CMAP

Lawn and Landscape Practices for Northwest Water Planning Alliance Communities

Community Approaches to Sustainable Outdoor Water Use

2013

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Illinois-Indiana Sea Grant is one of 33 programs nationwide and is dedicated to conducting research, education, and outreach to serve Lake Michigan's southern coast. With its mandate to bring the latest university-based science to those who need it, IISG brings together scientists, educators, policy makers, community decision makers, outreach specialists, business leaders, and the general public to work towards a sustainable environment and economy Visit **www.iiseagrant.org**.

Lake Michigan Coastal Program supports coordination and partnerships among local, state, and federal agencies as well as local organizations for the protection and sustainable use of natural and cultural resources in the Lake Michigan region. To learn more, visit **www.in.gov/dnr/lakemich**.

Lawn to Lake is a collaborative program to protect water resources in the Great Lakes region by promoting healthy lawn and landscape practices. With funding from the U.S. Environmental Protection Agency's (U.S. EPA) GLRI, partners are coordinating a pollution prevention campaign addressing the needs of those responsible for lawn and landscape care in the Southern Lake Michigan basin. Visit **www.lawntogreatlakes.org**.

Metropolitan Planning Council (MPC) connects the dots between regional needs, challenges, and solutions, and among the individuals and organizations with the ability to guide the growth of the ever-changing Chicago metropolitan region. As the region continues to grow and prosper, MPC's mission is going beyond Illinois to work with partners and communities throughout the tri-state region.

Northwestern Indiana Regional Planning Commission (NIRPC) is a regional council of local governments serving the citizens of Lake, Porter, and LaPorte Counties in northwest Indiana. NIRPC provides a forum that enables the citizens of northwest Indiana to address regional issues relating to transportation, the environment, and community and economic development. NIRPC has developed a 2040 regional comprehensive plan for the northwestern Indiana region that provides vision and implementation actions. Visit **http://www.nirpc.org**.

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Save the Dunes works to preserve, protect, and restore the Indiana Dunes and all natural resources in northwest Indiana's Lake Michigan Watershed to foster an enhanced quality of life. Visit **www.savedunes.org**.

University of Illinois Extension is the flagship outreach program of the University of Illinois at Urbana-Champaign, offering educational programs to residents of all 102 counties — and far beyond. Through learning partnerships that put knowledge to work, Extension programs are aimed at making life better, healthier, safer, and more profitable for individuals and their communities. See **web.extension.illinois.edu/state** for more information and **urbanext.illinois.edu/lawntalk** for more information on lawn care.

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A Message from Peter Wallers, P.E., CFM

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The significance of this guide and what separates it from the average lawn care guide is its emphasis on efficient lawn care, using as little water and fertilizer as possible while achieving maximum performance for your lawn.

Please consider that lawn watering represents a big portion of what we designate as discretionary water use, simply put non-essential water use. During the summer months many communities experience significant peak water demands on their systems primarily due to the increase in lawn water demand; these peak demands can be 1.5 to 4 times the water utilities' average day demand. Utilities are forced to increase capacity to meet these peak demands, if we can lower the peak demand by reducing the amount of water used to water lawns, not only will you save money on your water bill, you will also delay or eliminate the need for your utility to expand and that will help keep your costs down as well.

More efficient lawn care also translates into more time to enjoy the summer!

Introduction

Lawns are a significant and valued feature in the urban and suburban environments. Yet these often heavily managed landscapes have the potential to strain our municipal water supplies and contribute to runoff pollution due to over-fertilization, over-application of pesticides, and overwatering.[1] During periods of drought, the over-watering of lawns can be of particular concern due to limited community water supplies. Adopting lawn watering restrictions and practicing natural lawn care and sustainable landscaping can help protect and conserve our shared water resources.

Water conservation is a matter of increasing concern to many communities.[2] Even in northeastern Illinois, where Lake Michigan represents a relatively abundant source of water, water availability is a legitimate concern.[3] Increasing drought frequency, rising demand due to population growth, and water pollution are exerting more and more stress on water resources. Communities in the region are working to ensure a long-lasting, sustainable water supply for their residents, but they face challenges in doing so.

