groundwater levels and connected lake and stream levels – particularly on a seasonal basis. Reduced surface water levels can affect property owners, recreational use, navigation, and biological processes including spawning in trout streams.

Goals

The Groundwater Quantity Workgroup came to consensus on the following goals:

1. Ensure that "public rights" in Central Sands waters of the state, including, but not limited to reasonable base stream flows and lake levels, are not impaired by groundwater pumping.
2. Accommodate, to the extent feasible, the reasonable use of Central Sands groundwater by agriculture, industry, communities, and other users – consistent with the protection of "public rights" in waters of the state.
3. Ensure reasonably fair and reliable access to groundwater among competing users, both now and in the future.
4. Provide reasonable continuity of access to existing groundwater users, and reasonable opportunity for access to new users.
5. Encourage water conservation by all, for the benefit of all.
6. Act on the basis of sound information.

Objectives and Strategies

To help achieve the above goals, the Groundwater Quantity Workgroup proposes the following objectives:

1. Continue to expand our current knowledge.
2. Clarify "public rights" in Central Sands waters of the state.
3. Support voluntary cooperative efforts and appropriate public mechanisms to ensure that "public rights" in Central Sands waters of the state are not impaired by groundwater pumping.
4. Improve education and communications.

The Workgroup Report spells out specific strategies for achieving these objectives (see full report in Chapter C).

WORKING LANDS WORKGROUP

Wisconsin, one of the top food-producing states in the nation, is facing a quiet crisis: We are steadily losing our farmland – the indispensable foundation of our food system. If current trends continue, we could undermine our farm and food economy, our quality of life, and our hopes for a sustainable future.

Wisconsin residents consume roughly 30 million lbs. of food every day. Our population is growing, and we aspire to eat more fresh, locally grown, and sustainably produced food. Wisconsin's dairy and food industry is a central pillar of our state economy, and an important source of jobs. But as we continue to lose farmland, it becomes harder to grow our dairy and food economy, and harder to build a sustainable food system for the future.

Since 1950, Wisconsin has lost 40% of its farmland to other uses, including urban development and reforestation of marginal land. Each year, we lose over 22,000 acres of cropland to urban development alone (in just 35 years, that adds up to an area the size of Dane County). Most of that loss is occurring within commuting distance of urban centers. Commuter areas contain a disproportionate share of the state's best cropland, and are an important source of fresh local food for urban markets.

Soil erosion is also depleting Wisconsin farmland at a rate of over 60 million tons a year, contributing to the pollution of Wisconsin lakes and streams. Wisconsin soil erosion has *increased* steadily over the last 25 years, reversing an earlier downward trend.

Wisconsin has one of the most comprehensive FP programs in the nation, and program participation has been relatively stable. But FP zoning and agreements cover only about 1/3 of Wisconsin farmland, and Wisconsin continues to see a steady *overall* decline in farm numbers and farmland acreage. There are various underlying reasons identified in the Workgroup Report.

Farmland cannot be preserved for future generations if farming is not profitable and if future generations lack incentives to enter farming. In recent decades, farmers have faced serious challenges:

- Intense national and global competition.
- Increased market volatility and risk.
- Steady loss of farms (especially medium-size family farms).
- Growing concentration of farm ownership. In 2007, according to USDA, just 13% of Wisconsin farms accounted for 76% of farm product sales and 43% of all Wisconsin farmland. Just 3% of Wisconsin dairy farms now produce roughly 40% of our milk.
- Growing concentration of economic power in input and commodity markets, putting farmers at an economic disadvantage.
- Intense market pressure to squeeze more production out of every acre.
- Weakened rural communities and infrastructure.
- More absentee and speculative ownership of farmland (absentee owners now control about 1/3 of Wisconsin farmland).
- Land shortages, and high land acquisition costs.
- Aging farm owners (the average Wisconsin farmer is nearly 60 years old), and a younger generation that is leaving the land.
- Difficulty in attracting young talent.

Goal and Enabling Conditions

The Working Lands Workgroup identified an overall goal, *to maintain economically and environmentally resilient working landscapes.* Success in achieving this goal will depend, according to the workgroup, on the following *enabling conditions:*

- Public understanding.
- Compact and livable urban communities (to prevent wasteful "sprawl" that destroys farmland).
- Strong rural communities and infrastructure.
- A strong agricultural economy.
- Successful and diverse family farms that have roots in the land.

Objectives and Strategies

The Working Lands Workgroup came to consensus on the following strategic objectives, as part of a broad civic effort to achieve the above goal and enabling conditions:

- Increase public awareness.
- Support compact, livable urban communities.
- Make use of key farmland preservation tools, including *land conservation easements*.
- Take a regional approach to farmland preservation.
- Support diverse and profitable family farms, and the next generation of farmers.

The Workgroup Report spells out specific strategies for achieving these objectives (see full report in Chapter D).

Please Note: Unless otherwise attributed to another source, research, data, and other information referenced in the individual workgroup reports can be found in the background document prepared for this project, *"Food, Land and Water: Can Wisconsin Find its Way?"* by James Matson. It can be accessed online at this site: http://wisconsinlandwater.org/files/events/Food,_Land_and_Water_(3-28-16)_Finalreduced.pdf

Photos courtesy of Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade, and Consumer Protection; and Wisconsin Land and Water Conservation Association.

This is a revised and condensed version of the original *Food, Land and Water: Moving Forward* report that was published October, 2017.

NEXT STEPS

The Wisconsin Land and Water Conservation Association (WI Land+Water) is the primary organizer of the Wisconsin Food, Land and Water project. WI Land+Water represents county land conservation committees and conservation professionals, and works with a wide array of stakeholders on food, land, and water issues.

WI Land+Water is working with stakeholders towards implementing the vision outlined in this report. But the vision is much larger than any one organization, and ultimately involves all the people of Wisconsin. WI Land+Water hopes that this project will provide an organizing framework and catalyst for action by many different people and organizations, at many different levels, to secure a sustainable food, land and water future for Wisconsin.

Key actors will include farmers, farm organizations, dairy and food businesses, civic and community organizations, trade associations, state and federal agencies, local government entities, academic institutions, state legislators, news media, and ordinary citizens. We are all in this together, whether we like it or not; and we must all do our part.

CHAPTER A

SURFACE WATER QUALITY

MOVING FORWARD

Surface water quality is a big topic. Our work group focused on one of Wisconsin's most critical water quality problems – namely, phosphorus pollution from farms. It is a problem that highlights the powerful, and often troublesome, connections between food, land and water.

Phosphorus is a leading pollutant of Wisconsin surface water, but not the only pollutant. Farms are the leading source of phosphorus discharges to surface water, but by no means the only source. This report outlines a strategy for reducing phosphorus runoff from farms; but we cannot achieve our water quality goals unless we also reduce phosphorus discharges from other major sources, such as municipal sewage and urban storm water runoff.

Nitrogen, like phosphorus, is a major farm-related water pollutant. Nitrogen and phosphorus are both "good" crop nutrients that can become "bad" pollutants when they move from farm fields to surface water. Together, they pose a double-barreled threat to surface water quality – causing algae blooms, "dead zones," and lake eutrophication. This report focuses on phosphorus, rather than nitrogen. However, the actions that we recommend to reduce phosphorus runoff will also help to reduce nitrogen runoff. A separate report, by the Groundwater Quality Workgroup, addresses nitrogen management on farms and nitrate leaching to groundwater.

THE PHOSPHORUS CHALLENGE

Phosphorus (P) is one of the most widespread pollutants of Wisconsin lakes and streams. High P concentrations play a decisive role in algae blooms, lake eutrophication, and "dead zones" like the one in Green Bay. Algae blooms now degrade hundreds of Wisconsin water bodies, including drinking water sources such as Lake Winnebago and Lake Michigan. Hundreds of lakes and streams throughout Wisconsin are classified as "impaired" because of P concentrations in excess of water quality standards.

Figure 1. Split lake: P added to one side triggers algae bloom. Fisheries Board of Canada.

Figure 2. Lake Erie Algae Bloom. Satellite photo: NOAA.

Algae blooms can sometimes be toxic to people and pets. A large toxic algae bloom in Lake Erie caused a complete shutdown of the Toledo, Ohio, municipal water supply in 2014. Like Toledo, many Wisconsin communities such as Milwaukee, Kenosha, Green Bay, Appleton, and Oshkosh get their drinking water from surface waters.

Farm runoff is the largest statewide source of P loading to surface waters. Other sources include urban storm water runoff and regulated discharges from "point sources" such as municipal sewage treatment plants, paper mills, and cheese plants. Contributions from these sources vary between watersheds.

Phosphorus and Farms

Phosphorus is a "good" crop nutrient, essential for plant growth. But it can become a "bad" pollutant when it moves from farm fields to surface water. Phosphorus occurs naturally in the soil; but farmers also add P, in the form of chemical fertilizer or manure, to ensure abundant crop yields. In 2014, imported chemical fertilizer provided nearly 3/4 of the P applied to Wisconsin cropland, while dairy manure provided nearly 1/4 (relative contributions may vary over time, as shown in Chart 1). Much smaller, but locally important amounts of P come from other sources, such as treated sewage (bio-solids) and other livestock and poultry manure.

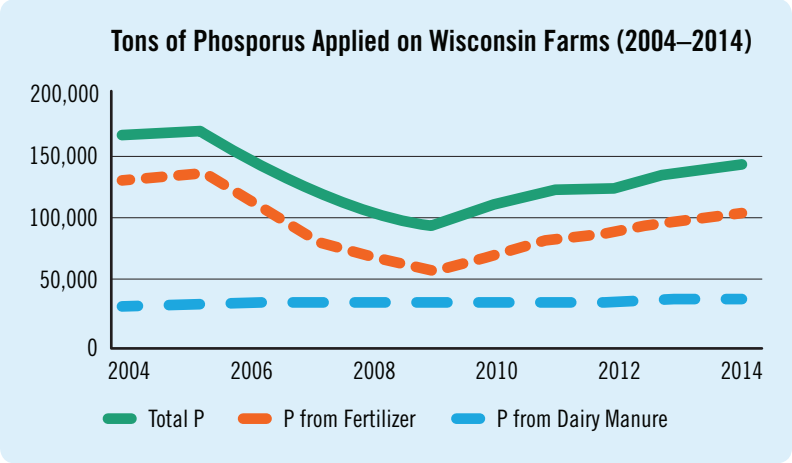


Chart 1: Phosphorus Applied on Wisconsin Farms.
Phosphorus (P) from dairy manure was estimated by multiplying total annual manure production by the average weight of P per lb. of manure (derived from ASABE). Phosphorus fertilizer tonnage was obtained from Wisconsin (DATCP) annual fertilizer tonnage reports (less than 5% non-agricultural tonnage). Much smaller, but locally important amounts of farm-applied P come from other sources, such as treated municipal sewage and other livestock and poultry manure (not shown on this chart).

Wisconsin is producing more milk than ever before, and more milk means more manure. In areas with high livestock concentrations, manure can be a predominant source of P. Overall Wisconsin manure production increased by roughly 7% from 2004 to 2014; but in some concentrated dairy growth areas, manure production has increased far more rapidly. A 1,000 cow dairy herd produces about as much P-equivalent fecal waste as Stevens Point, a city of 25,000 people. In some areas, manure applications may be exceeding cropland carrying capacity.

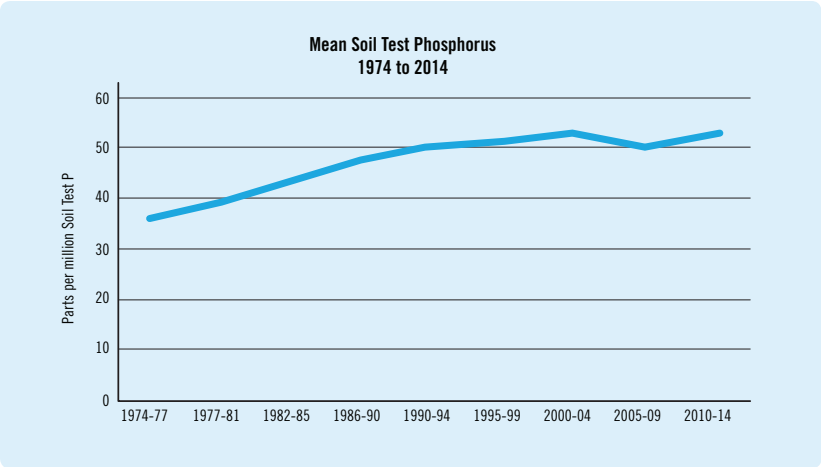


Chart 2. Statewide Soil Phosphorus.
Chart based on UW-Madison Soil Testing Laboratories, *Wisconsin's Historical 5-Year Summary Database.*

How much P, if any, should be applied to crop fields? The answer may vary, depending on existing soil P levels, crop types, and other factors. If P applications routinely exceed crop uptake, soil P concentrations will rise and P runoff risks will grow over time. Mean Wisconsin soil P concentrations have risen by nearly 40% since the 1970s (see Chart 2), and concentrations are still increasing in some areas. Soil conservation practices can help to keep P-rich soil "on the land" and "out of the water." But some runoff is inevitable, even with sound conservation practices. The higher the soil P concentration, the more P is carried to lakes and streams when soil erosion occurs.

Unfortunately, Wisconsin soil erosion rates have also increased in recent decades – reversing an earlier trend (see Chart 3). Most P runoff occurs during spring thaw and heavy rainfall events. Farms with high soil P and poor soil conservation practices pose higher runoff risks. A recent pattern of heavier rainfall events is making things worse. Steep topography increases runoff risks, and heavy row cropping can leave bare soil exposed to erosion and runoff for much of the year. Runoff can be mitigated through conservation practices such as cover crops, conservation tillage, crop rotation, perennial vegetation, and buffer strips.

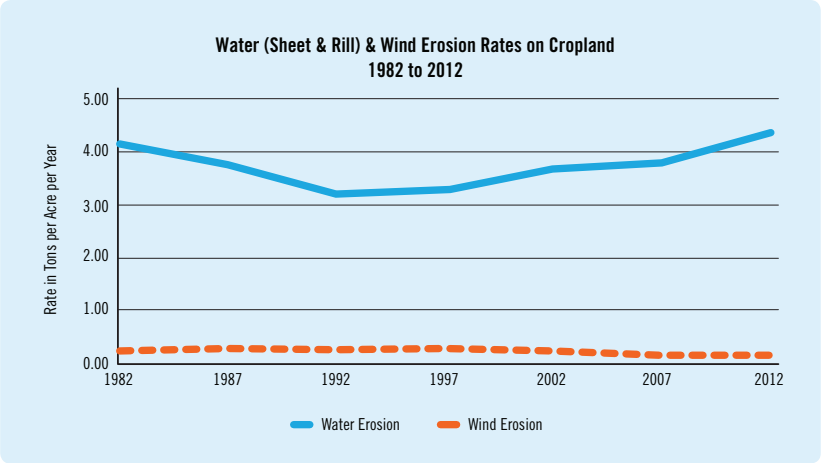


Chart 3. Wisconsin Soil Erosion Rate.
National Resources Inventory (NRI), USDA-NRCS and Iowa State University.

Wisconsin's Nutrient Reduction Strategy

Wisconsin has adopted a *nutrient reduction strategy,* as part of a national effort to reduce nutrient pollution of the Mississippi River and Great Lakes. The effects of Wisconsin pollution runoff do not stop at our state borders. Nitrogen and P discharges from the Upper Midwest are largely responsible for a vast "dead zone" (hypoxia zone) in the Gulf of Mexico, now the size of New Jersey. We also have a "dead zone" of our own, in Green Bay.

Since 1995, Wisconsin has reduced P discharges to the Mississippi River by about 23%, and to Lake Michigan by about 27%. We have done so mainly by reducing P discharges from point sources such as municipal sewage treatment plants, paper mills, and cheese plants. But much of the "low hanging fruit" has now been picked. Future point source reductions will be more difficult and costly.

We have had less success in reducing "nonpoint" P runoff from farms and urban areas. There are many reasons for this. Whereas point source discharges are strictly regulated, control of nonpoint runoff relies heavily on voluntary action. Nonpoint discharges occur in complex ways, over broad land areas, and are harder to monitor than point source discharges that come out of a pipe. In recent years, nonpoint runoff has been aggravated by urban sprawl, changing land cover, heavier storms and storm water discharges, more intensive livestock and crop production, higher P inputs, fewer acres enrolled in farm conservation programs, less crop rotation, and a heavy shift to row crops like corn.

Wisconsin is still only halfway toward meeting its statewide P discharge goals, and most of the remaining reductions must come from farm and urban nonpoint sources. At current rates of progress, Wisconsin is not likely to meet its nonpoint goals any time soon, if ever.

Water Quality Standards

The Wisconsin DNR has established water quality standards, including P standards, for the state's surface waters. DNR standards are subject to U.S. EPA and state legislative oversight. There are different standards for different water bodies, based on the natural characteristics and uses of those water bodies. P standards are normally expressed as numerical concentrations of P per unit volume of water.

