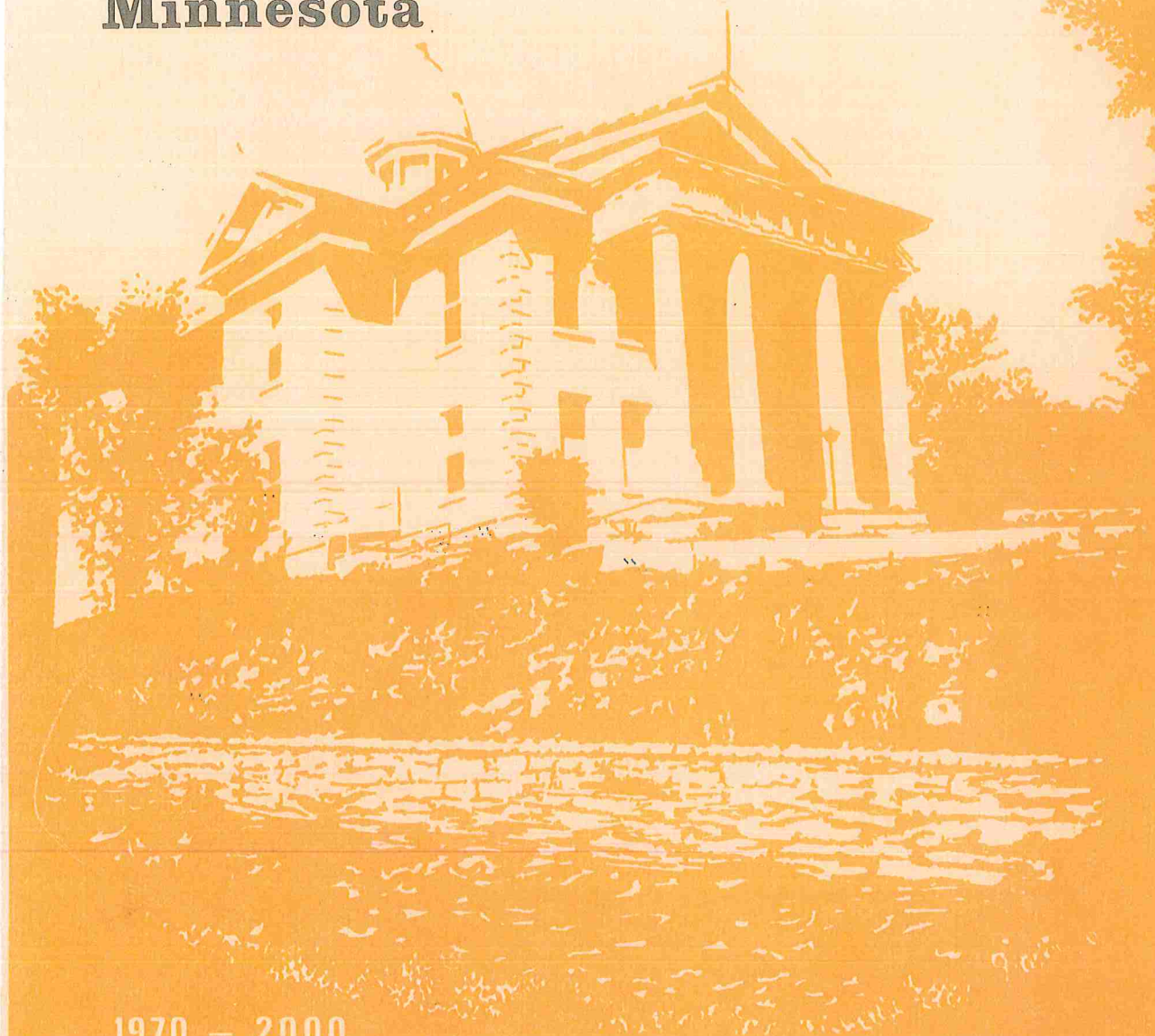


# **Dodge County**

## **Minnesota**



**1970 — 2000  
COMPREHENSIVE COUNTY  
DEVELOPMENT PLAN**

# The Comprehensive Plan And Process

Under a comprehensive planning program, the county uses foresight to ensure the most rational development. The result of such a program, properly carried out, is a more desirable environment in which to live and work; it is an area with better housing, better traffic circulation and, generally a more desirable and efficient use of land, both public and private. In addition to this, proper planning can result in great economies in government through proper use of tax funds to accomplish county objectives.

A proper planning program is more than just a Comprehensive Plan. It is an action program to achieve specific goals. Its success is measured in specified actions undertaken and actual projects built, not merely reports or documents.

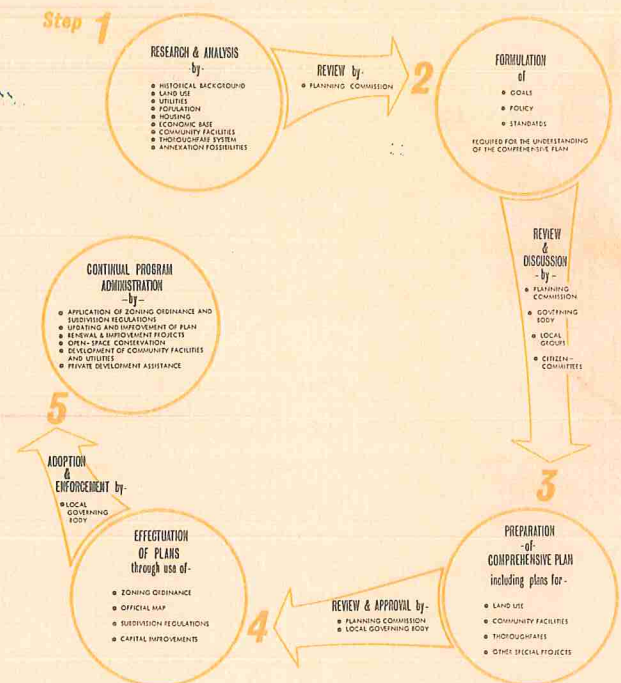
A plan is only as accurate as the information it is based on. Pertinent information must be continually updated, examined, and analyzed before any plans can be made. This step in the planning program is the Survey and Analysis. The analysis should reveal the county's assets, needs and problems.

A general statement of goals, policies and standards follows the Survey and Analysis, allowing the Planning Commission to express the general values and goals of the citizens in regard to the future environment. Through such a statement, a consensus on the direction of future development can be formed, because it indicates broad objectives and how they can be realized, it provides a focus for the formation of plans.

Once the goals and objectives have been stated and the research accomplished, a Comprehensive Plan can be prepared. This Plan attempts to indicate how private and public action can achieve county goals by utilizing county policies over the next 20 to 30 years. A plan synthesizes the available information and organizes it in various ways to meet specific problems. A plan is by no means a rigid design for the future; it suggests solutions to specific current problems and to those future problems that can be foreseen. It is a program for action and a guide to future development. For it to be effective, the county must carry it out, not in 20 years, but

continuously. This Comprehensive Planning Report is intended as a broad base for further detailed study and planning of specific projects and problems by the county, its officials and citizens.

If a plan is viewed as a directive for action, its success depends upon the way it is implemented. One way a plan can be put into operation is by public action. If the county builds its public buildings and its civic developments in accordance with the plan, much can be done to carry out the proposals of the plan. Private action is also important in effectuating the plan. The plan molds private development in two ways: by regulations, such as subdivision regulations and zoning ordinance, requiring minimum standards of development; and by influence on private citizens to utilize their land in accordance with broad county objectives, benefiting all residents of the county.



Through enabling legislation, the Minnesota State Legislature has given the county the authority to enact a number of local codes and ordinances to protect the environment and the general welfare of the citizens. Undoubtedly, there will be increased interest and emphasis in the area of environmental preservation and additional regulatory measures will be adopted. In order for these measures to be responsive to the desires of the citizens of Dodge County, the citizens must take an active interest and participate positively in the development of these measures.