We all live in a watershed and, therefore, have to consider the cumulative impacts of our actions. As we learn about how various water sources (lakes, rivers, and groundwater) are connected and managed, it makes more and more sense for communities facing similar water issues to work and plan together in order to achieve water supply sustainability.

The Northwest Water Planning Alliance (NWPA) was formed by an intergovernmental agreement in 2010 with the goal of facilitating voluntary sustainable sub-regional water supply planning.[4] This group connects roughly 80 member communities, five counties (DeKalb, Kane, Kendall, Lake, and McHenry), and five councils of government (COGs). The NWPA works with member communities to implement consistent water supply planning, as well as conservation programs, throughout the region. As outdoor water use spiked during the summer of 2012 due to drought conditions in Illinois, and communities scrambled to enact lawn watering restrictions, the importance of NWPA's mission was underscored. **In the fall of 2012, NWPA endorsed new lawn watering guidelines that implement uniform lawn watering hours and drought status criteria, setting the stage for communities to adopt local ordinances in accordance with the recommendations.**

1 U.S. Environmental Protection Agency – National Management Measures to Control Nonpoint Source Pollution from Urban Areas. See **www.epa.gov/owow/NPS/urbanmm/pdf/urban_ch09.pdf**.

2 Campbell, Heather E., Ryan M. Johnson and Elizabeth Hunt Larson. (2004). Prices, Devices, or Rules: The Relative Effectiveness of Policy Instruments in Water Conservation. *Review of Policy Research, Vol. 21, No. 5.*

3 Chicago Metropolitan Agency for Planning. *Water 2050: Northeastern Illinois Regional Water Supply/Demand Plan.* March 2010.

4 Northwest Water Planning Alliance mission statement. Retrieved from: **http://www.nwpa.us/#.**

"By agreeing to and enforcing the same watering restrictions, the member communities of the Northwest Water Planning Alliance will better protect their shared water supply and signal to residents that conservation is a value shared by their neighbors," said MPC Program Director Josh Ellis. "This regional approach to water supply management makes conservation the new normal."

For communities in this region, water use varies seasonally; so does the availability of water from both surface and underground sources. Water use is fairly constant from November to April; it starts rising in May, peaks in July, and decreases through the rest of summer and autumn.[5] The most significant driving factor of this summer increase in water use is lawn and landscape irrigation.[6] This phenomenon coincides with river flows and groundwater levels tending to be at their lowest. Furthermore, the highest levels of water use occur in summers with low precipitation — for most of Kane County, record water use took place in June and July during the 2005 drought. Thus, a focus on outdoor water conservation efforts during the summer months is an important consideration for water managers in the NWPA communities.

This manual introduces water resources in the NWPA region, reasons to conserve water outdoors, and lawn watering restrictions recommended by the NWPA. Research has shown that lawn watering restrictions are accepted by the public and result in conserving water outdoors when it is most needed — in times of drought. The effectiveness of restrictions is improved when coupled with outreach and education.[7] This manual also presents complementary policies and practices your community may choose to enact and promote to achieve outdoor water use reductions.

Watersheds

A watershed is land area draining to a specific body of water, whether a lake, stream or river. Watersheds come in all different shapes and sizes. They can be as small as the drainage area for a pond or as large as the Fox River Watershed basin (Figure 1). The Illinois portion of the Fox River Watershed covers McHenry, Lake, Kane, DeKalb, Kendall, and LaSalle Counties, as well as small portions of DuPage and Cook Counties. Understanding what a watershed is can help the public begin to realize how various land uses and practices within a drainage area might impact lakes and streams.