DNR evaluates watersheds, and designates "impaired" waters that fail to meet water quality standards. Of the more than 1,000 lakes and streams on Wisconsin's current "impaired waters" list, nearly 40% fail to meet P standards. Although DNR is proposing to remove 10 waters from the current list (because of water quality improvements), it is proposing to *add* another 225 (most of which are impaired for P). Over half of all Wisconsin stream segments evaluated to date fail to meet P standards. Even if P loading to a lake or stream is reduced, it may take time to reduce the total P concentration in that lake or stream. The amount of time will vary, depending on local hydrology.

DNR typically uses a "Total Maximum Daily Load" (TMDL) analysis to address excessive P concentrations in impaired watersheds. A TMDL analysis calculates the maximum P load that a watershed can receive without exceeding P concentration standards for that watershed. Based on its analysis, DNR develops a TMDL implementation plan for the watershed. The plan is designed to reduce P loading, and eventually P concentrations, in the watershed.

Based on watershed TMDL targets, DNR sets P discharge limits for individual point source dischargers, in their discharge permits. The TMDL plan also sets nonpoint source P reduction targets, but there is no DNR permit mechanism to implement those targets. A TMDL plan may promote nonpoint source reductions

in other ways, such as by advocating best management practices.

In many watersheds, it can be more cost-effective to reduce P loading from nonpoint sources (like farm and urban runoff) than from point sources (like sewage plants, paper mills, or cheese plants). A cost-effective P reduction strategy will, *among other things,* require a stronger focus on farm nutrient management and runoff control. That is a key challenge going forward, and the main focus of this report.

Agricultural Performance Standards

The State of Wisconsin has adopted minimum *agricultural performance standards* for all Wisconsin farms. The standards are designed to reduce farm runoff, including P runoff. The standards are mandatory, not voluntary; but implementation relies heavily on voluntary compliance. The obligation to comply is normally contingent on a 70% cost-share offer (there are some important exceptions), and cost-share funding is extremely limited relative to compliance needs (see below).

A farmer may not avoid compliance obligations by refusing a legally adequate cost-share offer, but enforcement actions against unwilling farmers are rare. Cost sharing helps farmers with the initial cost of compliance; but once compliance is achieved, farmers are theoretically required to maintain compliance without further cost sharing. In practice, many farmers abandon conservation practices when cost-share contracts end, when farms change hands, or when farm operations change.

Current state agricultural performance standards include basic minimum requirements for erosion control, manure handling, and tillage setbacks from lakes and streams (5-20 feet, as needed). Farmers must also comply with nutrient management (NM) standards: they must test their soils, determine cropping plans and nutrient needs, and implement an NM plan that considers nutrient inputs from all sources (such as soil P, fertilizer, manure, and treated bio-solids). Farmers may not apply P or other nutrients in excess of UW agronomic recommendations, and must limit P runoff risks as measured by a "P Index." Farmers can use runoff control practices to offset high soil P levels, at least to some extent. But as soil P levels rise, it gets progressively harder to manage runoff risks.

Statewide compliance with current standards would substantially reduce P runoff from farms. But there are major compliance gaps at this time. For example, only about 32% of Wisconsin farms report having NM plans, and it is unclear how well the plans are being implemented. In some ways, we are going backward: many effective conservation practices have been abandoned or overwhelmed in recent years, as livestock production and row cropping have intensified in response to market pressures.

Special Local Challenges

In some P impaired watersheds, compliance with current agricultural performance standards will not be enough to achieve P reduction (TMDL) targets. In those watersheds, supplementary conservation practices may be needed. Supplementary practices might include things like conservation easements, manure storage and treatment, seasonal controls on manure spreading, or more stringent NM standards (to keep "P Index"

values *below* the current statewide average of 2-3, and *well below* the maximum allowed value of 6). These practices can be implemented by carefully designed regulation, or by voluntary farmer cooperation. Farmers may be willing to cooperate, but they may need financial assistance. Additional public funding will be needed, in most cases.

Manure Management Challenges

Manure management can be a special problem in areas with concentrated livestock populations. The need to dispose of large quantities of manure, regardless of local crop nutrient needs and soil P levels, can cause excessive P applications to farm fields. Manure is heavy and costly to haul, so operators may be tempted to apply too much manure near livestock facilities. Manure can also pose direct spill and runoff risks if it is not carefully managed and applied. Although manure is a good organic fertilizer, it is not precisely formulated to match crop nutrient needs and soil P targets. For example, it can be hard to apply the "right" amount of nitrogen without applying "too much" P, or *vice versa.*

Livestock operators who have a high ratio of manure to "spreadable" land, or who lack adequate manure storage capacity, may have a hard time meeting NM standards. Such operators may need to haul manure over longer distances, secure more "spreadable" land, or add manure storage capacity – all at considerable cost. Inadequate manure storage capacity may force operators to apply manure when runoff risks are high, such as in late winter. But an average-sized manure storage facility can cost $350,000 (including $245,000 in public cost share dollars if the facility is cost-shared at 70%).

Even with adequate manure storage, the timing of manure applications can be difficult. Manure is normally applied during the spring (before crops are planted) or late fall (after crops are removed). During these periods, weather and field conditions may be marginal and manure haulers may be working overtime. Diversified crop rotations (which can make some fields available for summer spreading) and new technologies (which can allow for manure applications to growing crops) can help to minimize seasonal application risks. But they, too, come at a cost.

The following dairy and livestock "confinement" operations must meet runoff control and NM standards, *regardless* of cost-sharing:

- *An operation with 1,000 or more "animal units" (about 700 dairy cows).* An operation of this size is considered a point source pollution discharger, and must hold a point source permit (WPDES permit) from DNR.

- *An operation with 500 or more "animal units" (about 350 dairy cows), if covered by a livestock facility siting ordinance.*
  - A county or local government may adopt a siting ordinance, but is not required to do so.
  - An ordinance, *if adopted,* must meet state standards.
  - To date, 26 counties and a substantial number of towns have adopted siting ordinances.
  - Pre-existing livestock operations are "grandfathered," as long as they do not expand their number of "animal units" by more than 20%.

Manure *treatment* is often touted as a solution to acute manure disposal challenges. Manure treatment does not make manure or its P contents "disappear." But various forms of treatment can reduce pathogens and odor, concentrate nutrients, and separate bio-solids and water. Treatment can have significant value for livestock producers: it can reduce manure storage and hauling costs; facilitate field application and nutrient management; and minimize animal health, human health, odor, and nuisance

concerns. Some systems can also produce useful by-products such as bio-fuel, concentrated fertilizer products, and animal bedding.

Manure treatment systems are rare, however, because they are very costly. Treatment systems also present daunting logistical and operational challenges, even for large livestock operators. At today's prices, by-product sales do not pay for the cost of treatment. Ongoing research and development may address some of these concerns. But widespread manure treatment is not yet economically viable without substantial public subsidies or uncompensated private investments. *Shared* manure treatment facilities may be viable in some locations, and may offer greater economies of scale; but they, too, pose many organizational, operational, and financial challenges. There is, as yet, no self-sustaining private market for manure treatment services.

Land spreading of untreated manure is still the cheapest and most widely practiced form of manure management. Land spreading is, in fact, a form of biological "treatment." In most places, the soil can safely assimilate the waste – but *only* if it is not overloaded. Current agricultural performance standards provide basic ground rules; but in some susceptible locations, additional precautions may be needed. For example, DNR has proposed supplementary standards for shallow karst areas in northeastern Wisconsin, to address special risks of groundwater contamination in those areas.

Extreme weather events can sometimes compromise even the best manure management systems, just as they sometimes compromise municipal waste treatment systems. Manure management systems must be designed with a "safety margin" for rare, but reasonably foreseeable, weather events. But in truly extreme cases, even the most carefully designed systems can be compromised through no direct fault of the operator.

Current Farm Conservation Incentives

Farmers may support P runoff control in principle, but they also worry about production, profits, costs, and management flexibility. Costs may include cash outlays and time required to install and maintain conservation practices, as well as lost production opportunities (if conservation practices limit production potential). Cost-share grants may compensate for some, but not necessarily all, of these costs. Cost-share grant funding is extremely limited, relative to statewide conservation needs:

- For 2017, the State of Wisconsin provided $1.7 million in cost-share funding to counties, to cost-share NM plans and annual practices such as conservation tillage and cover crops. That amounts to just $24,000 per county, on average, and falls far short of meeting statewide compliance needs. At current cost-share rates, it would take *$14 million* in statewide cost-share funding *each year,* for 20 years, to cost-share basic NM compliance on farms that do not currently comply. Even *more* cost-share funding would be needed to implement more rigorous NM practices, beyond what is currently required by state standards. Higher per-acre cost-share rates might encourage more voluntary farmer participation, but would require more funding to cover an equivalent number of acres.

- For 2017, the State of Wisconsin provided $7.2 million in bond revenue funding to counties, to cost-share long-term "capital" projects such as manure storage facilities and riparian conservation easements. That is an average of just $100,000 per county – far less than the amount needed to cost-share just one average-sized manure storage facility per county per year.

- State cost-share funding is supplemented by federal, county, and local funding (federal funding for Wisconsin projects exceeds state funding, while county and local funding varies between counties). Still, the total amount of cost-share funding from all sources falls far short of current needs.

- Partnerships with point source P dischargers (such as municipal sewerage districts, paper mills, and cheese plants) may offer a new source of farm cost-share funding in some watersheds. Currently, there are three alternative approaches approved by the Wisconsin DNR and U.S. EPA:
  - A *Watershed Adaptive Management Partnership* is a DNR-approved multi-party arrangement that allows point source dischargers to fund *nonpoint* P reductions in the same watershed, in lieu of achieving (more costly) *point source* reductions, provided that the arrangement meets overall P reduction targets for the watershed. Only a few of these multi-party arrangements have been finalized to date – partly because of their comprehensive nature, and partly because of the uncertainty of achieving water quality goals via nonpoint P reductions.
  - *Phosphorus Trading* involves a DNR-approved contract between a point source P discharger and a nonpoint source P discharger in the same small watershed. Under the contract, the point source discharger pays the nonpoint discharger to implement practices that are reasonably designed to reduce P runoff by a specified amount. The point source discharger may count this estimated P reduction as part of the P reductions mandated under its point source permit. Phosphorus trading is most often used when a point source discharger needs small additional P reductions to meet its permit requirements.
  - A *Multi-Discharger Variance (MDV)* allows a qualifying point source discharger to defer for 10 years the P reductions mandated under its point source permit if it does one of the following:
    - Pays nonpoint dischargers to install practices that are reasonably designed to achieve equivalent *nonpoint* P discharge reductions. The point source discharger may negotiate with nonpoint dischargers directly, or through a 3rd party contractor. DNR must approve contract arrangements and P reduction estimates, and review annual progress reports provided by the point source discharger.
    - Pay $50 per pound of P discharge reductions required under its point source permit, up to a maximum of $640,000 per year, to fund county programs aimed at reducing *nonpoint* P discharges from farms. The county must use at least 65% of the proceeds to cost-share farm conservation practices that are reasonably designed to reduce P runoff. The county may use the remaining proceeds to help cover its staff and implementation costs. The county must apply the funds to impaired watersheds and projects that, in the county's judgment, have the greatest potential for P reduction (consistent with the county's Land and Resource Management plan). No specific proof of actual P runoff reductions is required. Point source dischargers are just now beginning to apply for MDVs, so total contributions to counties are not yet known (statewide contributions are likely to be under $10 million per year, in any case).

Farm cost-share programs have had only limited success to date; but cost-sharing can work where funding is adequate, and expenditures are well focused. Statewide funding is severely limited, relative to compliance needs; and many farmers choose not to participate even when cost-share funding is available. Some farmers also abandon cost-shared practices when cost-share grants end, or when there is a change in farm ownership or operations.

State farmland preservation (FP) income tax credits, totaling about $20 million per year, provide an important incentive for farm conservation compliance *in some areas*. Farmers who claim annual FP credits

must keep their land in agricultural use, and must also meet state agricultural performance standards *regardless of cost-sharing.* But FP credits are available *only* in certified FP zoning districts or "agricultural enterprise areas," which cover just 1/3 of Wisconsin farmland (many P-impaired watersheds are not covered). Even where credits are available, some eligible farmers choose not to claim the credits.

The Role of Counties

Counties are responsible for implementing state agricultural performance standards. Counties determine local conservation needs and priorities, work with farmers to install conservation practices, manage and distribute cost-share grants, negotiate and administer cost-share contracts, certify conservation compliance by farmers claiming FP tax credits, and provide information and technical support (including engineering review of capital projects).

A county can take enforcement action against a farmer who refuses to comply with an agricultural performance standard (after the county makes a legally adequate cost-share offer, if required). But counties rely heavily on voluntary compliance, and value their cooperative working relationships with farmers. Enforcement actions can be difficult and time-consuming, and are pursued only as a last resort.

The State of Wisconsin currently funds about 1/3 of all county conservation staff positions. The remaining 2/3 are funded by the counties themselves, or from other sources. Additional county staff will be needed if we want to accelerate farm conservation and nutrient management efforts.

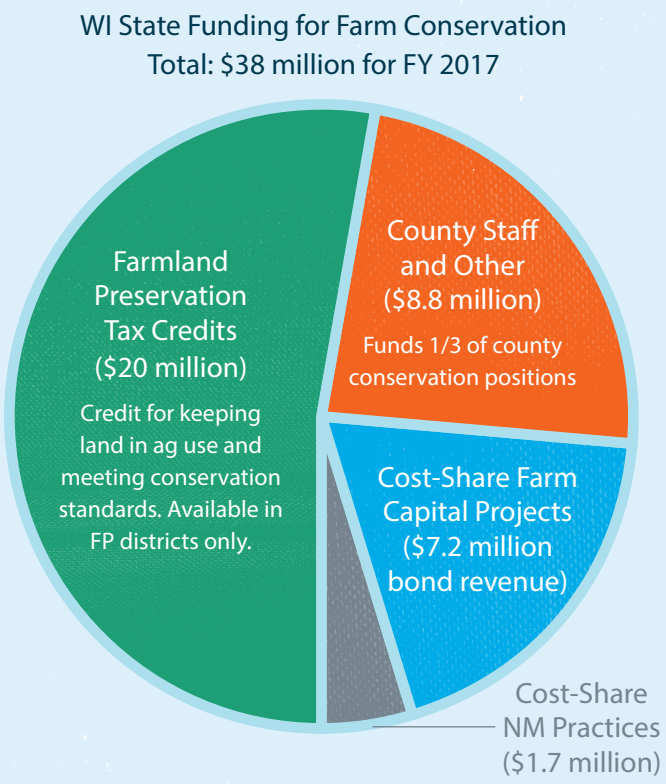


Chart 4. State Funding for Farm Conservation. Per 2017 WI Land and Water Conservation Plan.

WORKGROUP RECOMMENDATIONS

Our workgroup would like to see clear and sustained improvement in Wisconsin surface water quality, particularly in watersheds that are currently impaired by high P concentrations. Real improvement will require substantial reductions in farm P runoff, as part of a cost-effective statewide strategy to reduce P loading from *all* sources.

Goals

We aspire to:

1. Reduce statewide farm P runoff by at least 30% by 2035 (reductions may vary between watersheds), and make *steady interim progress* toward that goal.
2. Meet all watershed TMDL targets (combined P loading from farm *and nonfarm* sources) within 20 years, or within 20 years of TMDL approval, whichever date is later, and make *steady interim progress* toward those targets.
3. Meet P concentration standards for P-impaired waters, so as to remove 90% of all P-impaired waters from the Wisconsin P-impaired waters list by 2050.

We believe that, by achieving these goals, we will meet U.S. *Gulf Hypoxia* and Wisconsin *Nutrient Reduction Framework* targets.

Objectives

In order to achieve the above goals, we propose the following objectives:

1. Meet current state agricultural performance standards on all farms in P-impaired watersheds by 2027, and on all Wisconsin farms by 2035.
2. Design and implement clear strategies to meet TMDL targets in P-impaired watersheds.
3. Create strong farm conservation incentives, and provide enough resources to get the job done.
4. Address acute local manure and bio-solids management challenges.
5. Improve data collection and monitoring.
6. Work together as a community.

Achieving Our Objectives

OBJECTIVE 1: Meet current agricultural performance standards on all farms in P-impaired watersheds by 2027, and on all Wisconsin farms by 2035.

The Challenge:

Statewide compliance with current agricultural performance standards would substantially reduce P and N runoff from farms. However, there are major compliance gaps at this time. Progress will require more resources and a systematic, statewide compliance effort.

Strategies:

- Conduct systematic compliance surveys (state and county) to identify compliance levels, trends, and gaps. Report aggregate findings (not individual farms).
- Focus on compliance in P-impaired watersheds, and especially in local areas with high P runoff risks (see Objective 2).
- Create strong compliance incentives, and provide enough resources to get the job done (see Objective 3).
- Support "producer led" conservation initiatives, including information sharing, field demonstrations, and "pilot" projects to test promising conservation practices.
  - Offer statewide competitive grants for sound "producer led" projects.
  - Coordinate taxpayer-funded projects with counties and UWEX to ensure transparency, accountability and continuity.
- Inform farmers and the public. Use well-targeted information as part of a systematic compliance strategy.
- Identify and address non-monetary barriers to compliance (lack of information, complexity, 3rd party involvement, privacy concerns, management flexibility, etc.).
- Improve coordination between landowners, renters, crop consultants, manure haulers, farm supply outlets, and other members of the farm management "team," to ensure that performance standards are met. Develop model contract language that parties can use.