*Periodic Review  
and Revision*

To be effective, a plan must be revised periodically. Such updating, to make it compatible with changing conditions and an ever-useful document for public and private bodies, is a primary task of the Planning Commission utilizing the inputs of citizens and organizations both within and without the county. Only planning on a day-by-day basis can give a plan any real effect.

*A Joint Venture:  
County, State,  
and Federal*

The present planning program is a joint venture by the County, State, and Federal governments and is intended as a broad overlook of the numerous potential development aspects and problems of the county. The plan is a departure from the traditional approach of the Comprehensive Planning, in that it is a policy plan, rather than a delineation of specific uses for each individual parcel of land within the county. There are, however, specific recommendations for certain land uses and practices in certain areas of Dodge County. The recommendations contained are those most applicable to the situation after review of past and present conditions by the Planning Commission. Since some recommendations are the result of conversations with various individuals and agencies concerned with the county's development and tempered by the consultant's experiences, they will undoubtedly be subject to question. Nevertheless, the recommendations should provide a basis for the development of more detailed recommendations and plans in specific areas and provide for the orderly growth of the county.

*Creating a  
Dialogue*

In addition to the role of comprehensive planning, it is hoped that the program will serve as a coordinating instrument for all persons and agencies interested in the county's development. The County Planning and Zoning Advisory Commission will serve as a forum and resource for discussion and dissemination of pertinent information on county development problems and potentials. All persons and agencies interested in the county's development are urged to participate in the activities of the County Planning and Zoning Advisory Commission and utilize its resources.

# Goals For Development

The county should be developed in accordance with the Comprehensive Development Plan. Such plan should consist of the separate but related plans of the member municipalities within the county.

All development should take place in recognition of surface water drainage and preservation of ground water resources.

Local, planning district, school district, county, regional, state and federal planning should be coordinated in order to avoid conflicts, duplication, excessive public service costs, and other ill-effects.



COURTHOUSE-MANTORVILLE



VILLAGE OF MANTORVILLE

Major public expenditures should be in accordance with a capital improvements program and budget which establishes priority and schedules in advance, based on projections of need and estimated financial resources.

Develop a uniform set of standards for development applicable to the entire county.

Areas of prime agricultural potential should be retained in agricultural use and these should be outstanding examples of land management practices.

Protect agricultural and wildlife areas from the effects of urban and agricultural misuse.

To provide access parks to major streams and potential recreation areas.



SOUTH BRANCH-MIDDLE FORK ZUMBRO RIVER

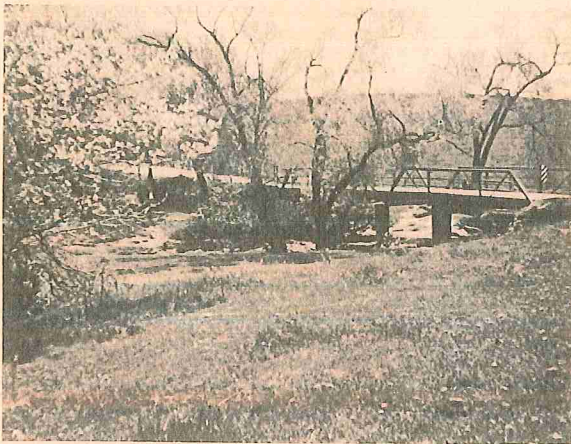
Develop an open space and recreation system properly related to and coordinated with those of other governmental jurisdictions with principal consideration for those sites with valuable natural amenities.

Preservation of the low, swampy areas for wildlife development where such preservation can aid in the relief of down-stream flood potential.

Rural areas should be developed so that normal urban facilities such as sanitary sewer and public water will not be required for twenty years or more.

The county and municipalities should coordinate efforts to develop a plan for sanitary sewer, storm drainage, and public water in areas adjacent to the municipalities within the county.

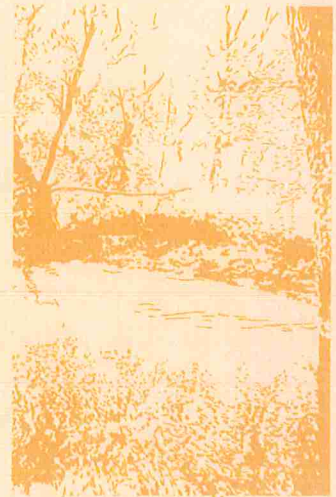
To insure that major woodland tracts and principal stands of trees are retained, as the highest and best use of the limited land areas presently existing in such use.



To protect scenic values by controlling billboards, signs, auto junk yards, excavation areas and other potentially unsightly land uses and practices.

To preserve the relatively few outstanding historical and aesthetically scenic areas of the county in public or private ownership. Such areas are principally along the North Middle and Middle Forks of the Zumbro.

To recognize existing flood plains and prohibit intensive development, reserving such areas for agriculture, open space and recreation. Surface water courses should be retained in their natural state on both sides of the stream channel to avoid bank erosion and degradation. Cultivating and excessive grazing of the stream banks must be eliminated.



*Only when we concern ourselves with the orderly development of our environment can we begin to take the steps necessary to effectively shape our future. To survive as a people we must strive to balance mans' development with that of nature. To aid us in our task we have at our command greater resources than ever before in the history of man. The task will be difficult to accomplish, but failure will mean certain catastrophe. The planning process is but a beginning down the long and extremely difficult road to peace with nature.*

# General Development Policies

Excellence of site and building design will be a factor in approving or disapproving all development proposals.

It will be the general policy of the governing body that development will be encouraged and extended full cooperation, however, the welfare of the general public and the intent of the Comprehensive Plan will be of primary importance.

Rezoning shall not be granted unless the proposal is shown to be in accordance with the intent of the Comprehensive Plan and Zoning Ordinance.

Regulatory measures and procedures will be modified in recognition of the needs of contemporary situations and the need to properly control such situations; the development policy will not be rigid and inflexible, but neither shall it be indiscriminately permissive.

The six villages of the county are to be encouraged to develop detailed comprehensive plans for their potential growth.



VILLAGE OF KASSON

The corporate limits of Dodge Center, West Concord, Kasson and Mantorville should be reviewed for potential annexation.

Dense residential development in Dodge County should be contained within the incorporated limits of Dodge Center, Kasson, Mantorville, Claremont, Hayfield and West Concord.

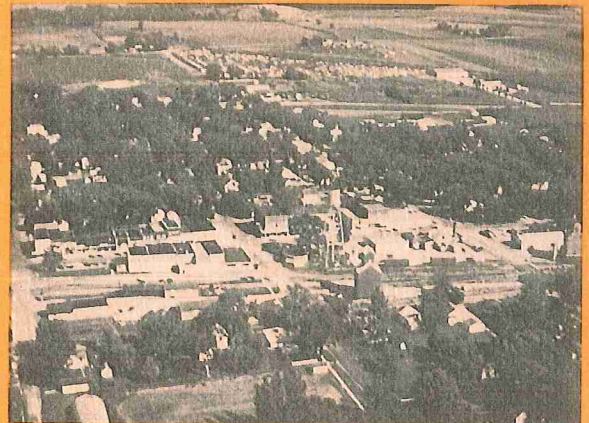
Historic preservation and restoration shall be continued in Wasioja and Mantorville and development in restoration areas shall conform to the established historic styles and architecture.

Development beyond the incorporated limits of the villages will be restricted to agricultural, conservation-recreational and farm residential uses.

All development shall comply with the intent if not the letter of regulations established by the County Board in order to guide and direct the development within Dodge County.



VILLAGE OF HAYFIELD



VILLAGE OF DODGE CENTER

# FIVE WAYS TO PROTECT PETS THIS WINTER

## FOLLOW THESE TIPS TO KEEP ANIMALS SAFE AND COMFORTABLE IN THE COLD

In many areas, winter is a season of bitter cold and numbing wetness. Make sure your four-footed family members stay safe and warm by following these simple guidelines.