Water Resources in the NWPA Region

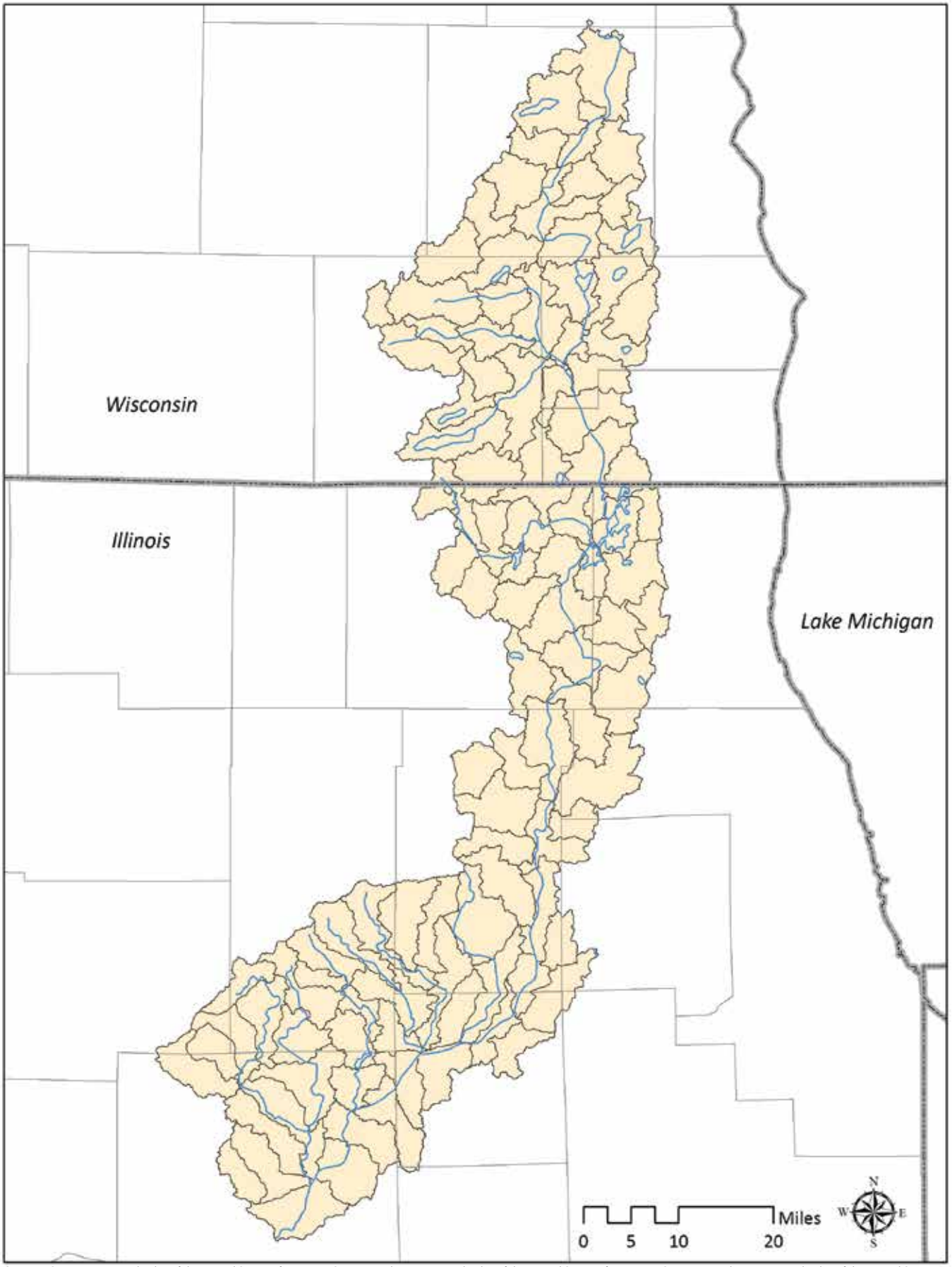
It's important to understand where water comes from and how water use affects our shared water resources. The freshwater that isn't locked up in icecaps or glaciers is found in lakes, rivers, and underground aquifers. All three are sources of drinking water for communities in the NWPA region (Figure 2 and Table 1).

5 Meyer et al. (2012). Opportunities and challenges of meeting water demand in Northeastern Illinois. Illinois State Water Survey Contract Report 2012-03.