  Note: *Roughly 1/3 of all Wisconsin farmland is now rented from absentee owners, who may or may not know whether renters are complying with agricultural performance standards. Many farm operators also delegate important tasks to 3rd party contractors, such as crop consultants, manure haulers, and farm input suppliers. These arrangements may complicate conservation compliance accountability.*

- Promote closer communication and cooperation between crop consultants and counties, to address key conservation needs.
- Monitor the performance of crop consultants, fertilizer and bio-solid suppliers, manure haulers, and other 3rd party agents to whom NM tasks are often delegated. Implement random audits and more robust professional certification where appropriate (state and counties).
- Improve follow-up monitoring, to ensure that NM plans and conservation practices are faithfully implemented. Develop audit procedures and conduct random audits, as appropriate (state and counties).
- Review current standards for applying treated municipal sewage and other bio-solids to farmland. Update standards, as necessary, to ensure that they are consistent with state NM standards and water quality goals. Conduct random audits to ensure compliance.
- Increase county staff resources to implement agricultural performance standards (see Objective 3).
- Ensure that professionals responsible for designing, reviewing, approving, and implementing farm NM and conservation practices have the appropriate expertise and credentials.
- Mobilize agriculture and food industry support for improved compliance. Consider supply chain incentives for compliance. Support, and cooperate with, reasonable county actions to identify compliance gaps and achieve compliance.

OBJECTIVE 2: Design and implement clear strategies to achieve TMDL targets in P-impaired watersheds.

The Challenge:

Our P runoff challenge is daunting, and our resources are limited. P runoff control efforts should be focused, to the maximum extent feasible, on P-impaired watersheds and high P runoff risk areas. Counties are responsible for implementing state agricultural performance standards, and must play a lead role in addressing farm P runoff. But to meet TMDL targets, we must also address urban P runoff and point source P discharges. Success will require a well-coordinated federal, state, county, municipal, UW, agricultural, industry, and community effort. We must work together to understand what is happening in our watersheds, both on the land and in the water. We must identify key challenges, set clear priorities, and focus our collective resources for maximum impact. To achieve TMDL targets, we may need to implement supplementary farm conservation practices that go beyond basic agricultural performance standards.

Strategies:

- Focus P management efforts on key P-impaired (HUC 12 size) watersheds.
- With DNR guidance, develop and implement clear watershed-level strategies to meet TMDL targets. Strategies should:
  - Be developed and implemented by key partners, including county and local partners, working together as a team.
  - Address P discharges from all relevant sources, including farm P runoff, urban P runoff, and point source P discharges.
  - Aim to meet TMDL targets in the most cost-effective way.
- Counties must play a lead role in addressing farm P runoff within their jurisdictions, in cooperation with other partners (including farmers). Counties should:
  - Systematically identify land areas, in P-impaired watersheds, which have high soil P and runoff risks.
    - Identify, map, and focus community attention on high-risk areas (not necessarily individual farms).
    - Collect and compile relevant information.
    - Evaluate problem scope, status, and trends.
  - At a minimum, ensure compliance with current agricultural performance standards (see Objective 1).
  - Implement supplementary farm P runoff control standards and practices, if needed to meet TMDL targets. Supplementary standards and practices should be carefully designed to address well-documented local problems that are not adequately addressed by state agricultural performance standards. Supplementary practices may require additional cost-share funding.
  - Coordinate federal, state, local, and private funding (including funding from “multi-discharger variance” partnerships with point source dischargers, where applicable).
  - Focus available resources for maximum impact.
    - Focus on high P runoff risk areas.
    - Identify key goals, strategies, and progress benchmarks.
    - Recognize and fund edge-of-field practices (wetlands, buffers, bioreactors, controlled drainage gates) to augment needed in-field practices.

- Consider cost-effective ways to reduce P-runoff risk.
- Identify funding needs and sources.
- Identify key partners (including farmers), and work with them.
- Develop clear plans and budgets.
- Mobilize public and farm community support.
- Be transparent. Provide clear information, and get community input.
- Help farmers, but expect accountability.
- Monitor performance.
- Measure results, on the land and in the water.
- Report on progress.

OBJECTIVE 3: Create strong farm conservation incentives, and provide enough resources to get the job done.

The Challenge

Farm conservation cost-share programs have had only limited success to date. Funding is severely limited, relative to compliance needs (see above), and many farmers choose not to participate even when cost-share funding is available. Some farmers also abandon cost-shared practices when cost-share grants end, or when there is a change in farm ownership or operations. If we are serious about reducing farm P runoff, we must create stronger conservation incentives and provide enough resources to get the job done.

Strategies

- Increase state funding for control of nonpoint source nutrient runoff, including runoff from farms.
- Increase funding for county staff and technical support to implement farm conservation practices.
- Coordinate federal, state, and local funding for maximum impact.
- Consider stronger statewide compliance incentives. Here are some possible new “carrots” and “sticks” to consider (workgroup member views may vary):
  - Increase cost-share grant funding and rates, to encourage more voluntary compliance (but note that increased rates, *without* increased funding, will *reduce* coverage).
  - Consider more active county enforcement of current agricultural performance standards. Offer help, but expect compliance. Seek voluntary compliance whenever possible, but develop streamlined compliance and enforcement procedures for use as needed. Focus on key compliance priorities.
  - Offer *tax credits,* rather than cost-share grants, to reward NM and conservation compliance (similar to current FP program, but with annual NM and conservation compliance credits available *statewide*). An annual tax credit would reward *continued* compliance.
  - Make eligibility for *current* farm tax breaks (such as the MAC income tax credit for farms) contingent on compliance with agricultural performance standards.
  - Reduce or eliminate current cost-share requirements. Enforce compliance with current agricultural performance standards, regardless of cost-sharing.
- Consider new revenue sources to fund farm conservation practices. Here are some possibilities (workgroup member views may vary):
  - Develop partnerships with point source dischargers (such as municipal sewerage districts) to

fund farm conservation practices, where authorized, as part of a cost-effective strategy to meet TMDL targets.
  - Consider re-purposing current farm tax credits (such as MAC income tax credit) to fund alternative statewide tax credits that reward farm NM and conservation compliance.
  - Consider "water quality fees" on fertilizer sales and livestock permits, to fund nutrient and manure management practices.
  - Consider a general sales tax to support farm conservation practices (Minnesota example).
  - Consider targeted water use fees to support farm conservation practices.

- Increase tangible agricultural and food industry support for farm conservation practices. This might include grants, supply chain financial incentives, public-private cooperative initiatives, information and technical support to farmers, or support for state funding financed by reasonable industry fees.

OBJECTIVE 4: Address acute local manure and bio-solids management challenges.

The Challenge

Livestock are increasingly concentrated in large confinement facilities, in certain parts of the state. In places where livestock are heavily concentrated, manure management can be a serious challenge. Heavy manure applications can contribute to high soil P levels and runoff risks. Comparable issues may arise, on a more limited basis, in connection with the farm application of treated bio-solids from municipal waste treatment facilities.

Strategies

- Identify areas with high or rapidly growing livestock concentrations (or bio-solid applications).

- Carefully monitor soil P levels, P runoff risks, and NM compliance in areas with high or rapidly growing livestock concentrations (or bio-solid applications). Focus information, monitoring, and compliance efforts in those areas.

- Ensure that livestock facilities (and bio-solid distributors) comply with all of the following that apply:
  - Current state agricultural performance standards, including NM standards (see Objective 1).
  - CAFO standards (DNR-permitted facilities with 1,000 or more "animal units").
  - County and local livestock facility siting standards (livestock facilities with 500 or more "animal units").
  - County manure storage facility construction standards.
  - State rules governing manure and bio-solid applications.
  - Valid county and local ordinances governing manure and bio-solid applications.

- Consider county or local livestock facility siting ordinances, as authorized by state law, for new or expanding livestock facilities with 500 or more "animal units" (26 counties and many towns have adopted such ordinances to date).

- Update state NM standards, as appropriate, to address acute manure management challenges in areas that are susceptible to runoff.

- Update current state bio-solid application standards, to minimize nutrient runoff risks and harmonize with state NM standards, as necessary.

- Consider reasonable local regulation of manure and bio-solid applications, consistent with state law, if needed based on clear and reliable evidence.

- Ensure that manure haulers and other agents comply with applicable requirements (see Objective 1), including valid county and local requirements where applicable.
- Consider funding for capital projects, including multi-farm manure treatment or management projects, where justified in the context of a clearly articulated watershed nutrient reduction strategy. Consider costs, benefits, business plans, financing, fairness, competitive impact, logistics, market incentives, and risks. Consider the appropriate role of public vs. private funding, including appropriate "user fees" for livestock operators who benefit.
- Consider steps to minimize risky manure application practices, such as winter spreading in areas susceptible to runoff. Note that excess manure volume and inadequate storage capacity can increase pressure to spread manure during high-risk periods.
- Mobilize agricultural and food industry support for effective manure management. Consider supply chain incentives to encourage sound practices.

OBJECTIVE 5: Improve data collection and monitoring.

The Challenge:

Effective surface water protection depends on good information. We need to understand what is happening on our land and in our water. We have a considerable amount of valuable information now, but we can do better. More systematic data collection, data sharing, and analysis will help us understand current P runoff risks, identify key sources and trends, pursue appropriate management strategies, and measure our progress.

Strategies:

- Systematically monitor surface water quality.
  - Focus on P-impaired watersheds.
  - Monitor P loading and concentrations.
  - Coordinate state, county, and local monitoring.
  - Create a statewide database, and share data.
  - Report key findings and trends.
  - Identify and map areas of high P loading.
- Systematically collect and monitor statewide soil test data:
  - Create a statewide database that includes data from certified private soil test labs and UW labs.
  - Report state and county soil P trends. Identify areas with high soil P.
  - Make aggregate data (not identified by individual farms) generally available.
- Systematically collect and report statewide fertilizer sales data, including total annual N and P tonnage.
  - Continue current annual reports (DATCP), but distribute more widely.
  - Expand reports to include tonnage by county.
  - Report and illustrate trends over time.
  - Make aggregate data (not identified by individual sellers) generally available.
- Systematically monitor and report manure production levels and trends.

- Systematically monitor livestock populations and distribution (state and county). Track dairy, poultry, and other livestock.
  - Develop standard procedures for estimating aggregate manure production and P content.
  - Estimate and report annual manure production and P contributions from manure.
  - Identify and report key state, county, and watershed trends.

- Systematically survey farm conservation compliance (see Objective 1), and report aggregate findings (not individual farms).

- Fund research on P runoff and runoff management options, and report findings.
  - Evaluate the economic and environmental impacts of soil health practices.
  - Develop affordable monitoring systems to complement USGS monitoring systems.
  - Expand applied research on working farms.
  - Provide ways for working farms to test new runoff control ideas. Consider limited waivers of regulatory barriers, as needed, to allow promising "pilot" projects which are conducted with county and UW oversight, which have a good chance of improving runoff control, and which may be useful on a wider scale.

OBJECTIVE 6: Work together as a community.

The Challenge:

We cannot make real progress toward our water goals without a serious commitment by farmers, farm and agribusiness organizations, dairy and food businesses, government, community organizations, and the public at large. This must include an adequate commitment of public and private resources. Farmers, farm and agribusiness organizations, and dairy and food industries can do a lot on their own initiative. But substantial public support will also be needed.

While farms are the leading source of P loading to surface water, they are by no means the only source. We cannot achieve our water quality goals unless we also reduce P loading from other major sources, including point sources (such as municipal sewerage districts) and urban storm water runoff. Success will require progress on many fronts. A strong effort on all fronts will encourage everyone to do their fair share. We must try to move forward in a spirit of problem solving, not finger pointing.

Farmers and the general public are not always well informed about P runoff and its impact on surface water quality. Lack of understanding can lead to apathy, inattention, unfair blame, and poor choices. It can also divide communities and impede constructive action. Better information and understanding can alert us to problems and concerns, reduce conflict, increase cooperation and community support, and promote constructive action.

In order to justify public (and private) investments in farm conservation, it is important to show that available resources are being used in a wise, accountable, efficient, and cost-effective manner; that resource commitments are producing tangible results; and that conservation practices are being faithfully implemented and maintained. Success will require a coordinated effort by many partners, and most importantly by farmers themselves. Counties must play a key role in coordinating and implementing farm conservation efforts.

Strategies:

- Increase farm and community awareness of economic and environmental challenges related to food production, including surface water contamination challenges. Provide reliable information, and support cooperative efforts to address key concerns. Encourage constructive conversations across traditional "fault lines."
- Increase farm and community awareness of key water quality problems, including P loading and concentrations in P-impaired waters. Improve understanding of causes, consequences, costs, and potential remedies.
- Improve P monitoring and accounting systems, and make more information available (see Objectives 1, 2, and 5).
- Provide more information, training, and technical assistance to farm owners, farm operators, and their agents. Identify conservation needs and practical options for farmers.
- Increase transparency, and invite input. Offer clear plans, priorities, budgets, and information.
- Support county, UWEX, and other staff who work to improve conservation practices on farms.
- Redouble agriculture and food industry commitment to sustainable practices:
  - Farmers can take the initiative to improve conservation and NM practices on land that they own or operate. Landowners can ensure that farmers who lease their land are complying with conservation and NM standards.
  - Crop consultants, NM planners, manure haulers, input suppliers, and other 3rd party agents responsible for NM compliance can work with state and county officials to ensure a high level of professionalism and accountability in their industries.
  - Farm and agribusiness groups can take an active role in educating their members, promoting improved P management on farms, supporting active county implementation of agricultural performance standards, and supporting improved funding of farm conservation programs.
  - Dairy and food businesses can actively promote and incentivize "sustainable" supply chains that minimize P runoff and protect surface water quality. Consumers and local communities can reward food businesses that do so.
  - Farmers can organize "producer led" efforts to reduce P runoff, with or without taxpayer-funded grants. Dairy and food businesses can help, as can farm and agribusiness organizations.
  - Farmers, dairy and food businesses, and farm and agribusiness organizations can work with state, county, and local authorities to envision and secure an economically and environmentally sustainable future.
  - Farm lenders can acknowledge farm conservation needs, and ensure that sound conservation practices are incorporated into farm business plans and lending policies.
- Increase public commitment and accountability:
  - Increase public awareness, and build public support. Increase public funding support.
  - Build active partnerships between key federal, state, county, and local agencies, including county conservation departments, public health departments, water utilities, and sewerage districts.
  - Work to develop and maintain a "sustainably produced" brand for Wisconsin agriculture and food products. Make sure that we live up to our brand.

SURFACE WATER QUALITY WORKGROUP MEMBERS

Co-Chairs:

Jim Baumann – Retired, Wisconsin Department of Natural Resources (DNR)
Dick Lamers – Tainter Menomin Lakes Improvement Association
Paul Zimmerman – Wisconsin Farm Bureau

Facilitator:

Pat Murphy – Retired, U.S. Department of Agriculture, Natural Resource Conservation Service

Members:

Greg Baneck – Outagamie County Conservationist
Eric Birschbach – Independent Crop Consultant
Eric Booth – University of Wisconsin (UW), Agronomy, Civil and Environmental Engineering
Kenn Buelow – Dairy Farmer
Kurt Calkins – Columbia County Land and Water Conservation
Amy Callis – Dane County Conservationist
Kevin Connors – Dane County Land & Water Resources Department
Dana Cook – Professional Nutrient Applicators Association of WI
Jim Coors – Courte Oreilles Lakes Association
Judy Derricks – USDA-NRCS
Randy Eide – Menomonie Public Works Department
John Exo – UW-Extension
Rick Georgeson – Petenwell and Castle Rock Stewards
Bill Hafs – New Water (Green Bay Metropolitan Sewerage District)
Jim Hebbe – Hebbe Farms
Steve Jacquart – Milwaukee Metropolitan Sewerage District
Angela James – AAJ Legal LLC
Corinne Johnson – DNR
Matt Krueger – River Alliance of Wisconsin
Scott Laeser – Clean Wisconsin
Mary Anne Lowndes – DNR
Kriss Marion – WI Farmers Union, Lafayette County Land Conservation Committee
Dave Marshall – Underwater Habitat Investigations LLC
Amber Radatz – UW Discovery Farms
Steve Richter – The Nature Conservancy
Rachel Rushman – Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP)
Scott Sturgul – UW Nutrient and Pest Management Center
Dave Taylor – Madison Metropolitan Sewerage District
John Umhoefer – Wisconsin Cheese Makers Association
Darin Von Ruden – Wisconsin Farmers Union
Laura Ward Good – UW Soils Department

CHAPTER
B

GROUNDWATER QUALITY

MOVING FORWARD

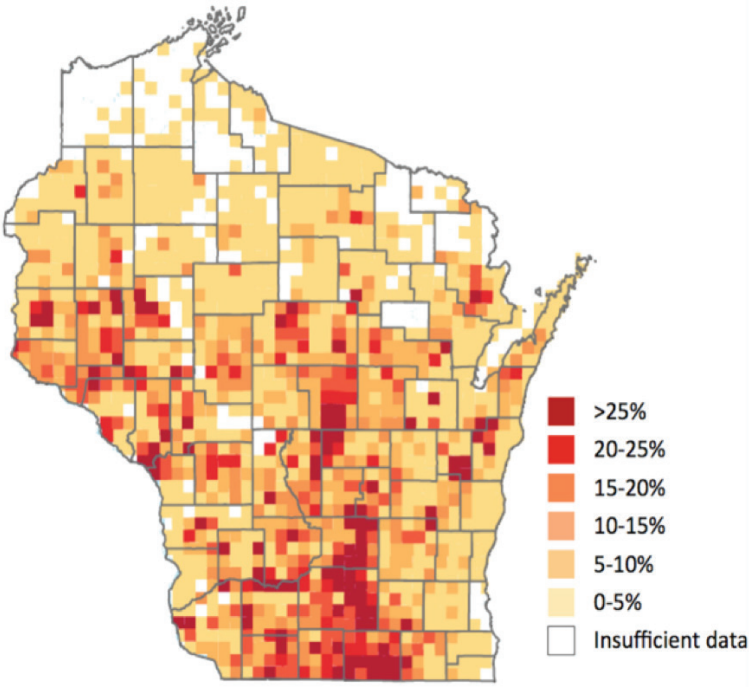
Two-thirds of Wisconsin residents get their drinking water from groundwater sources. But in many parts of the state, groundwater has been contaminated – often as a result of common agricultural practices. Key contaminants include nitrates and pathogens.