### KEEP PETS SHELTERED

Keep your pets inside with you and your family. Under no circumstances should pet cats be left outdoors. Dogs are happiest when taken out frequently for walks and exercise, but kept inside the rest of the time. Don't leave pets outdoors when the temperature drops.

### BUNDLE UP, WIPE DOWN

No matter what the temperature is, windchill can threaten a pet's life. Exposed skin on noses, ears and paw pads are at risk for frostbite and hypothermia during extreme cold snaps. For this reason, short-haired dogs often feel more comfortable wearing a sweater—even during short walks.

Rock salt and other chemicals used to melt snow and ice can irritate the pads of your pet's feet. Wipe all paws with a damp towel before your pet licks them and irritates their mouth.

### REMOVE COMMON POISONS

Antifreeze is a deadly poison. Wipe up any antifreeze spills immediately and keep it, like all household chemicals, out of reach. Coolants and antifreeze made with propylene glycol are less toxic to pets, wildlife and family.

Dogs are at particular risk of salt poisoning in winter due to the rock salt used in many areas—often when licking it

from their paws after a walk. Store de-icing salt in a safe place and wipe your dog's paws, even after short walks. If your dog ingests rock salt, call a veterinarian immediately.

### PROTECT OUTDOOR ANIMALS

If there are outdoor cats, either owned pets or community cats in your area, remember that they need protection from the elements as well as food and water. It's easy to give them a hand.

You can make your own cat shelter quickly and easily with a plastic tub.

Cars are one of many hazards to small animals—warm engines in parked cars attract cats and small wildlife, who may crawl up under the hood. To avoid injuring any hidden animals, bang on your car's hood to scare them away before starting your engine.

### HORSE CARE

Be sure your horses have access to a barn or a three-sided run-in so they can escape the wind and cold. While not all horses will need to be blanketed, blankets will help horses keep warm and dry, especially if there is any rain or snow. If you've body-clipped your horses, keep them blanketed throughout the winter.

Give your horses access to unfrozen water at all times. You can use heated buckets

or water heaters/de-icers to make sure the water doesn't freeze. Also, be sure to feed your horses more forage—unlimited amounts, if possible—during extreme cold. This will help your horses create heat and regulate their body temperatures.

### SPEAK OUT

If you encounter an animal left in the cold, politely let the owner know you're concerned. Some people genuinely don't know the risk that cold weather poses to their pets or farm animals and will be quick to correct any problems you address. If someone you raise these concerns with responds poorly or you continue to be concerned about the well-being of their animals, contact your local animal control or law enforcement.

### WHAT TO DO IF YOU SEE A PET LEFT OUT IN THE COLD

It can be a crime to leave pets outside in extreme temperatures without food and shelter.

Cold weather can be deadly for pets. As the temperature plummets in many parts of the country, the Humane Society of the United States sees a marked increase in the number of complaints about dogs and cats who have been left outside with no food or shelter.

We encourage you to contact local law enforcement agencies because pets left outside in extreme temperatures, especially without food and shelter,

are at risk of hypothermia, frostbite and even death.

### HOW YOU CAN HELP

- Report what you see: Take note of the date, time, exact location and the type of animal(s) involved and write down as many details as possible about the situation. Video and photographic documentation of the animal, the location, the surrounding area, etc. (including a cell phone photo) will help bolster your case.
- Contact your local animal control agency or county sheriff's office and present your complaint and evidence. Take detailed notes regarding whom you speak with and when. Respectfully follow up in a few days if the situation has not been remedied.
- If you have tried those channels and still need advice, call the Humane Society of the United States or email us at [animalcruelty@humanesociety.org](mailto:animalcruelty@humanesociety.org). Because we aren't a law-enforcement agency, we cannot take legal action, but we can provide expert advice.



THE HUMANE SOCIETY  
OF THE UNITED STATES

1255 23rd Street, NW, Suite 450  
Washington, DC 20037  
[humanesociety.org](http://humanesociety.org)

# CONSERVATION MINNESOTA

WINTER ❄️ 2019



CONSERVATION  
MINNESOTA

# CLEAN ENERGY IN ROCHESTER

## Turning the Tides in Half a Decade

As Anna Richey, Southern Minnesota Regional Manager, was just settling into her role in 2014, Conservation Minnesota sent an energy survey to residents in several communities, including Rochester. The results were overwhelmingly positive, showing around 80% support for clean energy and utility leadership. Yet, Anna was told Rochester's municipal power structure made renewable energy unreasonable and unaffordable for the community.



**Anna Richey**  
Southern MN Regional Manager

Despite this skepticism, the survey became the impetus for Rochester Public Utilities (RPU) to conduct their own clean energy survey. As it turned out, our results were conservative and community support was closer to 85%. With this information in hand, Rochester began to take action.

With a regional manager in the Rochester community, we were ready to engage. Anna made sure she had a seat at the table for the subsequent stakeholder meetings. She gave a voice to the many reasons clean energy is good for the community—economically and environmentally. And in early 2015 she was asked to serve on the City's Energy Commission.

During the last 5 years, Rochester has evaluated its energy portfolio, developed and adopted an Energy Action Plan, and hired new staff to address the changing picture of energy delivery and management, and Anna was involved throughout the process. Last summer, RPU put forward a **first-of-its-kind proposal for a municipal utility—be 100% renewable by 2050** and achieve 50% renewable energy by the time their current power contract expires in 2030. This commitment to a clean energy transition will make the city a pioneer in energy the same way it's long been a pioneer in medical innovation and computer technology.

# 4 THINGS TO KNOW ABOUT ELECTRIC VEHICLES

## 1 EVs can handle MN winters

Fuel mileage of all vehicles is impacted by extreme cold. In a gas-powered car, your fuel lines can freeze and your battery can die. While cold can affect an EV's battery life up to 30%, an average commute is 40 miles, still well below an electric vehicle's range of at least 150 miles. And, with an EV in your garage, you leave every morning with a full tank. No stopping to fill up in the freezing cold.

## 2 EVs have a lower carbon footprint than traditional vehicles

Total emissions for an EV are between 25% and 65% lower than those from a conventional car. EVs emit no tailpipe pollutants and are far more efficient at converting energy into power. When an EV and a gas-powered vehicle roll off the dealer's lot, the EV may have higher emissions due to the battery—which is 95% recyclable, unlike oil and gas. After that, the gas-powered car rapidly passes the EV in total emissions.



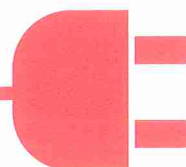
Electric Vehicles, or EVs, are getting a lot of attention these days. Here are a few things to know about this transportation transformation.

### 3 EVs plug into a grid that's getting cleaner everyday

We are in the midst of an energy transformation and in Minnesota almost 50% of our power generation is carbon-free. Low-cost clean energy is rapidly making coal-fired plants obsolete. Xcel Energy, Minnesota's largest producer of power, has a plan to be 100% carbon free by 2050. As a bonus, EVs help stabilize the grid. Most EVs get plugged in at night, when our grid experiences a drop in demand. EV load is predictable, manageable, and welcomed by utilities.

### 4 EVs save you money

Electricity as a power source is less expensive and more stable than gas. Without oil changes or tune-ups, spark plugs, valves, mufflers, distributors, starters, clutches, drive belts, hoses, or catalytic converters, EVs are also far cheaper to maintain. Today the purchase price of EVs is dropping and, with current federal rebates, new EVs are on par with a Toyota Camry or Honda Accord.



FROM THE EXECUTIVE DIRECTOR

## CLEAN CARS MINNESOTA

In late September, Governor Walz announced the **Clean Cars Minnesota initiative to reduce climate pollution** and protect the quality of our air and water. This is a critical step forward for Minnesota because our transportation sector has become the number one source of climate change-causing pollution.

Tailpipe exhaust from gas-powered cars not only creates climate pollution, it creates air quality problems resulting in serious public health concerns. According to the Minnesota Pollution Control Agency's "Life and Breath" report, **poor air quality contributed to 2,000 to 4,000 premature deaths** in 2013.