6 Ibid.

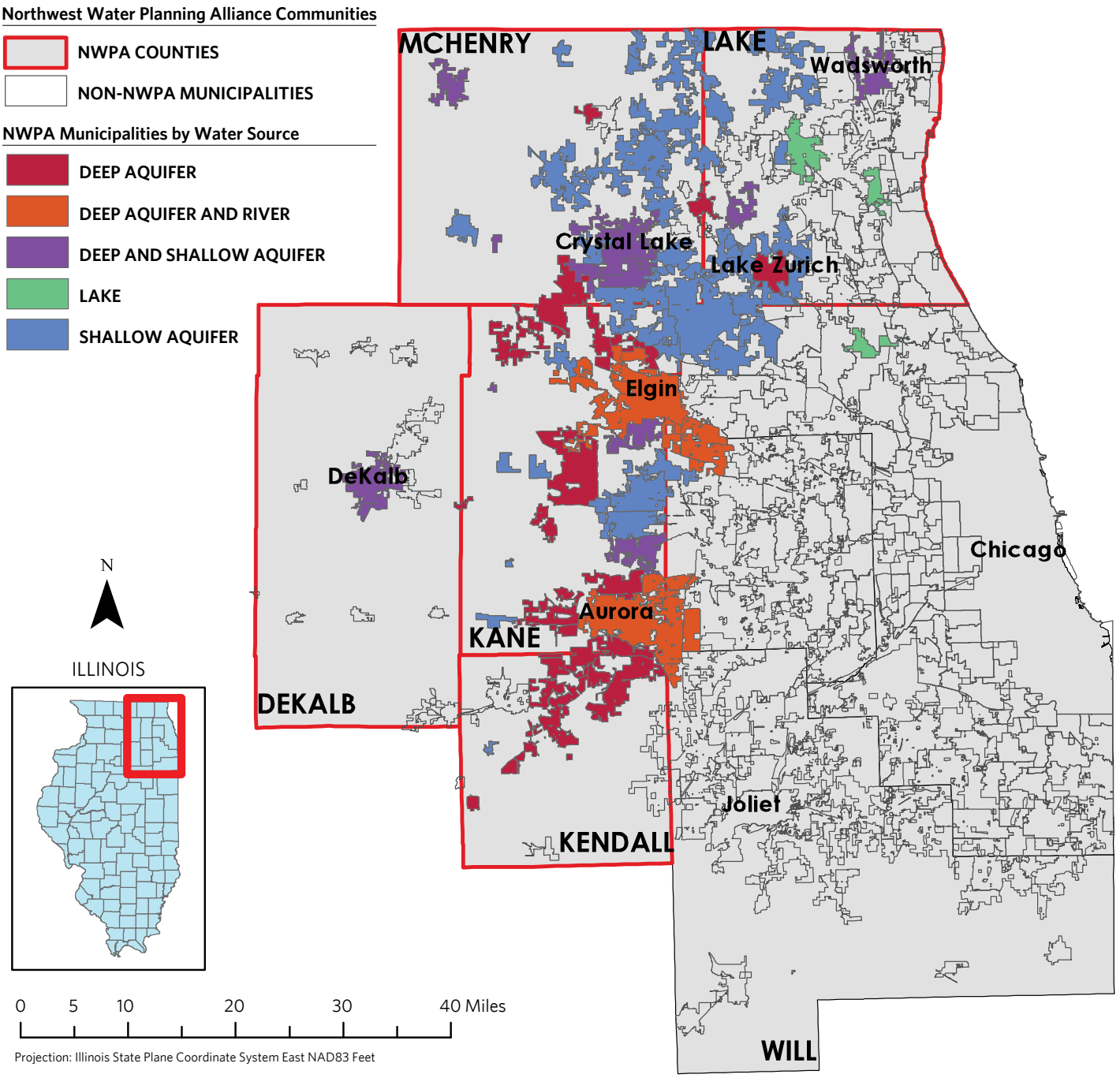
7 Kenney, Douglas S., Roberta A. Klein, and Martyn P. Clark. (2004) Use and Effectiveness of Municipal Water Restrictions During Drought in Colorado. *Journal of the American Water Resources Association.*

Figure 1. Fox River watershed



Sources: Streams: National Atlas of the United States of America; State Boundaries: National Atlas of the United States of America ; County Boundaries: National Atlas of the United States; HUC 12 Subwatersheds: State of Illinois; Watersheds: Illinois State Water Survey and Chicago Metropolitan Agency for Planning.