THE NITRATE CHALLENGE

Nitrate contamination is Wisconsin's most pervasive groundwater pollution problem. Nitrate comes from many natural and human sources, but nitrogen-rich farm fields are the primary source. Nitrate contamination is a significant public health concern, and a costly problem for private well owners and local communities.

Nitrate contamination exceeds state health standards in at least 9% of Wisconsin's private wells. In some heavily farmed areas, 20-30% of private wells exceed state health standards for nitrate (see Map 1). Heavy applications of nitrogen fertilizer and manure increase nitrate contamination risks.

Nitrate concentrations in excess of the state drinking water standard (10 mg/L) pose a variety of potential health risks. Among other things, nitrate can cause "blue baby syndrome" – a potentially fatal condition that affects infants. Nitrate contamination affects both private and community wells.



Map 1. Nitrate Contamination of Groundwater. Map shows percent of local groundwater samples above state drinking water standard for nitrate (10 mg/L). High concentrations reflect soil, geology, crop, irrigation, and nutrient application patterns.
Map: UW-Stevens Point, Center for Watershed Science and Education.

A third of all Wisconsin families get their drinking water from private wells. Households with contaminated wells face difficult choices. A new well (not guaranteed to eliminate contamination) costs about $7,200. Bottled drinking water costs about $190 per person per year. Water treatment devices cost about $800 (installation) plus $100 per year (operation). A third of all private well owners do not know whether their drinking water is contaminated, because they have never tested for nitrate.

Nitrate contamination is also costly for Wisconsin communities and businesses. In a 2012 survey, 47 Wisconsin communities reported nitrate contamination of community wells in excess of the state health standard, and another 74 communities reported rising contamination. As of 2012, Wisconsin communities had spent over $32 million for new community wells and water treatment processes to address nitrate problems.

Farm Applications of Nitrogen

Much of the nitrate in Wisconsin groundwater comes from nitrogen applied to farm fields. Nitrogen is an essential crop nutrient. Corn and potatoes (important crops in Wisconsin) are especially heavy nitrogen users. Farmers apply nitrogen to their fields to ensure abundant crop yields. In Wisconsin and elsewhere, farmers are applying more nitrogen than ever before. Today, for example, U.S. farmers apply *5 times more nitrogen fertilizer* than they did in 1960. Increased nitrogen applications have boosted U.S. crop yields, but they have also increased nitrate contamination of groundwater.

In 2014, imported chemical fertilizer accounted for nearly 2/3 of all nitrogen applied in Wisconsin, while dairy manure accounted for roughly 1/3 (relative contributions vary over time, as shown in Chart 1). Much smaller, but locally significant amounts of nitrogen came from other sources, such as treated municipal sewage (bio-solids) and manure from other livestock and poultry.

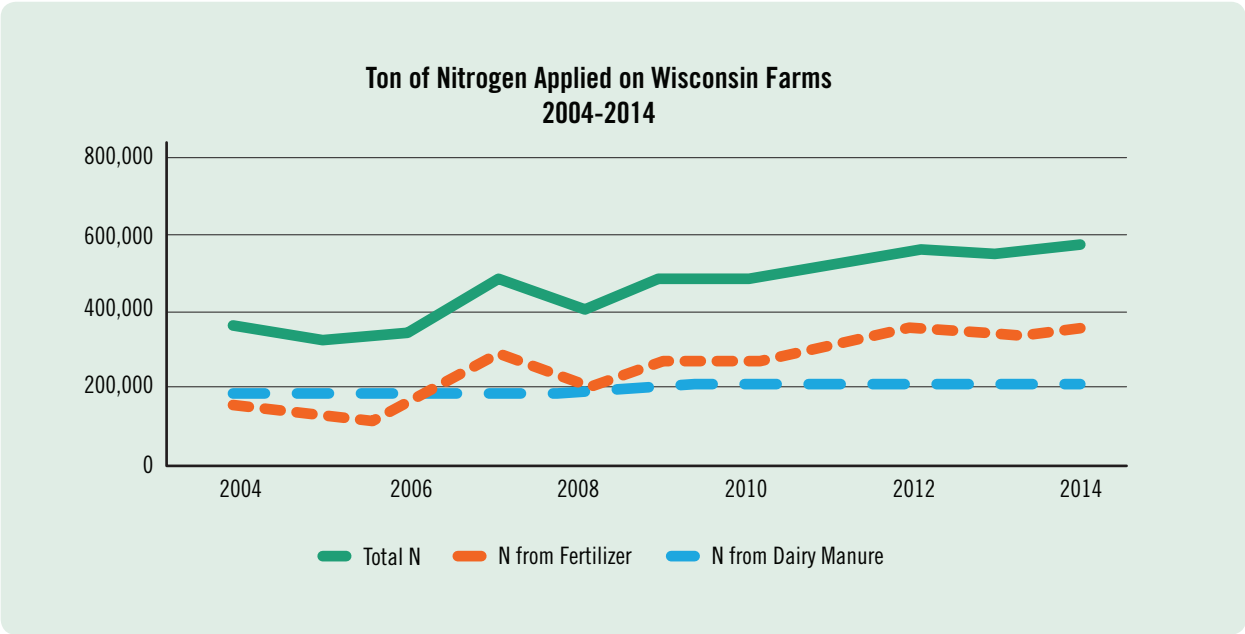


Chart 1. Nitrogen Applications on Wisconsin Farms. Nitrogen from dairy manure was estimated by multiplying total annual manure production by the average weight of N per lb. of manure (derived from ASABE). Nitrogen fertilizer tonnage was obtained from Wisconsin (DATCP) annual fertilizer tonnage reports (less than 5% non-agricultural tonnage). Much smaller, but locally important amounts of farm-applied nitrogen come from other sources, such as treated municipal sewage and other livestock manure (not shown on this chart).

Fertilizer Applications

Nitrogen fertilizer applications vary from year to year, but have trended upward for decades (see Chart 2). Between 2004 and 2014, Wisconsin farmers *doubled* their total applications of nitrogen fertilizer. The increase was fueled by higher crop prices, higher-yielding crop varieties, and a heavy shift to nitrogen-hungry crops like corn (ethanol production and strong exports boosted corn demand).

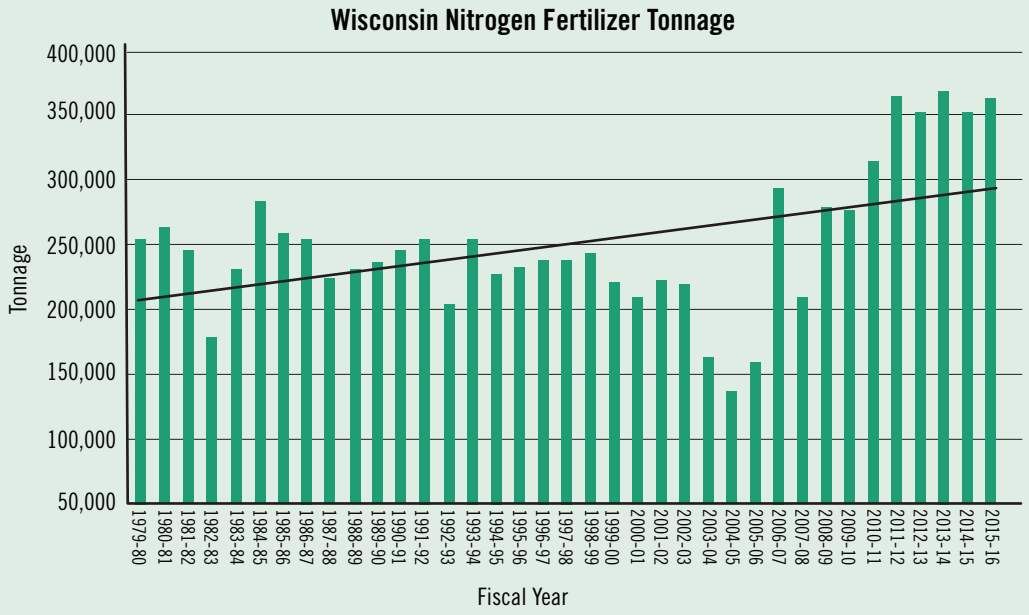


Chart 2. Wisconsin Nitrogen Fertilizer Tonnage (1979-2016). Less than 5% non-agricultural tonnage. Source: WI (DATCP) annual fertilizer tonnage reports.

Manure Applications

Manure applications are more consistent from year to year, because they are linked to dairy production (see Chart 1). But they, too, are on an upward trend. Wisconsin is now producing more milk than ever before (30 billion lbs. last year), and more milk means more manure. A typical dairy cow produces over 2 lbs. of manure (feces and urine, as excreted) for each pound of milk. Overall, Wisconsin dairy cows produced 7% more manure in 2014 than they did in 2004.

Manure production is surging in some local areas, where large dairy confinement facilities are concentrated. The largest 3% of Wisconsin dairy operations now account for 40% of Wisconsin's milk and manure production. A 1,000-cow dairy operation produces about as much fecal waste (total solids, BOD, nitrogen, and phosphorus equivalents) as Stevens Point, a city of 25,000 people.

Manure is a useful alternative to chemical fertilizer. But manure is heavy and expensive to haul, so livestock operators sometimes apply too much manure near livestock facilities. Livestock operators rely on land spreading to dispose of a growing volume of manure; but in some localities, manure production may be outrunning land availability and crop nutrient needs.

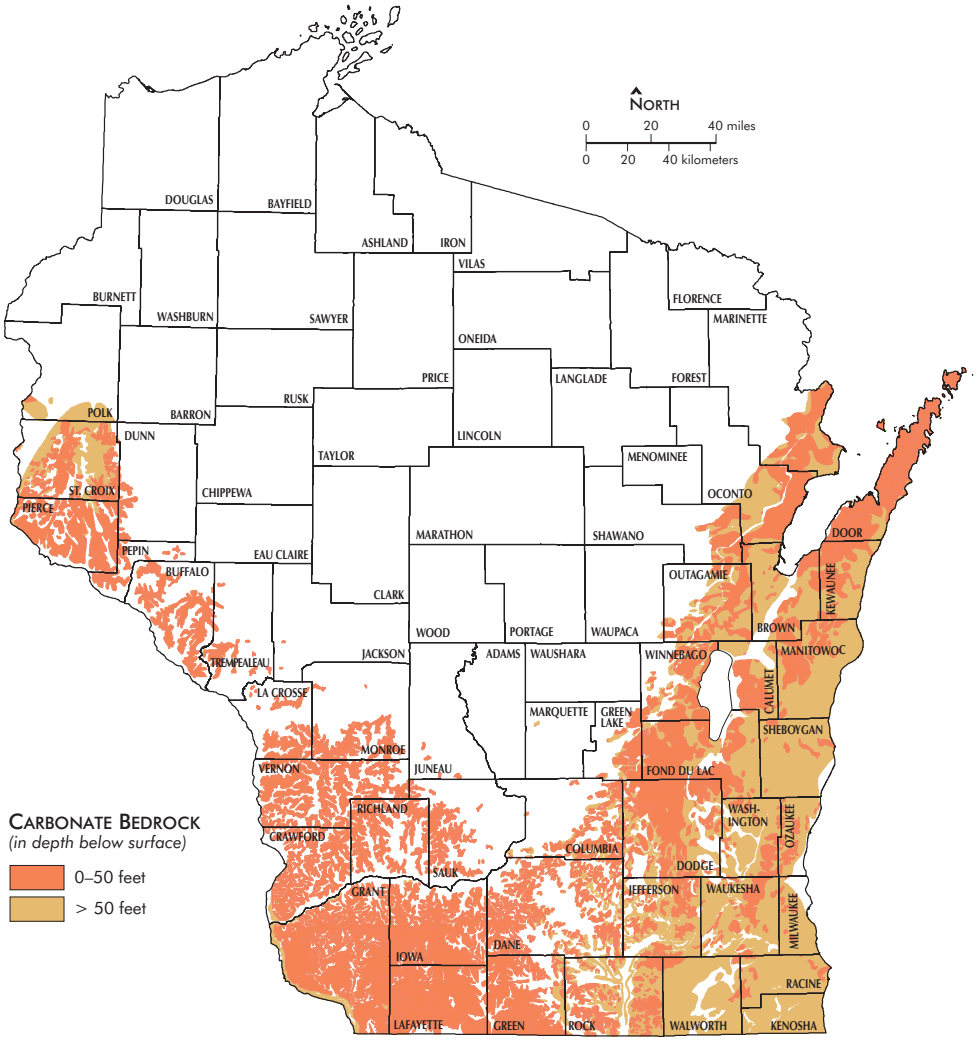
Nitrate Leaching to Groundwater

Crops cannot absorb all of the nitrogen applied to farm fields, even when that nitrogen is applied by the best available methods. Some of the "unused" nitrogen is eventually converted to nitrate, and leached to groundwater. University of Wisconsin (UW) research suggests that at least 20% of the nitrogen applied to corn on silt loam soils, at UW recommended agronomic rates, is eventually leached to groundwater as nitrate (leaching rates may be slower for manure than for nitrogen fertilizer). Nitrate leaching can be aggravated by excessive or poorly timed nitrogen applications, heavy rainfall, spring runoff events, sandy irrigated soils, and shallow karst geology.

THE PATHOGEN CHALLENGE

Pathogens are microorganisms, such as bacteria and viruses, which can contaminate drinking water and cause water-borne disease. Pathogen contamination from agriculture appears to be growing, although it is less widespread than nitrate contamination. Pathogen contamination can occur when manure (especially liquid manure) is applied to fields with shallow soils and fissured karst bedrock (see Map 2). In those areas, there is a risk of rapid, unfiltered manure runoff to groundwater. Excessive or inappropriate manure applications can increase pathogen contamination risks.

Wisconsin's Vulnerable Landscapes



Map 2. Shallow Karst Bedrock Areas. Wisconsin Geological and Natural History Survey.

WORKGROUP RECOMMENDATIONS

Wisconsin residents value the state's historically potable groundwater. But population growth and more intensive human activities of all kinds (not just agriculture) are degrading our groundwater resource.

We aspire to limit degradation of groundwater; to restore compliance with groundwater standards where exceeded; and to ensure safe drinking water for all Wisconsin residents. We propose to address nitrate and pathogen contamination from agricultural sources, as part of a larger effort to address contamination from *all* sources. To that end, we propose the goals, objectives, and strategies listed below.

Given the insistent demands of our food system, the intensity of today's farming operations, and the competitive pressure on farmers, this will not be an easy task. Significant, and potentially costly, action will be needed on several fronts. We believe that prompt action is needed; but we understand that some improvements will take time. In some places, the challenges will be especially difficult.

Progress will require a systematic, statewide, cooperative effort. But we must also recognize important local variations in land use, farming practices, soil, geology, and groundwater contamination risks. It will be important to identify key regional problem areas, and develop region-specific approaches where needed.

Goals

We aspire to the following goals:

1. Ensure safe drinking water for all Wisconsin residents.
2. Reduce nitrate and pathogen contamination of groundwater.
3. Maintain compliance with state groundwater standards where those standards are currently being met, and accelerate efforts to restore compliance where the standards are not being met.
4. Keep Wisconsin agriculture and rural communities vibrant and economically sustainable, while achieving our groundwater quality goals.

Objectives

To advance these goals, we propose the following objectives:

1. Increase groundwater monitoring and research.
2. Meet current state nutrient management (NM) standards on all Wisconsin farms, but especially in key areas of concern.
3. Address acute regional nitrate contamination problems.
4. Address acute regional pathogen contamination problems.
5. Expand assistance to well owners affected by groundwater contamination.
6. Understand the connection between land use practices and groundwater quality.
7. Find the will and resources to get the job done.

OBJECTIVE 1: Increase groundwater monitoring and research.

The Challenge:

Effective groundwater protection starts with good information. We already have some valuable data, but we can do better. Among other things, we need:

- More frequent, systematic, and statistically valid statewide monitoring of nitrate contamination levels and trends.
- More intensive monitoring of nitrate and pathogen contamination in highly susceptible areas, including areas with sandy irrigated soils, areas with shallow soils over karst bedrock, and areas with intensive row cropping.