**Paul Austin**  
Executive Director

Governor Walz's action will make Minnesota the 15th state to implement Clean Car Standards, the first in the Midwest.

**States with Clean Car Standards provide more vehicle choices to their residents.** Currently, less than half of the available electric vehicle models sold nationally are available in Minnesota. Clean Cars Minnesota will increase our access to these vehicles.

The first phase of the Clean Cars Minnesota rulemaking process is a public comment period initiated by the Minnesota Pollution Control Agency (MPCA). For information on submitting a comment, visit our website at **[ConservationMinnesota.org/CleanCars](http://ConservationMinnesota.org/CleanCars)**.

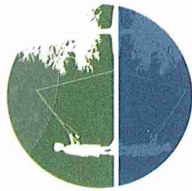


Clean Cars Minnesota will help produce less pollution, save money at the pump, provide more car options, and keep Minnesota a great place to live for generations to come.

The work of Conservation Minnesota is guided by your values and priorities. We listen to Minnesotans and focus on solving the conservation problems that matter most to you.

**[conservationminnesota.org](http://conservationminnesota.org) | 612.767.2444**





CONSERVATION  
MINNESOTA

1101 West River Parkway, Suite 250  
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# Upper Midwest Plants

## for Native Bees

Pollinators are a vital part of a healthy environment.

Native bees are North America's most important group of pollinators.

Patches of flowers can be grown almost anywhere and will form an important food resource for bees.



Bumble bee foraging on beebalm.

Photo by Eric Mader

Pollinators are a diverse and fascinating group of animals. In addition to their beauty, pollinators provide an important link in our environment by moving pollen between flowers and ensuring the growth of seeds and fruits. The work of pollinators touches our lives every day through the food we eat. Even our seasons are marked by their work: the bloom of springtime meadows, summer berry picking, pumpkins in the fall.

Native bees are the most important group of pollinators. Like all wildlife they are affected by changes in our landscapes. The good news is that there are straightforward things that you can do to help: providing patches of flowers is something that we all can do to improve our environment for these important insects. Native plants are undoubtedly the best source of food for bees, but there are also some garden plants that are great for pollinators.

This fact sheet will help you provide flowers that these vital creatures need and make the landscape around us—from small urban backyards to large natural areas—better for bees. On the back you'll find a simple guide to selecting plants for bees.

For more information, visit our web site, [www.xerces.org](http://www.xerces.org), where you will find other fact sheets and more detailed guidelines on how to enhance habitat for pollinators. You'll also find information about the *Pollinator Conservation Handbook*.

Written by  
Eric Mader and  
Matthew Shepherd



**The Xerces Society  
for Invertebrate  
Conservation**

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Portland, OR 97215  
503-232 6639

[www.xerces.org](http://www.xerces.org)

## Choosing the Right Flowers

To help bees and other pollinator insects—like butterflies—you should provide a range of plants that will offer a succession of flowers, and thus pollen and nectar, through the whole growing season. Patches of foraging habitat can be created in many different locations, from backyards and school grounds to golf courses and city parks. Even a small area planted with the right flowers will be beneficial, because each patch will add to the mosaic of habitat available to bees and other pollinators.

In such a short fact sheet it is not possible to give detailed lists of suitable plants for all areas of the Upper Midwest. Below are two lists of good bee plants, the first of native plants and the second of garden plants. Both are short lists; there are many more bee-friendly plants. However, these lists, combined with the following notes, will get you started on selecting good bee plants. Your local chapters of the Wild Ones, the Native Plant Society and native plant nurseries are worthwhile contacts for advice on choosing, obtaining, and caring for local plant species.

- **Use local native plants.** Research suggests native plants are four times more attractive to native bees than exotic flowers. In gardens, heirloom varieties of herbs and perennials can also provide good foraging.
- **Choose several colors of flowers.** Flower colors that particularly attract native bees are blue, purple, violet, white, and yellow.
- **Plant flowers in clumps.** Flowers clustered into clumps of one species will attract more pollinators than individual plants scattered through the habitat patch. Where space allows, make the clumps four feet or more in diameter.
- **Include flowers of different shapes.** Bees are all different sizes, have different tongue lengths, and will feed on different shaped flowers. Consequently, providing a range of flower shapes means more bees can benefit.
- **Have a diversity of plants flowering all season.** By having several plant species flowering at once, and a sequence of plants flowering through spring, summer, and fall, you can support a range of bee species that fly at different times of the season.

## Native Plants

Native plants should be your first choice to help our native bees. Listed below are some plants that are good sources of nectar and pollen for bees. This list is not exhaustive; there are many other plants good for bees. Individual species have not been included. Not all of these genera will have species in your local area, but they do represent plants that will grow in a variety of environments. Use a wildflower guide or contact local nurseries to find your local species.

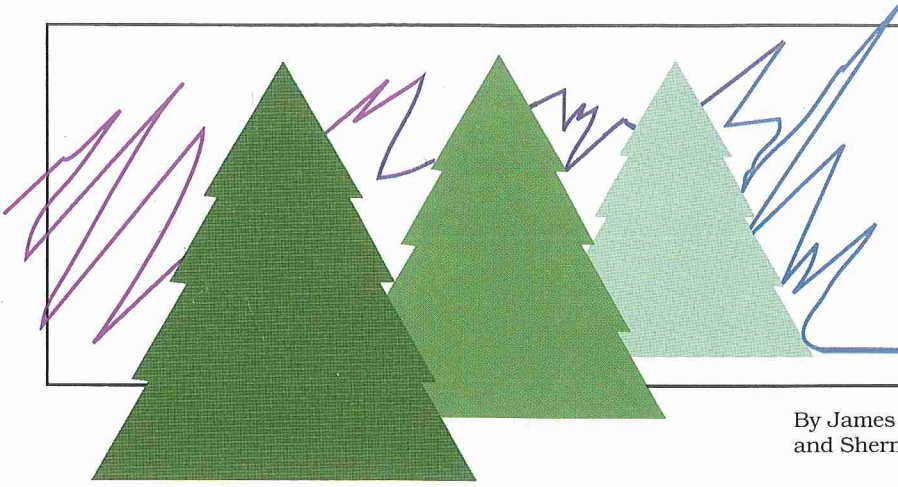
Aster	<i>Aster</i>	Lupine	<i>Lupinus</i>
Beebalm	<i>Monarda</i>	Milkweed	<i>Asclepias</i>
Blazing star	<i>Liatris</i>	New Jersey tea	<i>Ceanothus</i>
Cup plant	<i>Silphium</i>	Obedient plant	<i>Physostegia</i>
Wild indigo	<i>Baptisia</i>	Penstemon	<i>Penstemon</i>
Fireweed	<i>Chamerion</i>	Prairie clover	<i>Dalea</i>
Goldenrod	<i>Solidago</i>	Purple coneflower	<i>Echinacea</i>
Giant hyssop	<i>Agastache</i>	Rattlesnake master	<i>Eryngium</i>
Ironweed	<i>Vernonia</i>	Spiderwort	<i>Tradescantia</i>
Joe Pye weed	<i>Eupatorium</i>	Steeplebush	<i>Spiraea</i>
Leadplant	<i>Amorpha</i>	Sunflower	<i>Helianthus</i>
Lobelia	<i>Lobelia</i>	Willow	<i>Salix</i>

## Garden Plants

Flower beds in gardens, business campuses, and parks are great places to have bee-friendly plants. Native plants will create a beautiful garden but some people prefer "garden" plants. Many garden plants are varieties of native plants. This list includes plants from other countries—"exotic" plants—and should be used as a supplement to the native plant list. As with the native plants, this list is far from exhaustive.