Figure 2. Northwest Water Planning Alliance communities by water source, 2010



Sources: Municipalities, water sources, and Northwest Water Planning Alliance from Metropolitan Planning Council; counties from Illinois State Geological Survey.
Map prepared by Abby Crisostomo, 26 April 2012.

Table 1. Northwest Water Planning Alliance municipalities by water source

GROUNDWATER				GROUNDWATER AND FOX RIVER	LAKE MICHIGAN
DEEP AQUIFER	SHALLOW AQUIFER		COMBINATION		
Campton Hills	Algonquin	Lakemoor	Batavia	Aurora	Grayslake
Elburn	Antioch	Lakewood	Burlington	Bartlett	Green Oaks
Gilberts	Barrington	Lily Lake	Crystal Lake	Elgin	Prospect Heights
Greenwood	Barrington Hills	Lindenhurst	DeKalb	Sleepy Hollow	
Hampshire	Big Rock	Marengo	Harvard		
Huntley	Bull Valley	McCullom Lake	Lake in the Hills		
Island Lake	Carpentersville	McHenry	South Elgin		
Lake Zurich	Cary	Millbrook	Union		
Maple Park	Deer Park	North Barrington	Wadsworth		
Montgomery	East Dundee	Pingree Grove	Wauconda		
Newark	Fox Lake	Prairie Grove			
North Aurora	Fox River Grove	Richmond			
Oswego	Geneva	Ringwood			
Sugar Grove	Hainesville	South Barrington			
West Chicago	Hawthorn Woods	Spring Grove			
West Dundee	Hebron	St. Charles			
Yorkville	Inverness	Tower Lakes			
	Johnsburg	Trout Valley			
	Kaneville	Virgil			
	Kildeer	Wayne			
	Lake Barrington	Woodstock			
	Lake Villa				

Sources: Table prepared by Chicago Metropolitan Agency for Planning/Illinois-Indiana Sea Grant with data provided from Metropolitan Planning Council.

Use of these shared water resources impacts water supply availability for both current water users and future generations. Since overuse in one community could lead to a shortage in another community, either due to inadequate river flow or low groundwater levels, it is essential for communities in the same watershed and those using the same groundwater sources to work together and create water supply management plans that avoid such conflicts. This type of planning is particularly necessary in the northeastern Illinois region, where rapid urbanization and development are quickly changing municipal water use patterns.

Groundwater

In the NWPA region, most communities draw on groundwater for their water supply. The layers of underground rock that hold groundwater are called *aquifers*. People often picture aquifers as underground pools or lakes. However, it's more accurate to think of aquifers as sponges.[8] Water is contained in the pores, or spaces, of a rock layer; these pores are connected, which allows water to move through the rock layer.

Aquifers are also characterized by what is known as a recharge rate; this refers to how quickly incoming water can replace outgoing water.[9] Though water may move faster through some types of rock relative to others, recharge in general tends to be a slow process. Deep aquifers tend to be contained in sandstone or bedrock layers more than 500 feet below the surface. Shallow aquifers are present within 500 feet of the surface, and include aquifers contained in sand, gravel, and shallow bedrock.[10]

Shallow Aquifers

Shallow aquifers require less infrastructure investment because they are easier to reach and tend to have a faster rate of recharge. Even though they recharge faster, their smaller size makes them relatively easier to drain. Shallow aquifers are also more susceptible to contamination from surface activity. Moreover, shallow aquifers are more vulnerable to drought; since they are closer to the surface and receive most of their recharge through precipitation, the groundwater level drops significantly when there is little rainfall.