More systematic data collection will help us spot contamination problems, identify contamination sources and trends, pursue appropriate management strategies, and measure our progress.

Strategies:

- Conduct statewide statistical surveys of groundwater nitrate concentrations at least once every five years (DATCP).
- Expand current nitrate and pathogen testing of community and private wells, especially in highly susceptible areas (state and local testing).
- Consolidate and analyze data from available sources, including statewide statistical surveys, community well tests, and private well tests, to create a more complete statewide body of information. Include available information on nitrates, pathogens, and other relevant contaminants.
- Publish a comprehensive nitrate contamination report at least once every five years (WI Groundwater Coordinating Council). Report relevant state, county, and local contamination patterns, levels, and trends. Provide information in a consistent format that facilitates comparisons to prior reports. Use maps and other graphic tools to portray information in a clear, readily understandable way.
- Build predictive models to help assess well vulnerability to pathogens, and to evaluate health risks from those pathogens.
- Support programs and innovations that facilitate private well water testing.
- Support research and development related to groundwater contamination, NM, and “best management practices” to prevent groundwater contamination.
- Ensure that data from required well water tests (tests required in connection with the construction, repair, or inspection of private wells) are entered into the DNR Groundwater Retrieval Network or a similar database. Include data on nitrate, pathogens, and other contaminants for which testing is required.
- For new well construction permits, require GPS coordinates down to a five-meter resolution (rather than the quarter-quarter section location currently used).

- Work with local communities to collect and report groundwater data in areas that are highly susceptible to contamination. Standardize procedures for collecting and reporting local data, including more specialized analyses.
- Restore Wisconsin's status as a national leader in groundwater monitoring and research by providing adequate state funding.
- Where feasible, create continuous groundwater monitoring systems that report groundwater data in real time.
- Support research to identify best management practices that can minimize contamination risks in highly susceptible areas.

OBJECTIVE 2: Meet current state nutrient management (NM) standards on all Wisconsin farms, but especially in key areas of concern.

The Challenge:

Good farm NM practices can help to reduce nitrate and pathogen contamination of groundwater. Wisconsin has adopted required minimum NM standards for all Wisconsin farms (the standards are not just guidelines). To meet current state NM standards, a farmer must:

- Conduct soil tests to determine existing nutrient levels.
- Determine cropping plans and relevant crop nutrient needs.
- Count nutrient contributions from all sources, including existing soil nutrients, nutrients supplied by crops (such as N from alfalfa and soybeans), and nutrients supplied by fertilizer and manure.
- Develop and implement an NM plan that considers multi-year cropping plans, crop nutrient needs, and nutrient contributions from all sources.
- Avoid nutrient applications in excess of UW agronomic recommendations for relevant crops (considering nutrient contributions from all sources).
- Use appropriate conservation practices (such as conservation tillage, cover crops, grass waterways, buffer strips, and sound manure management practices) to limit nutrient movement to surface water and groundwater.

Better statewide compliance with these standards would help to reduce nitrate *and* pathogen contamination risks. Unfortunately, there are major statewide compliance gaps at this time. For example, only about 32% of Wisconsin farms report having NM plans, and it is unclear how well those plans are being implemented.

Although current NM standards are enforceable, compliance obligations are normally contingent on a 70% cost-share offer (there are some important exceptions). Cost-share funding is extremely limited, relative to compliance needs (see below); and some farmers decline to participate voluntarily, even when funds are available. A farmer may not avoid compliance obligations by declining a legally adequate cost-share offer;

but enforcement actions against unwilling farmers are rare. Counties rely heavily on voluntary compliance, and value cooperative working relationships with farmers.

Current state NM standards prohibit nitrogen applications in excess of UW recommendations. It should be noted that these are *agronomic* recommendations (designed to maximize farm economic returns relative to fertilizer input costs), *not* groundwater protection recommendations. Even when farmers follow UW recommendations, some nitrogen is leached groundwater as nitrate. But the UW recommendations help farmers to avoid clearly wasteful applications that increase production costs and groundwater contamination risks.

State funding for NM cost-share grants is very limited, relative to statewide compliance needs. For 2017, the State of Wisconsin provided $1.7 million in NM cost-share funding to counties – an average of just $24,000 per county (see Chart 3 on page 39). But at current minimum cost-share rates, it would take *$14 million* in cost-share grants each year, for 20 years, to cost-share basic NM compliance on farms that do not currently comply.

Farmland preservation (FP) tax credits, totaling about $20 million per year, provide an important incentive for NM compliance *in some areas.* Farmers who claim FP tax credits must comply with state NM standards, *regardless* of cost-sharing. But FP tax credits are available *only* in certified FP zoning districts or "agricultural enterprise areas." These FP districts cover only about 1/3 of Wisconsin farmland.

NM cost-share grants and FP tax credits have thus far failed to achieve an adequate level of NM compliance statewide. Many farmers decline to participate voluntarily, even when cost-share grants or FP tax credits are available to them. Some farmers may believe that these current incentives do not adequately compensate them for NM compliance costs.

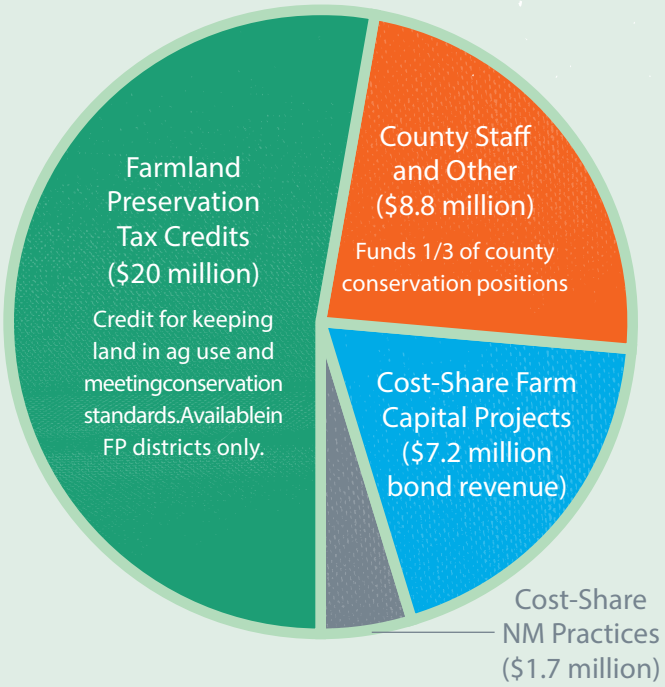


Chart 3. State Funding for Farm Conservation. Per 2017 WI Land and Water Conservation Plan.

Strategies:

- Increase public funding for NM on farms, and consider alternative delivery mechanisms (such as annual NM tax credits, rather than one-time cost-share grant contracts).
- Improve NM compliance incentives. Here are some possible "carrots" and "sticks" to consider (workgroup member views may vary):
  - Increase NM cost-share and FP tax credit *rates* to encourage more voluntary farmer participation (but note that if higher rates are not supported by more funding, fewer acres will be covered).
  - Tie other farm tax relief, such as the Manufacturing and Agriculture Tax Credit (MAC) to NM compliance.
  - Create *separate* FP and NM tax credits, with NM credit available statewide (not just in FP districts).
  - Take a more active compliance approach (offer cost-sharing, but expect compliance). Focus compliance efforts and cost-share funding on the most serious problems. Don't just wait for volunteers.
  - Reduce or eliminate current 70% cost-share requirement. Enforce compliance with state NM standards, regardless of cost-sharing.

- Encourage “producer-led” initiatives and pilot projects, with or without state grant funding.
- Provide targeted cost-share funding for manure treatment facilities or manure management infrastructure, where appropriate as part of a comprehensive and cost-effective NM strategy.
- Provide more NM training and technical support.
- Strengthen food industry support (such as supply chain incentives) for NM on farms.
- Identify and address key non-monetary barriers to farm implementation of NM practices:
  - Increase coordination between landowners, renters, crop consultants, manure haulers, farm supply outlets, and other responsible parties.
  - Improve farmer awareness of NM requirements, and commitment to follow NM plans.
  - Make NM plans as clear and practicable as possible, consistent with state requirements.
- Improve NM surveys and compliance screening (state and county coordination).
- Focus on NM compliance in high priority areas. Provide help, but expect compliance. Target available resources for maximum impact. Track NM plan implementation.
- Selectively audit NM plans (coordinate state and county efforts, to avoid duplication). Provide statewide model audit procedures that counties can use. Work with partners, in a systematic way, to rectify deficiencies.
- Support county and local efforts to ensure compliance with established standards.
- Expand use of livestock facility siting and FP zoning ordinances, which incorporate state NM standards (permit holders must comply with NM standards, regardless of cost-sharing).
- Focus more attention on crop advisors, fertilizer suppliers, manure haulers, and other agents to whom NM tasks are often delegated:
  - Provide more training and information.
  - Improve certification and oversight.
  - Conduct selective audits to ensure compliance with NM standards.
  - Develop compliance screening and audit procedures (DATCP) that counties can use.
- Provide information on voluntary NM practices that can supplement basic NM compliance.
- Support research on NM, including key challenges, best practices, implementation, and effectiveness in reducing groundwater contamination.
- Develop and implement technologies to track and report nutrient applications in real time.
- Promote innovative NM practices such as precision nutrient application technologies.

OBJECTIVE 3: Address acute regional nitrate contamination problems.

The Challenge:

Compliance with state NM standards will help to reduce groundwater contamination statewide by reducing wasteful and excessive nitrogen applications. But in highly susceptible areas, additional measures may be needed to prevent groundwater contamination from exceeding state health standards. Special measures may also be needed to ensure safe drinking water alternatives. Highly susceptible areas include areas with sandy irrigated soils, areas with shallow soils over karst bedrock, and areas with intensive corn and cash grain crop rotations.

Strategies:

- Establish criteria to identify and map areas highly susceptible to nitrate contamination (similar to the recent DNR-Kewaunee County Workgroup effort).
- Develop a menu of additional practices that might help to mitigate contamination in highly susceptible areas.
- Update state NM standards to incorporate supplementary standards for highly susceptible areas (see, for example, DNR's proposed revisions to Wis. Adm. Code ch. NR 151).
- In highly susceptible areas:
  - Encourage farmers to adopt alternative cropping practices, cover crops, reduced N application rates, or other practices that may reduce nitrate contamination of groundwater (DATCP, counties, and UW-Extension).
  - Provide incentives for reduced nitrogen applications, as appropriate.
  - Encourage agricultural diversification that reduces groundwater contamination risks. Consider crops that demand less applied nitrogen. Consider alternative livestock production strategies, such as grazing strategies (UW-Extension).
- Expand assistance to well owners affected by nitrate contamination (see Objective 5).

OBJECTIVE 4: Address acute regional pathogen contamination problems.

The Challenge:

Pathogen contamination of groundwater, as a result of manure applications, is not widespread in Wisconsin; but it is a significant concern in karst regions with shallow soils. In those regions, there is a greater potential for pathogens to reach aquifers that serve as drinking water sources. Compliance with current state NM standards may not be enough to prevent pathogen contamination in such areas, and additional precautions may be necessary. Special measures may be needed to ensure that residents affected by well contamination have safe drinking water alternatives, but drinking water alternatives should not substitute for pollution prevention.

Strategies:

- Establish criteria to identify areas that are highly susceptible to pathogen contamination of groundwater from manure applications (similar to the recent DNR-Kewaunee County Workgroup effort). Map highly susceptible areas based on those criteria.
- Develop a menu of additional practices that might help to mitigate pathogen contamination in highly susceptible areas.
- Develop stronger well construction guidelines for highly susceptible areas.
- Update state NM standards to incorporate supplementary standards for highly susceptible areas (see, for example, DNR's proposed revisions to Wis. Adm. Code ch. NR 151).
- Consider targeted funding for shared manure treatment or manure management systems, where appropriate as part of a comprehensive and cost-effective NM strategy.
- Allow for carefully managed manure irrigation, which may be a valuable NM tool under some conditions (see *2016 Manure Irrigation Workgroup Report*).
- Minimize manure application during groundwater recharge periods (early spring and fall) in highly susceptible areas (see DNR-Kewaunee County workgroup recommendations).
- Provide incentives for "low tech" manure treatment practices, such as manure composting or compost bed pack barns, that can help to reduce pathogen risks and can be implemented by small- to medium-sized livestock operations.
- Ensure more rigorous and transparent tracking of manure applications in highly susceptible areas. Ensure that all persons applying manure to a crop field are aware of relevant manure application restrictions, and of manure applications made to the same field by other persons. Consider a shared manure application record that is accessible by landowners, renters, NM planners, and manure haulers.
- Improve oversight and monitoring of professional manure haulers. Improve training and monitoring to ensure compliance with relevant standards. Use selective audits to monitor ongoing compliance (DNR, DATCP, and counties, as appropriate).
- Provide more information to well owners in highly susceptible areas, including persons applying for private well permits. Include key pathogen contamination concerns and precautions, instructions on how to report contamination incidents, and options for securing safe drinking water.
- Expand assistance to well owners affected by pathogen contamination (see Objective 5).

OBJECTIVE 5: Expand assistance to well owners affected by groundwater contamination.

The Challenge:

Individuals with contaminated wells may face costly and difficult choices. A new well (not guaranteed to eliminate contamination) usually costs from $7,000 to $10,000, but can exceed $15,000. Bottled drinking water costs about $190 per person per year. Water treatment devices cost about $800 for equipment and installation, and between $100 and $200 per year to operate. Follow-up testing may be needed to monitor treatment effectiveness.

Many well owners are unaware of potential contamination risks. Up to a third of all private well owners do not know whether their drinking water is contaminated, because they have never tested their water. Owners of contaminated wells may also lack information about the nature of the contamination, and the degree of risk that it may pose. Well owners need more information, in order to make sound choices.

It can be hard to pinpoint the source of well contamination, or to prove that contamination occurred as a result of someone's legal "negligence." In many cases, contamination occurs even where farmers are using well-established agricultural practices that comply with existing regulatory standards. Although well owners are exposed to health risks and significant costs through no fault of their own, it may be difficult or impossible to recover compensation in a private lawsuit.

The DNR administers a "no fault" well compensation grant program to assist private well owners whose drinking water has been contaminated by hazardous substances, including nitrates and bacteria from livestock. Qualifying well owners may receive compensation, without having to prove another person's "fault." While proposed legislation could expand current eligibility criteria, state law currently limits program eligibility in the following ways:

- The household income of grant recipients may not exceed $65,000 a year.
- Compensation for a new well is limited to 75% of the well cost, and may not exceed $12,000.
- Compensation for alternative treatment systems is available only if DNR determines that a new well is not likely to address the contamination issue. Compensation is limited to 75% of the cost of the alternative treatment system.

In the case of nitrate contamination, compensation is not available unless:

- Nitrate levels exceed 40 ppm (the state health standard is 10 ppm).
- The contaminated well serves both humans and livestock.

Strategies:

- Provide more information to private well owners.
  - Actively disseminate information to well owners (not just on DNR website), especially in highly susceptible areas.
  - Include information related to:
    - Key potential contaminants and associated health risks.
    - Well testing, including test kit sources and proper testing procedures.
    - Alternative ways to secure potable water, including general cost estimates. Information on treatments systems should be consistent with CDC and scientific literature on effectiveness.
    - The Wisconsin well compensation program. Include eligibility requirements, compensation limits, and how to apply for compensation.
    - Other assistance that may be available.

- Expand Wisconsin's "no fault" well compensation program (for an example of one approach, see 2017 Wi State Assembly Bill 226):
  - Relax current eligibility criteria for private wells:
    - Remove household income limit.
    - Lower the current 40 ppm contamination threshold for nitrates.
    - Remove the requirement that wells compensated for nitrate contamination must be used for humans *and livestock.*
  - Offer compensation for water treatment (not just new wells), where appropriate and cost-effective.
  - Consider making compensation available, on appropriate terms, for public wells.

- Fund "no fault" well compensation payments (nitrate and livestock bacteria) with contributions from relevant agribusiness sectors.
  - Consider fees on nitrogen fertilizer sales and livestock facilities.
  - Fees would help to "internalize" hidden pollution costs that are now shifted to others.
  - No finding of individual farmer "fault" would be required or implied.

- Review certification standards for treatment systems that claim to remove pathogens from private wells.

- Ensure prompt state or local investigation of private drinking well "brown water" or suspected pathogen contamination events.

OBJECTIVE 6: Understand the connection between land use practices and groundwater quality.

The Challenge:

Farmers, well owners, and the public at large are not always well informed about groundwater contamination and related agricultural production challenges. Lack of understanding can lead to apathy, inattention, unfair blame, and poor choices. It can also divide communities and impede constructive action. Better information and understanding can alert us to problems and concerns, reduce conflict, increase cooperation and community support, and promote constructive action.