Basil	<i>Ocimum</i>	Oregano/marjoram	<i>Origanum</i>
Borage	<i>Borago</i>	Rosemary	<i>Rosmarinus</i>
Catmint	<i>Nepeta</i>	Russian sage	<i>Perovskia</i>
Cosmos	<i>Cosmos</i>	Spearmint	<i>Mentha</i>
Lavender	<i>Lavandula</i>	Squill	<i>Scilla</i>

**For more pollinator conservation information, go to [www.xerces.org](http://www.xerces.org)**



# How Windbreaks Work

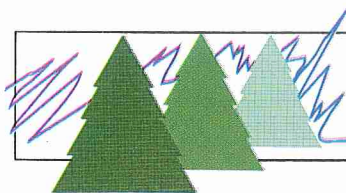
By James R. Brandle, University of Nebraska-Lincoln  
and Sherman Finch, Soil Conservation Service

Windbreaks are barriers used to reduce and redirect wind. They usually consist of trees and shrubs, but may also be perennial or annual crops and grasses, fences, or other materials. The reduction in wind speed behind a windbreak modifies the environmental conditions or microclimate in the sheltered zone.

As wind blows against a windbreak, air pressure builds up on the windward side (the side towards the wind), and large quantities of air move up and over the top or around the ends of the windbreak. Windbreak structure — height, density, number of rows, species composition, length, orientation, and continuity — determines the effectiveness of a windbreak in reducing wind speed and altering the microclimate.



A well-designed farm or ranch incorporates many types of windbreaks to protect fields, livestock and the homesite.



# Windbreak Characteristics



## Open Wind Speed 20 mph Deciduous 25-35% Density

H distance from windbreak	5H	10H	15H	20H	30H
miles per hour	10	13	16	17	20
% of open wind speed	50%	65%	80%	85%	100%



## Open Wind Speed 20 mph Conifer 40-60% Density

H distance from windbreak	5H	10H	15H	20H	30H
miles per hour	6	10	12	15	19
% of open wind speed	30%	50%	60%	75%	95%



## Open Wind Speed 20 mph Multi Row 60-80% Density

H distance from windbreak	5H	10H	15H	20H	30H
miles per hour	5	7	13	17	19
% of open wind speed	25%	35%	65%	85%	95%



## Open Wind Speed 20 mph Solid Fence 100% Density

H distance from windbreak	5H	10H	15H	20H	30H
miles per hour	5	14	18	19	20
% of open wind speed	25%	70%	90%	95%	100%

### Effect of height

Windbreak height (H) is the most important factor determining the downwind area protected by a windbreak. This value varies from windbreak to windbreak, and increases as the windbreak matures. In multiple-row windbreaks, the height of the tallest tree-row determines the value of H.

On the windward side of a windbreak, wind speed reductions are measurable upwind for a distance of 2 to 5 times the height of the windbreak (2H to 5H). On the leeward side (the side away from the wind), wind speed reductions occur up to 30H downwind of the barrier. For example, in a windbreak where the tallest trees are 30 ft, lower wind speeds are measurable for 60 ft to 150 ft on the windward side, and up to 900 ft on the leeward side. Within this protected zone, the structural characteristics of a windbreak, especially density, determine the extent of wind speed reductions.

### Effect of density

Windbreak density is the ratio of the solid portion of the barrier to the total area of the barrier. Wind flows through the open portions of a windbreak, thus the more solid a windbreak, the less wind passes through. Low pressure develops on the leeward side of very dense windbreaks. This low pressure area behind the windbreak pulls air coming over the windbreak downwind, creating turbulence and reducing protection downwind. As density decreases, the amount of air passing through the windbreak increases, moderating the low pressure and turbulence, and increasing the length of the downwind protected area. While this protected area is larger, the wind speed reductions are not as great. By adjusting windbreak density different wind flow patterns and areas of protection are established (Figure 1).

In designing a windbreak, density should be adjusted to meet landowner objectives. A windbreak density of 40 to 60 percent provides the greatest downwind area of protection and provides excellent soil erosion control. To get even distribution of snow across a field, densities of 25 to 35 percent are most effective, but may not provide sufficient control of soil erosion.

Windbreaks designed to catch and store snow in a confined area usually have several rows, and densities in the range of 60 to 80 percent. Farmsteads and livestock areas needing protection from winter winds require multiple row windbreaks with high densities. In these cases, wind speed reductions are greater but the protected area is smaller.

Figure 1. Wind speed reductions to the lee of windbreaks with different densities, A) density of 25-35 %, B) density of 40-60 %, C) density of 60-80 %, D) density of 100 %.

The number of rows, the distance between trees, and species composition are factors controlling windbreak density. Increasing the number of windbreak rows or decreasing the distance between trees increases density and provides a more solid barrier to the wind. The species chosen for the windbreak will determine height as well as density, and will influence the length of the sheltered area.

The interaction of height and density determines the degree of wind speed reduction, and ultimately the length of the protected area. For a given height, the protected area usually increases as density increases. However, if density is below 20 percent, the windbreak does not provide useful wind reductions. If density is above 80 percent, excessive leeward turbulence may reduce windbreak effectiveness beyond 8H.

The cross-sectional shape of windbreaks with equal densities has minimal influence on wind velocities within 10H of the leeward side of a barrier. Beyond 10H, straight sides provide slightly more protection than slanted sides, because more wind passes through the trees, and extends the protected area farther to the leeward.

### Effect of orientation

Windbreaks are most effective when oriented at right angles to prevailing winds. The purpose and design of each windbreak is unique, thus the orientation of individual windbreaks depends on the design objectives.

Farmsteads and feedlots usually need protection from cold winds and blowing snow or dust. Orienting these windbreaks perpendicular to the troublesome winter wind direction provides the most useful protection.

Field crops usually need protection from hot, dry summer winds, abrasive, wind-blown soil particles, or both. The orientation of these windbreaks should be perpendicular to prevailing winds during critical growing periods.

Successful field windbreaks should be designed to fit within the farming operation. Consideration should be given to reducing wind erosion, providing crop protection, increasing irrigation efficiency and improving wildlife habitat. Windbreaks protect fall-seeded small grains like winter wheat that may need protection from summer and winter winds. To control soil erosion, windbreaks should be planted to block the prevailing winds during the times of greatest soil exposure—winter and early spring. To recharge soil moisture with drifting snow, windbreaks should be placed perpendicular to the prevailing winter winds.

Although wind may blow predominantly from one direction for a season, it rarely blows exclusively from that direction. As a result, protection is not equal for all areas on the leeward side of a windbreak. As the

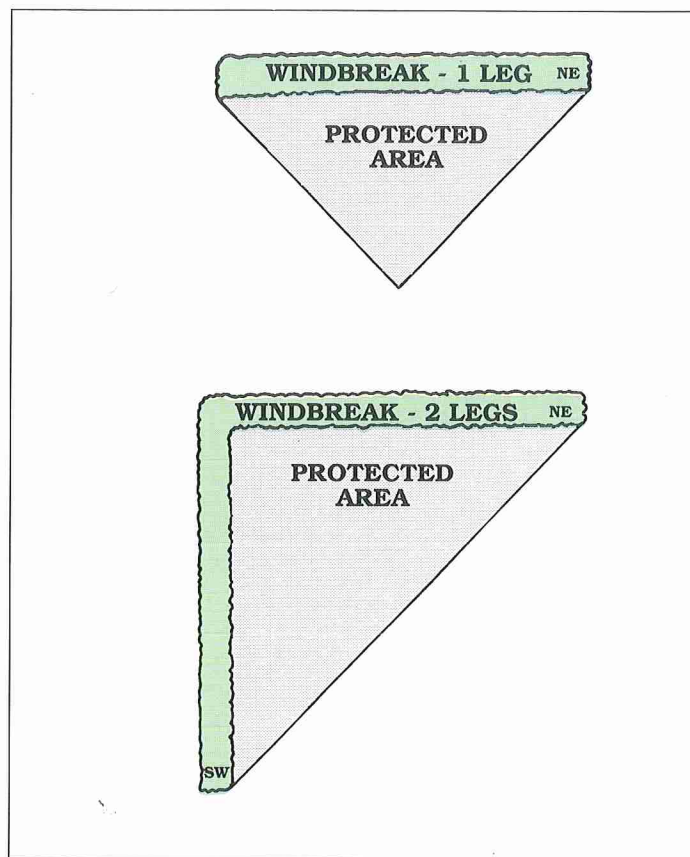


Figure 2. In areas with variable winds, multiple-leg windbreaks or windbreak systems provide greater protection to the field or farmstead than single-leg windbreaks.

wind changes direction and is no longer blowing directly against the windbreak, the protected area decreases (See Figure 2). The use of multiple-leg windbreaks provides a larger protected area than a single windbreak. Again, individual placement depends on the site, the wind direction(s), and the design objectives.

### Effect of length

Although the height of a windbreak determines the extent of the protected area downwind, the length of a windbreak determines the amount of total area receiving protection. For maximum efficiency, the uninterrupted length of a windbreak should exceed the height by at least 10:1. This ratio reduces the influence of end-turbulence on the total protected area.

The continuity of a windbreak also influences its efficiency. Gaps in a windbreak become funnels that concentrate wind flow, creating areas on the downwind side of the gap in which wind speeds often exceed open field wind velocities (Figure 3). Where there are gaps, the effectiveness of the windbreak is diminished. Lanes or field accesses through windbreaks should be located to minimize this effect or if possible avoided altogether.

## Microclimate modifications

The reduction in wind velocity behind a windbreak leads to a change in the microclimate within the protected zone. Temperature and humidity levels usually increase, decreasing evaporation and plant water loss. Actual temperature modifications for a given windbreak depend on windbreak height, density, orientation, and time of day. Daily air temperatures within 10H leeward of a windbreak, are generally several degrees higher than temperatures in the open. Beyond 10H, air temperatures near the ground tend to be cooler during the day. On most nights, temperatures near the ground in sheltered areas (0H to 30H) are slightly warmer than in the open. However, on very calm nights, sheltered areas may be several degrees cooler than open areas.

Soil temperatures in sheltered areas are usually slightly warmer than in unsheltered areas. Taking advantage of these warmer temperatures may allow earlier planting and germination in areas with short growing seasons. In the area next to an east-west windbreak soil temperatures are significantly higher on the south side due to heat reflected by the windbreak. On the north side of an east-west windbreak, soil temperatures, especially in the early spring, are lower due to shading by the windbreak. These cooler temperatures may reduce the rate of snow melt, and cause problems with field access in early spring.

Relative humidity in sheltered areas is 2 to 4 percent higher than in open areas, depending on windbreak density. Higher humidity decreases the rate of plant water use, so production is more efficient than in unsheltered areas. However, if the windbreak is too dense, and humidity levels get too high, diseases may become a problem in some crops.

Heat loss due to wind-chill is reduced on the leeward side of a windbreak. Moderation of the chill factor is most important in farmstead and livestock windbreaks where humans and other animals readily notice increased energy efficiency.

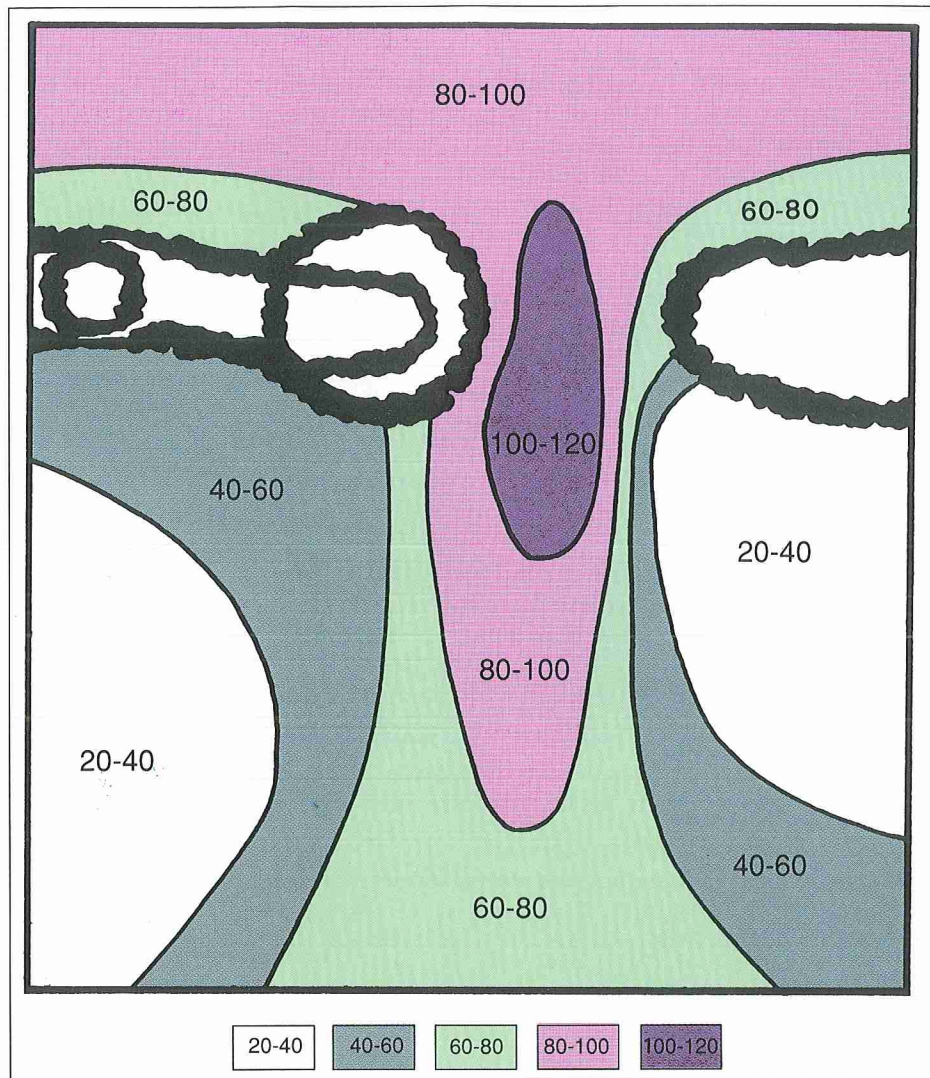


Figure 3. Wind flow increases through gaps in a windbreak decreasing the effectiveness of the windbreak. Numerical values represent the percent of open field wind speed (after Nageli).

Most windbreak benefits come about indirectly because of changes in the microclimate of the sheltered zone. One exception is the direct benefit of reducing wind speed to control soil erosion. A well designed windbreak can reduce soil erosion to near zero within 10H of the leeward side of the tree row.

## Summary

Windbreaks reduce wind speed on both the leeward and windward sides. The resulting reductions in wind speed lead to moderation of the microclimate in these protected zones. With careful planning, and in consultation with local professionals, these changes in microclimate can be used to create desirable environments for growing crops, raising livestock, and protecting the living and working areas.



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# MEAT'S PLATE SHARE GROWS

## U.S. livestock sector backed by domestic, global demand

After several years of steady declines, U.S. consumers are adding more protein to their plates. In 2018, U.S. red meat and poultry consumption reached a record high. That trend is expected to continue. This is coupled with growing incomes in developing countries – a huge growth area for U.S. meat products and feed grains.

"As markets become more global, economies improve and the middle class increases, consumption of protein will grow," says Don Close, senior animal protein analyst with Rabo AgriFinance.

Robust demand has encouraged U.S. livestock producers to increase production. "We've been on an amazing expansion when you look at beef, pork and chicken," says Scott Brown, University of Missouri economist. "The strong domestic demand in the last several years has helped maintain livestock prices that would have otherwise fallen given this kind of expansion."