Strategies:

- Increase farm, business, community, and public awareness of groundwater basics, including contamination risks, protective measures, and contamination findings and trends.
- Support farm and community outreach, communications, and constructive problem solving.
- Publish annual county groundwater quality reports as a tool for focusing community attention.
- Convene the Education Subcommittee of the WI Groundwater Coordinating Council on a regular periodic basis (the subcommittee met quarterly prior to 2010).
- Review existing communication strategies and resources targeted to new private well owners. Ensure that well owners receive standard information on well construction, well maintenance, and recommended water quality sampling. Improve current information as needed.
- Provide online resources for well owners, including real-time monitoring data, important tips related to well ownership, message boards, and access to well water quality information and timely news. This could be funded by a surcharge on new well construction permits.
- Develop educational materials for landowners who rent out their land for agricultural production. Include information and sample rental agreement provisions related to NM responsibilities.
- Develop educational materials for realtors and well inspectors, to help them address questions related to private wells and well contamination.
- Develop classroom curriculum for groundwater education, targeting grades K-12.
- Expand information and outreach to farmers, farm input suppliers, and farm service providers.

OBJECTIVE 7: Find the will and resources to get the job done.

The Challenge:

Groundwater protection is critical to our health, quality of life, and economic prosperity. It is also important for the future of our dairy and food industries, and the viability of our dairy and food supply chains. We cannot fail to address this important challenge. Yet real progress will require a substantial commitment of public and private resources.

Farmers and food industries must do their fair share. Increased public funding will also be needed. We should consider all available sources and forms of support, both public and private. Among other things, we should reevaluate current NM incentives, including funding levels, funding sources, fund delivery mechanisms (e.g., cost-share grants vs. tax credits), cost-effectiveness, fairness, and accountability.

Strategies:

- Inventory current groundwater protection funding sources and funding levels. Prepare a "gap analysis" of groundwater protection needs and resources.

- Seek additional state, county, and local support for groundwater monitoring and research, NM compliance, regional problem solving, well owner assistance, information, and outreach. Consider the following forms of support:
  - Dedicated agency budgets and staff.
  - Cost-share grant funding.
  - Tax credit incentives, such as a statewide tax credit for NM compliance.
  - County staff and technical assistance (including staff with NM and agronomic expertise).
  - Targeted competitive grants for NM, manure management, and farm outreach projects, including "farmer led" outreach and pilot projects.
  - Coordination and targeting of federal, state, county, and local resources, for maximum combined impact.

- Consider new funding sources for groundwater protection, such as:
  - A general sales tax (per Minnesota or Missouri example), or a sales tax on bottled water.
  - A fee on nitrogen fertilizer sales (see Objective 5).
  - A fee on livestock facilities (see Objective 5).
  - New groundwater management districts, with taxing authority, in highly susceptible areas (similar to Wisconsin lake districts).
  - A fee on private onsite human waste treatment systems.

- Consider private funding and support, including:
  - Supply chain incentives for responsible NM practices and groundwater protection.
  - Active farm group support for responsible NM practices and groundwater protection.
  - Active cooperation with state, county, and local authorities to improve NM practices and groundwater protection.
  - "Farmer led" projects to improve NM practices and groundwater protection, including information sharing, field demonstrations, and "pilot" projects (with or without public grant support).
  - Industry contributions to state well compensation fund (see Objective 5).

- Consider a more active county approach to NM compliance (not purely voluntary). Provide support, but expect compliance with current state standards. Focus compliance efforts on key areas of concern.

- Review programs and resources in other states, to identify potentially effective models.

GROUNDWATER QUALITY WORKGROUP MEMBERS

Co-Chairs:

Kevin Masarik – UW-Stevens Point
Chuck Wagner – Kewaunee County Land Conservation Committee

Facilitator:

Ed Odgers – Retired State Conservation Engineer, Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP)

Members:

Eric Allness – U.S. Department of Agriculture, Natural Resource Conservation Service (USDA-NRCS)
Don Bennett – Hartung Brothers (Wisconsin farming business)
Davina Bonness – Kewaunee County, Land and Water Conservation
Mark Borchardt – U.S. Dairy Forage Research Center (pathogen specialist)
Russ Brown – Waushara County farmer
Keith Foye – DATCP, Land and Water Resources
Madeline Gotkowitz – Wisconsin Geological & Natural History Survey
John Holevoet – Wisconsin Dairy Business Association
Dale Konkol – Door County, Soil and Water Conservation
Dave LaCrosse – Pagel's Ponderosa (Kewaunee County dairy farming operation)
Maureen Muldoon – UW-Oshkosh
Don Niles – Dairy Dreams (Kewaunee County dairy farming operation)
John Pagel – Kewaunee County Land Conservation Committee; Pagel's Ponderosa Farm
Russ Rasmussen – Wisconsin Department of Natural Resources (DNR)
Sara Walling – DATCP, Nutrient Management

CHAPTER
C

CENTRAL SANDS GROUNDWATER

MOVING FORWARD

THE CHALLENGE

Agriculture is the largest water consumer in the U.S. In many western states, which rely heavily on irrigation, water shortages have reached crisis proportions. In Wisconsin, the situation is different. In most of the state, we have abundant surface water and groundwater supplies; and our agriculture is far less dependent on irrigation.

But irrigation *is* important in Wisconsin's Central Sands region, which accounts for most of our high-value potato, vegetable, and cranberry production, and a significant share of our grain and dairy production. Irrigation allows very high agricultural production on otherwise marginal land. It also allows more reliable and uniform production to meet the exacting demands of processors, retailers, and consumers. Irrigation is important to farmers, but also to food processors and bankers who have contract and security interests in the farmer's crop. Irrigation has transformed Central Sands agriculture, dramatically increasing food production and farmland values. Indeed, it has given a strong boost to the whole Central Sands economy.

Wisconsin Central Sands region.

In the Central Sands, crop irrigation and new dairy operations have contributed to a rapid proliferation of high capacity wells. There are now about 3,000 high capacity wells in the Central Sands, compared to just 100 in 1950, and pumping demand continues to grow. Most of the pumping demand is for irrigated agriculture; but municipal and industrial wells, where present, also have an important impact.

Groundwater pumping is *not* exhausting the overall supply of groundwater in the Central Sands. There is an ample supply of groundwater overall. But the dramatic increase in groundwater pumping *is* affecting lake, stream and groundwater levels, as well as wetlands. Central Sands lakes and streams are important public and ecological assets. Reduced surface water levels can affect property owners, recreational use, navigation, and biological processes including spawning in trout streams.

Central Sands surface water and groundwater are closely connected. Pumping can reduce water levels in the top few feet of the groundwater aquifer, at least on a temporary basis. Individual well levels may recover fairly quickly when pumping stops, as groundwater flows back into the local "cone of depression" created by pumping. But roughly 70-90% of the pumped groundwater will be lost to the aquifer (roughly 10-30% will infiltrate back into the aquifer as "return flow"). Even temporary reductions in groundwater levels can reduce surface water levels in connected lakes and streams – especially on a seasonal basis. Groundwater pumping also intercepts the normal flow of groundwater toward surface water outlets. The effect on lakes and streams can be delayed, and can take longer to dissipate. In some cases, surface water impacts can accumulate slightly from year to year.

Groundwater pumping normally peaks in late summer, when lakes and streams tend to be naturally low – causing surface water levels to fall even further. The impact on surface water levels may vary between watersheds, depending on local pumping and hydrology. Some wells (particularly those located a short distance from surface water) can have a much bigger impact than others. But even when wells have a negligible *individual* impact, their *combined* impact can be significant.

Many factors can affect lake and stream levels, including rainfall, natural seasonal variations, annual weather patterns, long-term climate changes, changing land use patterns, topography, vegetative cover, evapotranspiration rates, groundwater flow patterns, *and* groundwater pumping. Groundwater and surface water levels may vary throughout the year and over time. The interaction of factors is complex, but new modeling tools allow us to isolate the effect of groundwater pumping with greater precision.

The Little Plover River watershed has been the subject of intensive data collection and study. Multiple independent models for the Little Plover River area suggest that high-capacity well pumping has reduced local groundwater levels by up to 5 feet (at least on a seasonal basis) and reduced Little Plover base flow by up to 4.5 cubic feet per second (at least on a seasonal basis). Other parts of the Central Sands have been less intensively studied, and pumping impacts in those areas may differ. Additional data collection and modeling would improve our understanding of groundwater pumping impacts in those areas.

Conflicts over pumping rights and surface water impacts are increasing, and have sparked litigation and high profile legislative battles. Conflicts may grow as the Central Sands population and economy expand, and as Central Sands agriculture continues to intensify. Our challenge is to find sustainable long-term solutions.

Central Sands Hydrology

At the request of the workgroup, six of the state's leading hydrologists prepared a short summary paper titled *Groundwater Quantity Fundamentals in Wisconsin's Central Sands Region* (see wisconsinlandwater.org/programs/groundwater-quantity). The paper reflects a unanimous agreement among the six hydrologists who co-authored the paper, including academic, public, and industry hydrologists with long experience in the Central Sands. The paper may or may not represent the views of non-hydrologists on the workgroup.

The hydrologists' paper makes the following key points:

- A single groundwater flow system occurs throughout the Central Sands.
- Groundwater and surface water are directly connected throughout the Central Sands.
- Pumping wells affect groundwater levels.
- Pumping wells divert water from streams.
- Cumulative impacts matter.
- When crops are irrigated using groundwater, there is a net loss to the groundwater system.
- Groundwater, surface water, evapotranspiration, and high-capacity well use in the Central Sands have important transient components, meaning that conditions continually vary through time.
- Groundwater levels have declined in parts of the Central Sands where a higher density of high-capacity wells occurs.
- Streamflow and lake levels have declined in parts of the Central Sands where a higher density of high-capacity wells occurs.

- Results of numerical groundwater flow models are consistent with observations of declines in streamflow and groundwater levels in areas of numerous high-capacity wells.
- Evapotranspiration is related to land cover and influences water levels and streamflows.
- Proposed causes other than groundwater pumping have been unable to fully explain observed patterns of normal and depressed water levels and streamflows.

Legal Background

- *Constitutional public trust doctrine.* Under the Wisconsin Constitution, the state holds the navigable surface waters of the state in trust for the public, and has an obligation to protect surface water levels on behalf of the general public. The means by which the state protects surface water levels may vary. "Public rights" levels in surface water are not always clearly or easily defined, partly because of natural variations in surface water levels over time.

- *Wisconsin common law* takes a "reasonable use" approach to the allocation of water (you can use water as long as you don't unreasonably impair use by others). That differs from the "prior use" doctrine used in western states. But what "reasonable use" means, in the context of groundwater pumping impacts on surface water levels, is not altogether clear.

- *Wisconsin currently regulates groundwater pumping to some degree.* Under current state law, all high-capacity wells (capacity over 100,000 gallons a day) must get a permit from DNR. DNR may conduct environmental reviews and set pumping limits on certain wells. All permit holders must report pumping volumes to DNR.

- *Cumulative impact.* The Wisconsin Attorney General has opined that DNR lacks authority, under current law, to consider the "cumulative impact" of multiple wells when granting or denying a permit for an individual high-capacity well. The Attorney General did not say that surface waters are unaffected by the "cumulative impact" of high-capacity wells, but rather that DNR may only consider the impact of an individual well when granting or denying a permit for that well. Pending litigation may test that opinion. In any case, the legislature could enact a regulatory program to manage the cumulative impact of groundwater pumping on surface water levels, should it choose to do so. Such a program could take a variety of alternative forms.

- *Other States.* Like Wisconsin, Minnesota and Michigan require state permits for high-capacity wells. *Unlike* Wisconsin, Minnesota and Michigan currently consider the "cumulative impact" of multiple wells when reviewing a new high-capacity well permit application. A well permit may be denied if the new well will cause the "cumulative impact" of all wells to exceed an acceptable level (i.e., if the new well is the "final straw" that "breaks the camel's back") – even if *existing* permitted wells have a bigger individual impact. This points to an underlying issue in all three states: How do we allocate a limited resource among "new" and "existing" uses that are constantly changing? Do we "lock in" existing uses, at the expense of "new" or changing uses? Is there a fair, flexible, and efficient way to manage groundwater pumping, and promote conservation by all, so as to protect our surface water resources?

- *Recent Wisconsin Legislation.* 2017 Wisconsin Act 10 limited DNR review of high-capacity well permits at the time of permit renewal, and mandated a DNR study of groundwater pumping impacts in parts of the Central Sands. The legislature did not provide funding for the study, but could include funding in the 2017-19 biennial budget bill (now pending in the legislature). The amount of funding, if any, will have a decisive effect on the feasibility and scope of the study.

WORKGROUP RECOMMENDATIONS

The Central Sands groundwater pumping issue is complex and highly charged. There are many stakeholders, and many valid questions and concerns on all sides. At this time, the workgroup is not in a position to recommend detailed final "solutions" to this dynamic issue. But the challenge will become more acute as use demands continue to grow. So it is important to move forward now, in whatever ways we can. We believe that progress can beget progress, that trust can beget trust, and that sustainable solutions can ultimately be found. In that spirit, we propose the following shared goals, objectives, and strategies.

Goals

We aspire to the following goals:

1. Ensure that "public rights" in Central Sands waters of the state, including, but not limited to reasonable base stream flows and lake levels, are not impaired by groundwater pumping.
2. Accommodate, to the extent feasible, the reasonable use of Central Sands groundwater by agriculture, industry, communities, and other users – consistent with the protection of "public rights" in waters of the state.
3. Ensure reasonably fair and reliable access to groundwater among competing users, both now and in the future.
4. Provide reasonable continuity of access to existing groundwater users, and reasonable opportunity for access to new users.
5. Encourage water conservation by all, for the benefit of all.
6. Act on the basis of sound information.

Objectives

To help achieve the above goals, we propose the following objectives:

1. Continue to expand our current knowledge.
2. Clarify "public rights" in Central Sands waters of the state.
3. Support voluntary cooperative efforts and appropriate public mechanisms to ensure that "public rights" in Central Sands waters of the state are not impaired by groundwater pumping.
4. Improve education and communications.

Achieving Our Objectives

OBJECTIVE 1: Continue to expand our current knowledge.

Strategies:

- Support sufficient and timely funding for DNR to perform a complete study of the Central Sands designated study areas authorized in 2017 WI Act 10.
- Support government, private, and UW cooperation to expand current understanding of:
  - Central Sands hydrology.
  - Central Sands groundwater pumping demands and effects, including current and projected future demands and effects.
  - The impact of groundwater pumping versus other factors that may affect waters of the state in the Central Sands.
- Support increased data collection, data sharing, modeling, model evaluation, and analysis.

OBJECTIVE 2: Clarify "public rights" in Central Sands waters of the state.

Strategies:

- Identify significant impairment criteria and thresholds for specific Central Sands waters that are most at risk.
- Encourage DNR to provide technical specificity.

OBJECTIVE 3. Support voluntary cooperative efforts and appropriate public mechanisms to ensure that "public rights" in Central Sands waters of the state are not impaired by groundwater pumping.

Strategies:

- Promote voluntary conservation and groundwater management efforts by high-capacity well owners, including farmers, industrial users, and municipalities.
- Support a focused watershed management effort that will improve flows in the Little Plover River.
- Develop systematic, voluntary, cooperative management strategies:
  - Use the Little Plover River watershed to test promising management strategies, on a voluntary cooperative basis.
  - Consider systematic management practices, including:
    - Cooperative irrigation scheduling, voluntary water pricing arrangements, water transfers, municipal conservation programs, or other voluntary arrangements as appropriate.
    - Enhanced "best management practices" programs, such as the Wisconsin Water Steward Program.
    - Wetland redevelopment and enhancement.

- Evaluate the effectiveness of voluntary arrangements, and the level of participation by farmers, industrial users, and municipalities.
- Consider additional high-capacity well permit criteria, groundwater pricing mechanisms, or other regulatory measures if needed to protect public rights in waters of the state.
- Regularly evaluate the effectiveness and adequacy of existing permit criteria, programs, voluntary management strategies, and other relevant factors, and consider changes if needed.
- Implement public and private strategies to manage the cumulative impact of groundwater pumping.
- Consider fairness, predictability, and access for current and future groundwater users.
- Acknowledge that market-based supply chain programs can create incentives for water conservation.

OBJECTIVE 4. Improve education and communications.

Strategies:

- Support regular, constructive, well-informed communications among stakeholder groups.
- Improve stakeholder access to, and understanding of, available information on Central Sands hydrology, surface and groundwater trends, and groundwater pumping demands.
- Promote and support educational programs regarding water resources, associated natural resources, land use, agriculture, and economics.

GROUNDWATER QUANTITY WORKGROUP MEMBERS

Co-Chairs:

Mike Carter (co-chair) – Bushman's Inc.
Skip Hansen (co-chair) – Central Sands Water Action Coalition
Andy Johnson (co-chair) – Retired, Marathon County Conservation, Planning and Zoning

Facilitator:

Don Last (facilitator) – UW Extension

Members:

Andrew Aslesen – Wisconsin Rural Water Association
Jake Barnes – Friends of the Tomorrow/Waupaca River
Ken Bradbury – WI Geological and Natural History Survey
Andy Diercks – WI ATCP Board
Patty Dreier – Portage County
James Drought – GZA GeoEnvironmental Inc.
Mike Fienen – USGS
Adam Freihoefer (advisor) – DNR
Scott Froehlke – Wisconsin Institute for Public Policy and Service
Tamas Houlihan – Wisconsin Potato Vegetable Growers Association
Justin Isherwood – Potato Farmer
Mike Koles – Wisconsin Towns Association
George Kraft – UW Stevens Point
Jordan Lamb – DeWitt Ross & Stevens
Bob Martini – Retired DNR Water Resources
Amber Meyer-Smith – Clean Wisconsin
Kara O'Connor – Wisconsin Farmers Union
John Ramsden – NRCS
Wally Sedlar – Adams County Conservationist
Carl Sinderbrand – Axley Brynelson, LLP
Allison Werner – River Alliance
Jim Wysocki – Wysocki Family of Farms
Louis Wysocki – Wysocki Family of Farms

CHAPTER D

WORKING LANDS

MOVING FORWARD

THE CHALLENGE

Wisconsin, one of the top food-producing states in the nation, is facing a quiet crisis: We are steadily losing our farmland resource – the indispensable foundation of our food system. If current trends continue, we could undermine our farm and food economy, our quality of life, and our hopes for a sustainable future.

Farmland is not just dirt, or a factor of production. It is a fountain of life. Well-managed farmland is important for food, jobs, recreation, wildlife habitat, a healthy environment, scenic beauty and quality of life. Our deeply held image of "Wisconsin" is shaped, in no small part, by our traditional farm landscapes, our food traditions, and our rural heritage. Farmland, once lost, is gone forever. We would do well to pay attention.

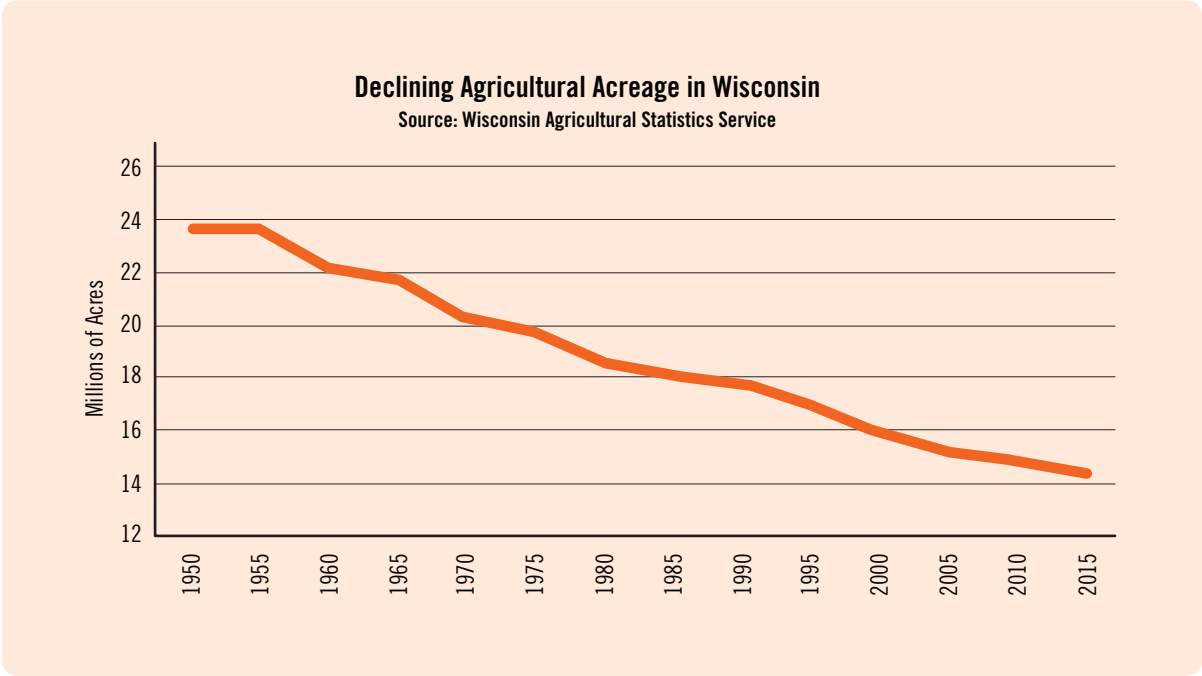


Chart 1. Declining Agricultural Acreage in Wisconsin (1950-2015)

Wisconsin residents consume roughly 30 million lbs. of food every day. Our population is growing, and we aspire to eat fresher, locally grown, and sustainably produced food. Wisconsin's dairy and food industry is a central pillar of our state economy, and an important source of jobs. But as we continue to lose farmland, it becomes harder to grow our dairy and food economy, and harder to build a sustainable food system for the future.

Wisconsin's dairy and food industries depend, for their very existence, on the integrity of our farmland resource. Farms, farm suppliers, and wholesale food processors contributed $88 billion to Wisconsin's economy in 2012 (the dairy industry alone contributed $43 billion). A shrinking farmland base and growing land use conflicts are undermining the foundation on which Wisconsin's dairy and food economy is built.

Many Ways to Lose Farmland

Since 1950, Wisconsin has lost 40% of its farmland to other uses, including urban development and reforestation of marginal land. Each year, we lose over 22,000 acres of cropland to urban development alone (in just 35 years that adds up to an area the size of Dane County). Most of that loss is occurring within commuting distance of urban centers. Commuter areas contain a disproportionate share of the state's best cropland, and are an important source of fresh local food for urban markets.

Farmland can be lost in many ways. Urban sprawl can consume farmland in large contiguous chunks. But scattered rural development can also have a detrimental impact, by carving continuous swaths of farmland into small tracts that are harder to farm. *Soil erosion* is also depleting Wisconsin farmland at a rate of over 60 million tons a year, contributing to the pollution of Wisconsin lakes and streams.

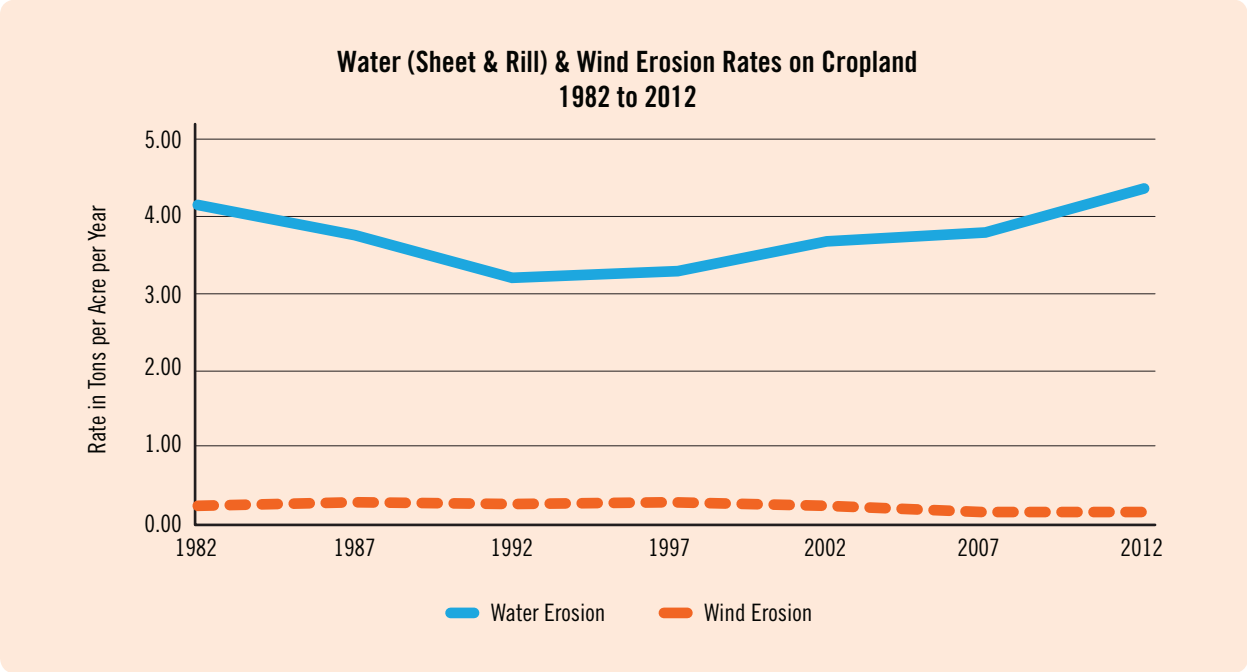


Chart 3. Wisconsin Soil Erosion Rate, 1992-2012 Source: National Resources Inventory (NRI), produced by USDA-NRCS and Iowa State University. https://www.nrcs.usda.gov/Internet/NRCS_RCA/reports/nri_eros_wi.html

The Rural Social Fabric

When Wisconsin became a state, most of its people lived on farms. Today, farm households comprise less than 2% of the state's population, and only 8% of its *rural* population. We now have twice as many prisoners as dairy farm operators. The average Wisconsin farm operator is now nearly 60 years old, and many young people are leaving the land – taking farming know-how with them. Beginning farmers face daunting economic challenges – including income uncertainty, heavy financial risk, high initial investment barriers, and increasing land acquisition challenges.

Big farms command an ever-larger share of farm product sales and available land. In 2007, according to USDA, just 13% of Wisconsin farms accounted for 76% of farm product sales and 43% of all Wisconsin farmland. Just 3% of Wisconsin dairy farms now produce roughly 40% of our milk. A third of all Wisconsin farmland is now leased from absentee owners. The continuing decline of mid-sized, multi-generational, owner-operated family farms is both a cause and a consequence of farmland loss. It is also having a profound effect on rural communities.

Many Demands on a Finite Resource

Wisconsin is no longer a "frontier" state. Our individual dreams may be as big as ever, but we now have 6 million people sharing a finite land resource. Our individual land uses inevitably affect others, for better or worse. We can all achieve more if we plan and work together. That is a big job, requiring patient effort over the long haul. There may be different solutions for different regions. County and local governments must play a leading role, in cooperation with farmers and other stakeholders.

Wisconsin's "Smart Growth" Law

Wisconsin's *Comprehensive Planning ("Smart Growth") Law* provides an important land-use planning tool, which can help us achieve workable solutions. The law requires county and local governments to develop comprehensive land use plans with public input. Most county and local governments have now adopted comprehensive plans, which can be adjusted over time. Comprehensive plans do not, by themselves, regulate land use. Zoning ordinances, public infrastructure investments, and other tools can be used to implement land use plans. Zoning ordinances must be reasonably consistent with applicable plans.

Local land use planning provides an important vehicle for collecting and analyzing land use information, identifying key local trends and priorities, obtaining public input, reconciling land use conflicts, and developing locally appropriate land use strategies. Good county and local plans are informed by relevant state, regional, and watershed information, as well as local information. The state can support the local planning process by providing planning grants, information, and technical assistance.

Wisconsin's Farmland Preservation Law

Wisconsin's Farmland Preservation Law (enacted in 1977 and revised in 2009) provides a framework for preserving farmland. The law has two purposes:

- To keep farmland in agricultural use.
- To promote compliance with Wisconsin's *agricultural performance standards,* which are conservation standards designed to reduce soil erosion and pollution runoff.

Under the Farmland Preservation (FP) Law, every county has adopted an FP plan.

- The county identifies farmland that it expects to remain in agricultural use for at least 10 years.
- The FP plan is *not* a zoning ordinance. It does not, by itself, regulate land use. But it can be implemented by county and local ordinances.
- The FP plan is part of the county comprehensive plan, and must be consistent with other parts of that plan.
- Counties have recently updated their FP plans with state assistance (many counties had not updated their plans since the 1980s).

County and local governments *may* adopt, but are not required to adopt, FP zoning ordinances. An FP zoning ordinance puts "teeth" in an FP plan, by limiting non-farm development in mapped FP zoning districts.

- About 1/3 of Wisconsin farmland is covered by FP zoning (FP zoning applies to 4.7 million of the state's 15.4 million farmland acres).
- Farmland owners covered by a state-certified FP zoning ordinance may claim FP income tax credits.
- A certified ordinance must meet minimum state standards, and must be reasonably consistent with the county FP plan.

Many county and local governments have recently updated, or are in the process of updating, their FP zoning ordinances (some had not done so since the 1980s). Some towns have also adopted FP zoning ordinances for the first time.

The State of Wisconsin (DATCP) may also certify "agricultural enterprise areas" (AEAs) based on local petitions.

- AEAs are *not* zoning ordinances. They do *not,* by themselves, regulate land use. But landowners in AEAs may enter into voluntary FP agreements. An FP agreement keeps farmland in agricultural use for 15 years. Farmland owners who enter into FP agreements may claim FP tax credits.
- There are now 33 AEAs, covering about 1.1 million acres. But at this time, only about 11% of the eligible farmland in AEAs is covered by FP agreements. Many landowners choose not to participate. Further, many AEAs are not targeted to areas at especial risk of farmland loss to development.
- Some AEAs overlap with FP zoning districts. Landowners may claim higher FP tax credits if their land is covered by both FP zoning *and* an FP agreement.

In summary, farmland owners may claim FP tax credits ($5-10 per acre) if all of the following apply:

- Their land is covered by FP zoning or (if the land is located in an AEA) by an individual FP agreement, or both. About 1/3 of Wisconsin farmland is eligible.
- Their land is farmed in compliance with Wisconsin *agricultural performance standards,* to protect soil and water resources (counties certify compliance).

All told, Wisconsin farmland owners receive about $20 million in FP tax credits each year. However, many eligible farmland owners choose not to claim FP tax credits (some say the tax credits do not adequately compensate them for conservation compliance costs).

Farmland Conservation Easements

In 2009, Wisconsin enacted a f*armland conservation easement* program (PACE). Under the PACE program, the state offered competitive grants to counties, local governments and nonprofit conservation entities, to cost-share the purchase of FP easements from willing landowners. Under a PACE easement, the landowner continues to own, manage, and use the land. The easement merely prevents current and future owners from developing the land in a way that precludes agricultural use. Easements can provide a very durable form of farmland protection, because they are legally binding in perpetuity. Although the PACE program is still on the books, state funding has been eliminated since 2012. So the program is no longer active.

Obstacles to Farmland Preservation

Wisconsin has one of the most comprehensive FP programs in the nation, and program participation has been relatively stable. But FP zoning and agreements cover only about 1/3 of Wisconsin farmland, and Wisconsin continues to see a steady *overall* decline in farm numbers and farmland acreage. There are many underlying reasons for this:

- Wisconsin's population continues to grow (rapidly in some areas). Reasonable urban development and expansion must be accommodated. Municipal annexations can override FP plans and zoning ordinances.
- Within applicable limits, landowners have wide latitude to use their land as they see fit. Competing interests may outweigh a landowner's commitment to farmland preservation. Other land uses may offer higher financial returns, regardless of FP incentives.
- Although Wisconsin law mandates a county and local planning process, and provides important FP tools and incentives, *it does not dictate outcomes.*
  - County and local governments are primarily responsible for land use planning and regulation, and their decisions are driven by local constituent pressure.
  - County and local governments decide which farmland should be protected, and how.
  - If local development pressure outweighs local support for FP zoning, a local government may opt to reduce or eliminate an FP zoning district. A local government may also rezone individual parcels out of an FP zoning district, at the request of parcel owners.
  - Public infrastructure projects (roads, power lines, pipelines, federal, and state land purchases, etc.) can override local FP zoning and FP agreements.
  - Municipal annexations can override county and town FP zoning, as well as state AEA designations (individual FP contracts remain in effect until they expire).
  - Cash-strapped county and local governments often favor non-farm development, because it can generate higher local property tax revenues. Wisconsin's "use value" property tax assessment program keeps farm property taxes low, relative to non-farm property taxes.
- In many areas, there is a traditional distrust of land use planning and regulation.
- Farmers themselves may be ambivalent about farmland preservation:
  - Many farmers support FP in the abstract, but want to keep their own options open.
  - Wisconsin farmers are, on average, nearly 60 years old. Their land is their "retirement fund," and selling for development may give them a bigger payout. Fewer farmers are turning over their family operations to the next generation.
  - In some cases, farming is no longer an economically viable option.
- Absentee owners now hold 1/3 of Wisconsin's farmland.
  - Absentee owners may be less inclined to keep the land in agricultural use.
  - Absentee owners and their renters may be less aware of, and less committed to, land conservation practices.
  - Some absentee owners acquire farmland for development or speculative investment purposes. Low farmland property taxes allow them to hold land at relatively low cost, pending development or resale.

- Farmland owners can collect FP tax credits for years, then have their land rezoned for development without penalty.

  Note: In 2012, the Wisconsin Legislature repealed the "conversion fee" that farmland owners were required to pay if their land was rezoned out of an FP zoning district at their request. The original FP law (1977) had included a tax credit payback requirement, which was changed to a simpler "conversion fee" in 2009.

- Current FP tax credits may not be adequate to ensure strong landowner participation, or to mobilize strong landowner support.
  - Many eligible landowners choose not to claim FP tax credits.
  - For some landowners, FP tax credits may not justify compliance costs.
  - FP tax credit relief ($20 million per year statewide) is relatively small compared to other farm tax relief such as "use value" property tax assessment and the Manufacturing and Agriculture (MAC) income tax credit.

- Some landowners may not be fully aware of the FP program, or FP tax credit opportunities.

WORKGROUP RECOMMENDATIONS

Our future depends on saving our farmland resources and using them wisely. But farmland resources are connected in complex and sometimes contradictory ways to people, communities, local economies, and the environment. So farmland preservation is complex, and must be approached from multiple angles. We offer the following recommendations as a starting point:

Overall Goal

Our overall goal is to maintain economically and environmentally resilient working landscapes.