### HUNGRY GLOBAL CUSTOMERS

U.S. exports of meat and poultry have grown at an average of 4% per year during the past decade,

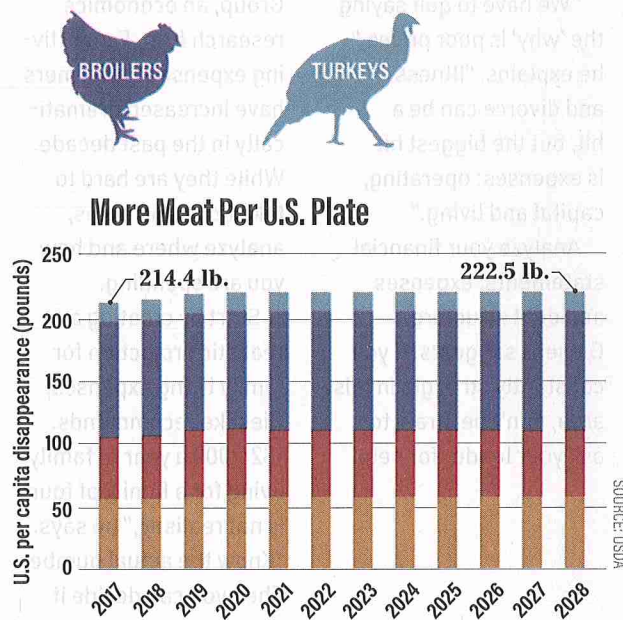
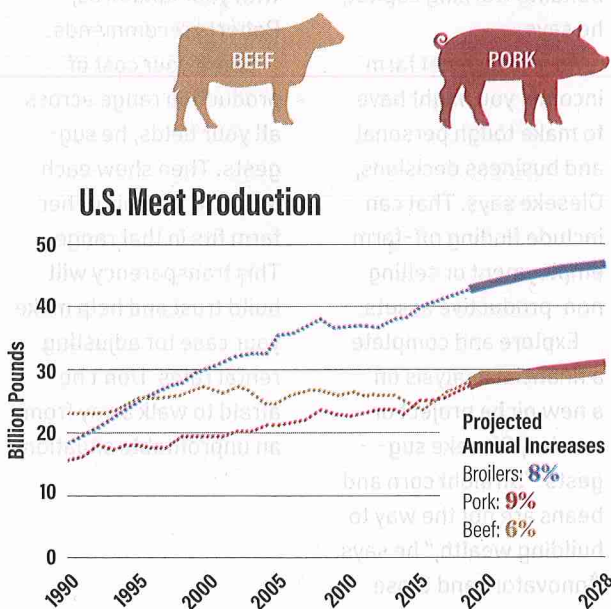
according to USDA. Through 2024, USDA expects annual global consumption to grow by 2% for poultry, 1% for pork and 1% for beef.

"I think we will see a transition for the U.S. to become a larger exporter of animal proteins and a smaller producer of raw commodities," Close says. "The efficiency of shipping containers full of meat is far greater compared to the inefficiency of hauling raw commodities around the globe and then converting them into protein products." **FJ**

By Sara Schafer

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## Growing Meat Supply Supported by Higher Consumption



# TRANSITION TO ORGANIC SUSTAINS FARM'S FUTURE

As food industry and consumer demand outpaces production, one farmer finds his niche

As a student of the 1980s, Joel Layman never thought he'd have the opportunity to farm. His parents encouraged him to attend Michigan State University where he earned a degree in agriscience. During his nearly 20 years working in ag retail he couldn't shake his desire to farm.

The problem? The '80s were hard on his family's farm – so he had to rebuild the operation.

In 2007, Layman started farming part time near Berrien Center, Mich. "I lived frugally and really only bought essentials so the rest could go to the farm," Layman says. "It was hard, but my gut said this is where I want to be in the future."

In 2013, he transitioned to the farm full time. Shortly after, he took an even bigger risk by dabbling in organic production.

To date, 1,700 of Layman's acres are certified organic, 200 are in transition and 350 are being rented out and farmed conventionally. He has raised snow peas, green beans, fall squash, corn, soybeans, black beans and pinto beans.

## PROFIT POTENTIAL

It all started after working with his neighbor, who in 2013 had recently started farming under organic standards. After seeing its potential, Layman rented 25 acres and went through the process to certify them as organic.

That same year, Chipotle released "The Scarecrow" video. After the video went viral, Layman decided to see what all the fuss was about. A visit to the restaurant changed the trajectory of his farm.

"I was the oldest person in Chipotle by at least 10 years," he recalls. "I then went to a McDonald's to buy a Coke, and I was the youngest person there by at least 10 years. That's when it hit me: that's the future."

He saw consumer interest in local, organic and natural, and he wanted a piece of the demand. He started the process by transitioning 1,000 of his acres.

"We went wide-scale on transition," Layman explains. "I rented 500 of my acres to a neighboring farm. It was a risk mitigation strategy, and it helped convince our lenders to give us a shot."

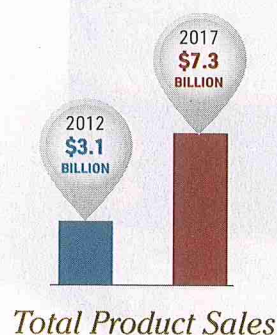
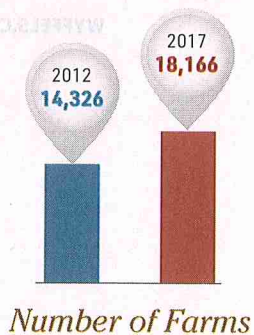
## UNDERSTAND THE RISKS

The profit margins for organic production are attractive. According to USDA, organic corn prices

## BY THE NUMBERS: THE ORGANIC FARMING INDUSTRY

"The organic grain market is still a niche market," says Stephen Nichols, Rabo AgriFinance senior analyst for grains and oilseeds. "Currently, organic corn and soybean production only represents 0.2% and 0.1% of total U.S. production, respectively."

SOURCE: USDA





*The first stumbling block in transitioning to organic farming is your own perception, says Michigan farmer Joel Layman. "I had to buy the organic concept mentally."*

PHOTO: CHAD TIDEY

ranged from \$7.25 to \$9 per bushel in 2019, and soybeans ranged from \$18.90 to \$19.

With prices more than double their conventionally grown counterparts, why aren't more farmers jumping into organic production?

Layman encourages farmers to think about these three hurdles:

► **Crop insurance.** Producers must use county averages rather than historic APH for the three-year transition period. Once the field is

certified organic, it takes another four years to build an organic APH for crop insurance guarantees.

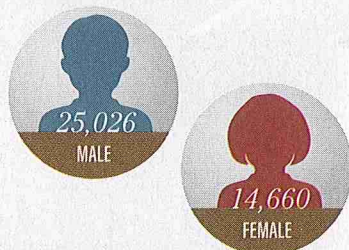
► **Financial risks.** Because guarantees are low during the transition and first few years, poor weather or other catastrophes could wreak havoc on balance sheets.

► **Lender confidence.** Low guarantees and lack of understanding make getting a lender to buy into organic farming challenging.

"A producer making the transition needs a strong balance sheet to weather lower returns during transition," says Stephen Nicholson, Rabo AgriFinance senior analyst for grains and oilseeds.

When Layman first started farming, he would have said there was no way he'd ever grow organic crops. Today, as he gazes at his microbe-rich soils, he wonders why he didn't start sooner. **FJ**

**By Sonja Begemann**  
sbegemann@farmjournal.com



Gender of Producers



Number of Farms by Value of Sales



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# The Farmer's Share

Did you know that farmers and ranchers receive only 14.6\* cents of every food dollar that consumers spend? According to the USDA, off farm costs including marketing, processing, wholesaling, distribution and retailing account for more than 80 cents of every food dollar spent in the United States.

## Bacon

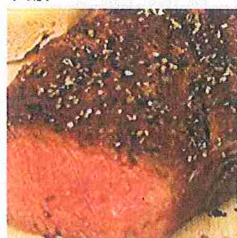
1 lb.



Retail: \$5.33  
Farmer: \$0.80

## Top Sirloin Steak

1 lb.



Retail: \$8.99  
Farmer: \$1.79

## Bread

2 lbs.