Enabling Conditions

Success in achieving our overall goal will depend on the following enabling conditions:

- *Public understanding.* We cannot maintain resilient working landscapes if we fail to understand the powerful connections between food, land, water, and quality of life. We must take the long view, and understand that farms and urban areas are interrelated parts of a single organism.

- *Compact and livable urban communities.* Well-planned, compact and livable urban communities will minimize wasteful "sprawl" that needlessly destroys our farmland resources.

- *Strong rural communities and infrastructure.* Agriculture depends on strong rural communities and supporting infrastructure. Successful farming operations, in turn, help to sustain rural communities.

- *A strong agricultural economy.* A strong and diverse Wisconsin agricultural economy helps to sustain Wisconsin farm families, allowing them to keep their land in agricultural use.

- *Successful and diverse family farms that have roots in the land.* Sustainable working landscapes are created by diverse family farms that have access to affordable land, pride and responsibility of land ownership, strong personal ties to the community, a strong farming tradition, deep farming knowledge, a strong commitment to land stewardship, a view to the future, and a strong prospect of success.

Objectives

We propose the following strategic objectives, as part of a broad civic effort to achieve the aforementioned goal and enabling conditions:

1. Increase public awareness.
2. Support compact, livable urban communities.
3. Make use of key farmland preservation tools, including *land conservation easements.*
4. Take a regional approach to farmland preservation.
5. Support diverse and profitable family farms, and the next generation of farmers.

Achieving Our Objectives

OBJECTIVE 1: Increase public awareness.

The Challenge:

Sweeping land use changes often reveal themselves gradually, over time. They are the sum of countless individual decisions and transactions. We may fail to see the underlying trends if we are not paying attention. As years turn to decades, we may wake up to find ourselves – as if by accident – in a radically altered and potentially inhospitable place. If we want a sustainable and harmonious future, we must take a longer and more comprehensive view. We must connect the dots, and see the big picture. We must understand the powerful connections between food, land, water, and quality of life, and between urban and rural areas.

Strategies:

- Regularly collect, compile, and publish key land use information:
  - Identify and map key land resources, including soils, topography, geology, watersheds, land cover, and other key natural features.
  - Identify and map existing land uses, including agricultural, residential, commercial, manufacturing, transportation, recreation, and infrastructure uses.
  - Monitor key land use drivers, including population and economic trends, housing and development trends, agricultural and business trends, recreation and tourism trends, and transportation and infrastructure trends.
  - Monitor key land use changes, including farmland conversions.
  - Monitor soil loss, nutrient runoff, water quality, and other signs of resource degradation.
  - Identify key food system requirements, including land, water, and infrastructure needs.
  - Monitor trends in farmland ownership, including absentee ownership, ownership concentration, alien ownership, and corporate ownership.
  - Use available information to project emerging trends and issues.
  - Make it easier for people to see the connections, and understand the big picture.

Note: See, e.g., UW-Stevens Point "Mega Trends" website at https://www.uwsp.edu/cnr-ap/clue/Documents/megatrends/Megatrends%20Agriculture.pdf

- Work together, at all levels, to improve our shared information base.
  - Take a broad, strategic approach. Focus on key information needs.
  - Coordinate government, academic, business, nonprofit, farm, and community efforts.
  - Work across traditional dividing lines. Break out of restrictive habits and information "silos."
  - Improve data collection, data sharing, data management, analysis, and reporting.
  - Identify, and work to resolve, information gaps and discrepancies.

- Expand our vision:
  - Work to understand Wisconsin's farm and food industry. Consider its resource needs and impacts, and the forces that affect it.
  - Think of urban and rural areas as interdependent parts of a single organism, rather than separate worlds. Work for the health of the whole organism.
  - Consider the importance of farmland in urbanizing areas: open space, diversified food supply, flood and storm water control, groundwater recharge, food industry employment, local character and quality of life, and connections to other key resources and community assets.
  - Consider how farm conservation practices can bolster the public image of Wisconsin's agricultural and food industry, and build public support.

- Highlight farmland preservation as a key part of the local planning and zoning process:
  - Provide strong state support for county and local FP planning. Provide FP training, planning grants, information, and technical assistance. Expand current support where possible, and focus on key regional challenges (see Objective 4).
  - Ensure that county FP plans are updated on a regular periodic basis, and are well integrated into county comprehensive plans.
  - Invite stakeholder input, to ensure well-informed FP plans.
  - Offer statewide FP training for local planning and zoning officials. Develop well-coordinated training programs and strategies, drawing on the expertise of DATCP and other state agencies, the UW, the WI Counties Assn., the WI Towns Assn., nonprofits, and key stakeholder groups.

    Note: See, for example, UW-Extension, Center for Land Use Education, workshops for local plan commission members: http://www.uwsp.edu/cnr-ap/clue/Pages/workshops/workshopspc.aspx .

- Build public understanding and support.
  - Promote understanding by public officials, the news media, and the general public. Provide objective, useful background information on key issues.
  - Sponsor a statewide FP study tour for public officials and news media, to acquaint them with key challenges and alternative approaches.
  - Mobilize dairy and food industry support to preserve the farmland base on which those industries depend.
  - Build a positive public image for agriculture, based on a credible industry commitment to land stewardship and natural resource protection.
  - Work with community stakeholders to identify and protect key farmland, and related natural and community assets.
  - Promote food, land, and water resource literacy in our schools, academic institutions, and communities.

OBJECTIVE 2: SUPPORT COMPACT, LIVABLE URBAN COMMUNITIES.

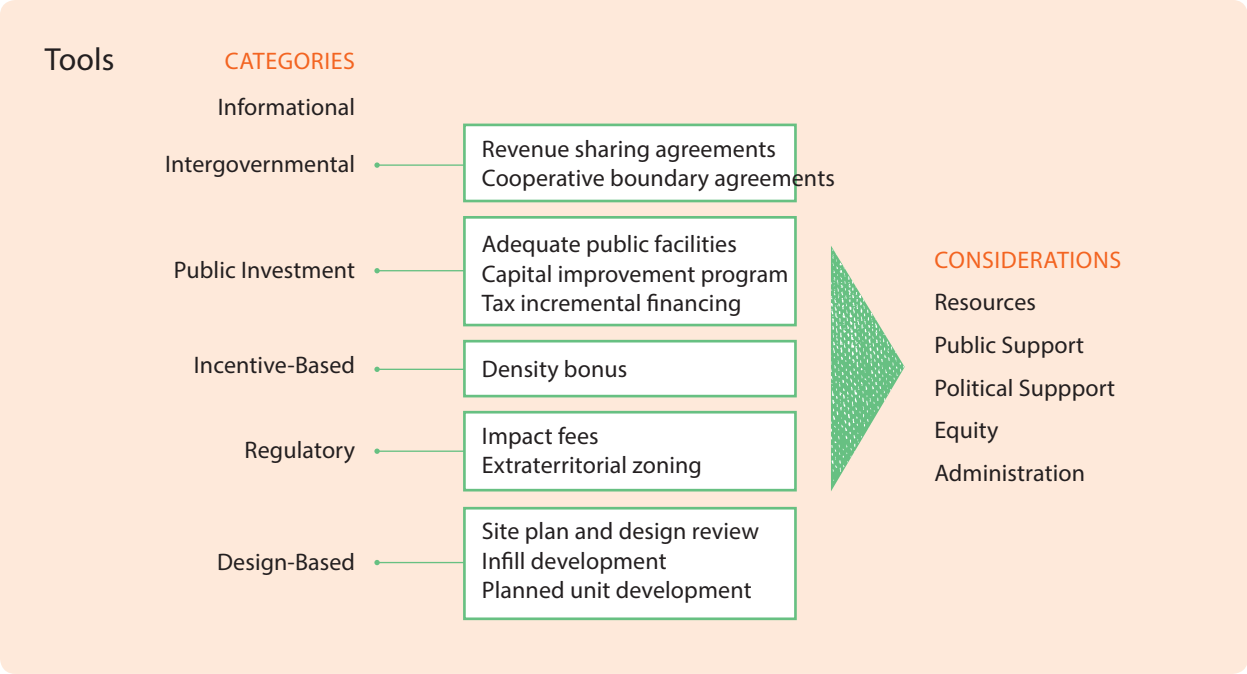
The Challenge:

As Wisconsin's population continues to grow, some conversion of agricultural land is unavoidable. But we should not sacrifice important farmland resources to wasteful urban and suburban "sprawl." One nationwide study found that "sprawl" development increases land conversions by 21%, road lane-miles by 10%, annual public service costs by 10%, and housing occupancy costs by 8%[1]. We can save farmland and money (including transportation dollars) by encouraging more compact urban development and infill.

Strategies:

- Support compact urban development, urban infill, efficient urban transportation, strong urban schools, and livable urban communities, so as to reduce wasteful "sprawl."
- Support effective urban and regional planning:
  - Coordinate housing, development, transportation, infrastructure, water management, FP, and other plans to support compact urban communities and infill development.
  - Coordinate state, county, and local plans to achieve harmonious regional solutions (see Objective 4).
- Provide incentives, such as Tax Incremental Financing (TIF), for urban infill development.
- Tie new development to municipal infrastructure, such as sewer and water. This simple requirement can help to limit wasteful "sprawl."
- Support transportation solutions that minimize consumption of farmland. Consider alternative transportation options, such as subsidized urban mass transit, and inter-urban buses and commuter shuttles.
- Address the agricultural impact of major infrastructure projects such as roads, transmission lines, and pipelines.
  - Expand current agricultural impact assessments to consider long-term development impacts, as well as immediate impacts on individual farms.
  - Require mitigation of current and projected future agricultural impacts.
  - Consider a "farmland mitigation" requirement for major infrastructure projects (comparable to current "wetland mitigation" requirements). Require the project sponsor to fund FP easements on two acres of farmland for every acre destroyed by the infrastructure project.
  - Coordinate state infrastructure planning with county and local governments, and ensure that FP is a key consideration in the planning process.
- Draw upon all available tools to support compact urban communities and infill development (see chart on next page).

[1] Conventional Development Versus Managed Growth: The Costs of Sprawl. Robert W. Burchell, PhD, and Sahan Mukherji. American Journal of Public Health, September 2003, Vol 93, No. 9 http://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.93.9.1534



OBJECTIVE 3: Make use of key farmland preservation tools, including farmland conservation easements.

The Challenge:

We should not think of farmland preservation (FP) as an isolated program, but as an integral part of our overall land use and development strategy. We can deploy a wide range of existing land use planning and implementation tools to achieve our FP, resource conservation, and community improvement goals. But we should also add some FP tools that are known to be effective. For example, Wisconsin currently lacks an active, funded program for the purchase of farmland development rights (farmland conservation easements). According to state and national experts, farmland conservation easements are the single most durable tool for protecting farmland, because they continue in perpetuity. We should make sure that this and other tools are available for use, where appropriate. But much will still depend on community vision, farmer support, and grass roots organization.

Strategies:

- Consider all available land use planning and implementation tools (not just FP program tools) to protect farmland, promote sound conservation practices, and encourage more compact urban development and infill (see Objective 2).
- Restore state funding for the *PACE conservation easement program* (see description, p. 68), an essential tool for durable farmland protection.
  - Use PACE funding to leverage farmland conservation easement funding from other sources.
  - Use voluntarily granted, PACE-funded easements to protect especially important farmland parcels from non-farm development (see criteria in Wis. Stats. s. 93.73).

- Develop model easement forms and procedures, with input from farmers, local governments, and other stakeholders (DATCP has already done much of this work).
- Provide state guidance related to local property tax assessment of land covered by farmland conservation easements (Dept. of Revenue).
- Consider potential revenue sources for PACE funding, such as a reasonable FP tax credit payback or "conversion fee" requirement on land rezoned out of FP at the owner's request (other states use this approach, as did Wisconsin prior to 2012).

- Strengthen the current agricultural enterprise area (AEA) program to encourage more active landowner participation (at this time, only about 11% of eligible farmland in AEAs is covered by FP agreements), and encourage its use in areas vulnerable to farmland conversion. Consider higher FP tax credits, or state protection against municipal annexation of AEA land that is covered by FP agreements.

- Consider other tools and incentives to promote FP and conservation practices. Here are some possible examples:
  - Increase current FP tax credits (available in FP zoning districts and AEAs), to provide more attractive rewards for FP and conservation compliance.
  - Create *separate* tax credits for FP and conservation compliance. *FP credits* would only be available in FP zoning districts and AEAs (as now), but *conservation credits* would be available *statewide.* Farmers in FP zoning districts and AEAs could claim *both* credits, if they met FP *and* conservation standards.

- Request a Legislative Council study to consider whether current farm tax relief programs (such as "use value assessment" and the MAC farm income tax credit) support farmland preservation and conservation compliance, and whether improvements are possible.
  - Consider whether modifications could augment FP and conservation compliance, and more effectively target tax relief benefits.
  - Consider whether eligibility should be contingent on farmland preservation and conservation compliance.
  - Consider ways to prevent developers, land speculators, and non-residents from taking advantage of tax relief intended for Wisconsin farmers.
  - Consider whether "use-value assessment" property tax relief could be converted to state income tax relief and limited to Wisconsin residents.

- Consider new FP funding sources. Here are some possible examples:
  - Reinstate a reasonable FP tax credit payback or "conversion fee" for land rezoned out of FP at the owner's request (other states use this approach, as did Wisconsin prior to 2012).
  - Consider reasonable fees on farmland sales, or at least on farmland that is platted for non-farm development.

- Ensure a sustained commitment of resources, information, and technical support to county and local officials, to assist FP planning, implementation, and compliance monitoring.

OBJECTIVE 4: TAKE A REGIONAL APPROACH TO FARMLAND PRESERVATION.

The Challenge:

There is no "one-size-fits-all" approach to farmland preservation (FP). There are wide regional variations in land resources, land uses, land values, population, development pressure, and resource threats. We need a strong statewide commitment to FP; but we must also recognize important regional differences, and focus on the most important regional problems.

County and local governments are primarily responsible for FP planning. But FP and related resource protection issues often transcend local jurisdictional boundaries. Land uses in one jurisdiction can have a strong effect on land uses and water quality in other jurisdictions. State-approved infrastructure projects also transcend local boundaries, and strongly affect regional land uses. Cooperative working relationships, and a regionally focused approach, can facilitate "win-win" solutions.

Strategies:

- Take a more regional approach to FP:
  - Identify, and give high priority to, key regions of concern.
  - Direct state planning grants and other resources toward priority regions.
  - Focus on saving the most important farmland.
  - Integrate FP planning with other state and regional planning.
  - Encourage regional cooperation.
- Cooperate to address regional FP challenges that transcend local boundaries.
  - Encourage county and local governments to work together, on a cooperative basis, to identify and address key regional challenges.
  - Reward county and local governments that work together. Provide grant funding for cooperative projects.
  - Help local governments to resolve jurisdictional disputes and achieve harmonious regional solutions. Provide information, technical assistance, and mediation.
  - Work with regional planning agencies, where they exist.
- Coordinate regional watershed management plans with FP plans. Recognize that land use affects water quality.
- Harmonize state and regional infrastructure plans with FP plans, to minimize farmland loss (see Objective 2).
- Provide state support, but maintain county and local flexibility to address key issues in locally appropriate ways.

OBJECTIVE 5: Support diverse and profitable family farms, and the next generation of farmers.

The Challenge:

Sustainable working landscapes are created by diverse family farms that have access to affordable land, pride and responsibility of land ownership, strong personal ties to the community, a strong farming tradition, deep farming knowledge, a strong commitment to land stewardship, a view to the future, and a strong prospect of success. Farmland cannot be preserved for future generations if farming is not profitable and if future generations lack incentives to enter farming. In recent decades, farmers have faced serious challenges:

- Intense national and global competition.
- Increased market volatility and risk.
- Steady loss of farms (especially medium-size family farms).
- Growing concentration of farm ownership.
- Growing concentration of economic power in input and commodity markets, putting farmers at an economic disadvantage.
- Intense market pressure to squeeze more out of every acre.
- Weakened rural communities and infrastructure.
- More absentee and speculative ownership of farmland.
- Land shortages, and high land acquisition costs.
- Aging farm owners, and a younger generation that is leaving the land.
- Difficulty in attracting young talent.

Farm profitability and career choices are driven by large economic and social forces, over which we have limited control. But public policies, services, and land use decisions can make a difference at the margin. We should support diverse, economically sustainable, and environmentally sustainable family farms as a way to preserve our farm landscapes.

Strategies:

- Consider how state and local policies – including tax, land use, public investment, and development policies – can support diverse, economically sustainable and environmentally sustainable family farms (especially mid-size family farms that have been declining rapidly).

- Consider a one-stop program (within DATCP's Farm Center), which offers proactive information and support for beginning farmers. Provide information on alternative farming models, farm organization, farm management, business plans, financing, marketing, farm acquisition and transition opportunities, training opportunities, federal and state assistance, farm support networks, and farm conservation standards and practices.
- Work to match farm sellers with beginning farmers who are looking to buy. Develop, promote, and implement a "land link" program for this purpose.
- Provide tax relief or other incentives for sellers who offer farmland covered by farm conservation easements.
- Consider farm tax relief or other incentives that support farm profitability and beginning farmers while *also* encouraging farmland preservation and conservation compliance. Consider the distribution, effectiveness, and collateral impact of current tax relief policies.

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