Retail: \$3.99  
Farmer: \$0.10

## Fresh Carrots

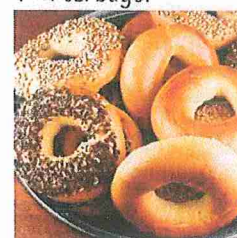
5 lbs.



Retail: \$4.59  
Farmer: \$1.43

## Wheat Bagel

1 - 4 oz. bagel



Retail: \$0.90  
Farmer: \$0.01

## Cereal

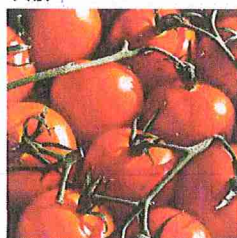
18 oz. box



Retail: \$3.49  
Farmer: \$0.06

## Tomatoes

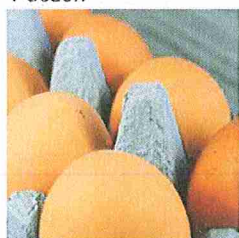
1 lb.



Retail: \$3.39  
Farmer: \$0.34

## Eggs

1 dozen



Retail: \$2.29  
Farmer: \$0.89

## Flour

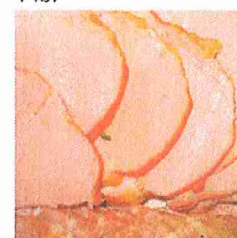
King Arthur, 5 lbs.



Retail: \$3.99  
Farmer: \$0.36

## Boneless Ham

1 lb.



Retail: \$4.99  
Farmer: \$0.80

## Lettuce

1 lb.



Retail: \$2.29  
Farmer: \$0.23

## Milk

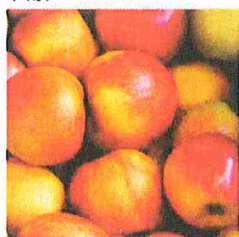
1 gallon, fat free



Retail: \$4.59  
Farmer: \$1.63

## Fresh Apples

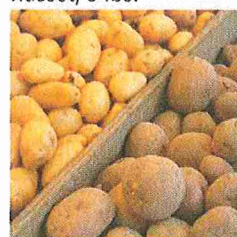
1 lb.



Retail: \$2.32  
Farmer: \$0.40

## Fresh Potatoes

Russet, 5 lbs.



Retail: \$3.49  
Farmer: \$0.73

## Soda

2 liters



Retail: \$1.19  
Farmer: \$0.05

Farmer's share derived from USDA, NASS "Agricultural Prices," 2019. | Prices based on August 2019 data.

Retail prices based on Safeway (SE) brand except where noted. | \*Figure according to U.S. Department of Agriculture Economic Research Service

September 30, 2019



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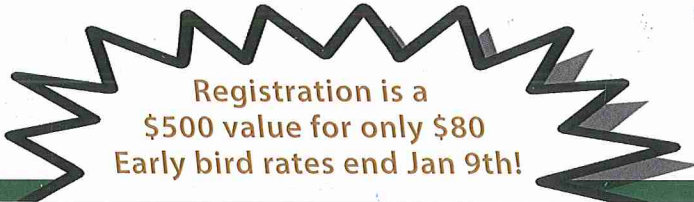

# Wisconsin Farmers Union

## 89TH ANNUAL CONVENTION

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**JAN 31**

**Noon-4:30pm | Groundswell**

How do we encourage racial justice and diversity in our rural communities? Nick Olson of Land Stewardship Project joins us to help foster an inclusive rural landscape.

**5:30-8:30pm | Candidate Meet & Greet**

Network with Farmers Union members & local, state, and national candidates

**FEB 1**

**Workshops | Our Lakes, Our Lands • Navigating Tough Conversations**  
**Competition in Ag • Supply Management: Dirty Word or Powerful Tool?**

**Grassroots Policy Discussion & Board Election**

**Keynote: Monopoly Power in U.S. Agriculture | Barry Lynn** of the Open Markets Institute will share how rising monopoly power in the food system fits into the larger picture of the economy.

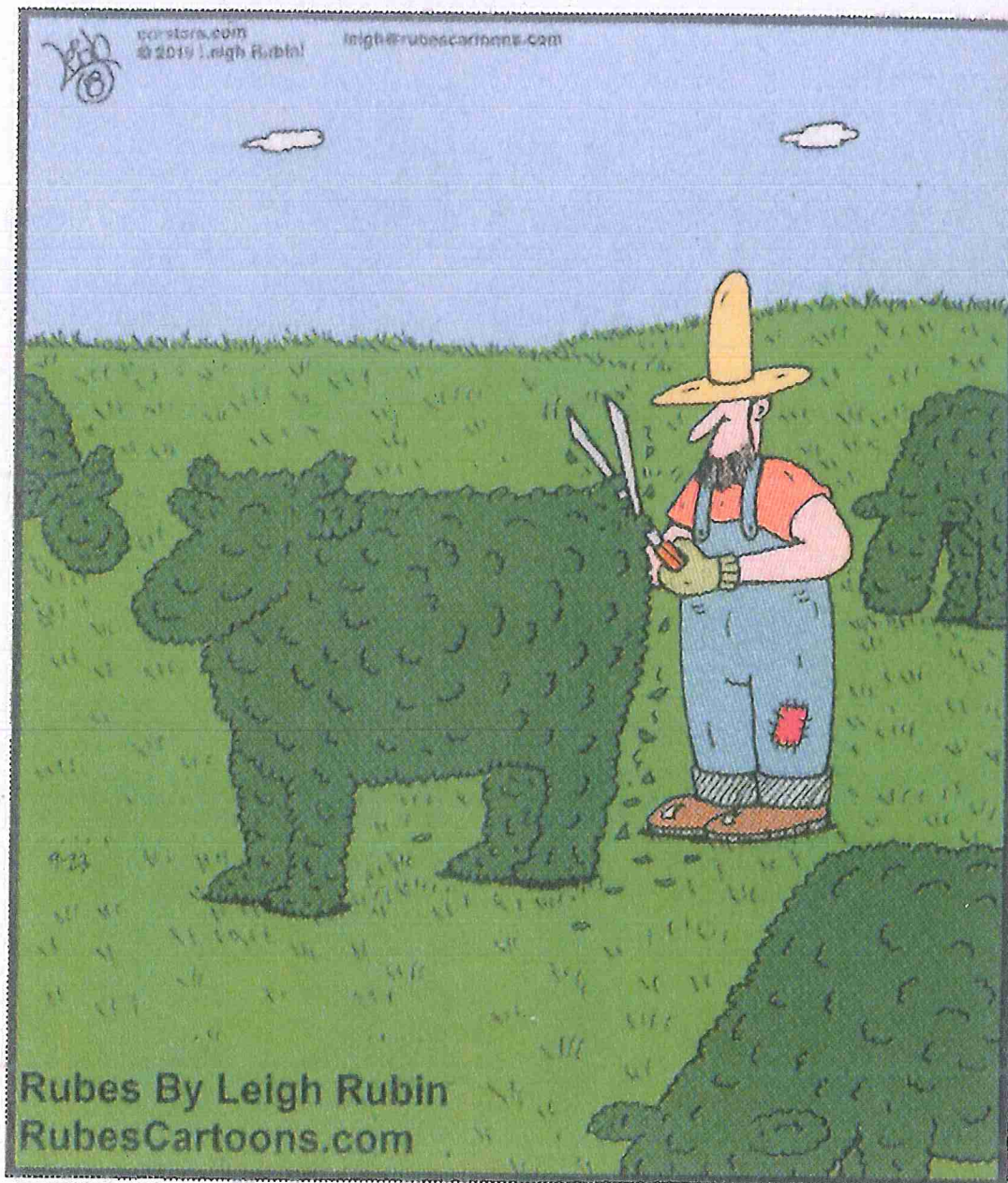
**FEB 2**

**Breakfast Roundtables**

Connect with others on the rural issues that matter to you!  
**Policy Discussion Wrap-Up**

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