Deep Aquifers

Deep aquifers are less likely to feel the effects of drought because they are further underground and they generally cover larger areas than shallow aquifers. Water quality, save the very bottom layer, tends to be better than that in shallow aquifers because surface contaminants don't usually travel that far down.[11] However, deep aquifers may be subject to contaminants from the surface that come down through abandoned wells. In addition, the deep aquifer underlying northeastern Illinois, like many other deep aquifers, is located above a layer of saltwater, so there is risk of saltwater intrusion; this risk increases with more pumping.

Deep aquifers are often capped by impermeable rock, so they are much slower to recharge; this can increase the likelihood of using water at unsustainable rates. When intensive water withdrawal leads to water use from the bottom layer of the aquifer, harmful quantities of heavy metals could be present. Researchers have reported levels of radium isotopes, arsenic, and barium from deep bedrock that are higher than U.S. EPA standards in the deep aquifer used by northeastern Illinois communities, especially in the area underlying northern Kane County.[12]

8 Metropolitan Planning Council and Openlands (2010). What Our Water's Worth: advantages and challenges of deep aquifer water. Retrieved from: **http://www.chicagolandh2o.org/documents/deep-aquifer.pdf**.

9 Ibid.

10 Metropolitan Planning Council and Openlands (2010). What Our Water's Worth — advantages and challenges of shallow aquifers. **Retrieved from: http://www.chicagolandh2o.org/documents/shallow-aquifer.pdf.**

11 There are exceptions; under DeKalb County, for instance, the shallow and deep aquifer systems actually come into contact. Contaminants in the shallow aquifer could infiltrate the deep aquifer at this point. Source: Meyer et al. (2012). Opportunities and challenges of meeting water demand in Northeastern Illinois.

12 Metropolitan Planning Council and Openlands (2010). What Our Water's Worth: advantages and challenges of deep aquifer water. Retrieved from: **http://www.chicagolandh2o.org/documents/deep-aquifer.pdf**; Meyer et al. (2012). Opportunities and challenges of meeting water demand in Northeastern Illinois. Illinois State Water Survey Contract Report 2012-03.

Surface Water

Surface water is any significant source of water visible at the surface; in an inland setting, this mainly refers to lakes and rivers. Communities pump water out of a nearby lake or river for their domestic, commercial, and industrial needs. After the water is used, treated wastewater is discharged back into lakes and rivers.

Fox River

The Fox River is the main source of inland surface water for communities in the NWPA region. Other than a minimum flow level requirement, the Fox River is fairly unregulated.[13] By working together, communities in the Fox River Watershed who draw their water from the river can plan their water use and determine how it will affect the river and surrounding ecosystem.[14]

The Fox River Watershed is currently home to 11 percent of the state population.[15] New development both in and around the river has led to an increase in use of surface water from the Fox River in the past few decades. A smaller water system than Lake Michigan, the Fox River is more susceptible to drought and the amount of water flowing down the Fox River is strongly related to the amount of precipitation the watershed receives. For the same reason, the Fox River is more sensitive to excess pumping; the net amount of water that communities remove can significantly impact downstream flows. In addition, low water levels can reduce water quality and increase the cost of treatment. This presents a challenge for communities that are trying to figure out how much water they can withdraw from the river. It also explains why the lowest streamflow numbers are used in these calculations — since climate conditions are variable, it's better to underestimate how much water the river can supply rather than overestimate the supply and face a shortage.

Lake Michigan

Most of the NWPA region uses either groundwater or water drawn from the Fox River, but a few communities get their water from Lake Michigan. This number could grow as more communities submit applications for Lake Michigan water allocation permits.[16] While Lake Michigan water is seemingly abundant, in fact, the amount the state of Illinois is allowed to draw is limited by a U.S. Supreme Court Consent Decree.[17] This was put into place to prevent conflict between states that look to Lake Michigan as a source of water, for drinking and other purposes. According to this decree, Illinois can extract about 2.1 billion gallons of water per day. A little more than half of that water is allocated among communities within the region to use as drinking water; the rest goes towards other uses such as navigation or diversion into the Chicago waterway system.[18]

The main advantage of having a Lake Michigan water allocation permit is security — Illinois has a set amount of water to distribute, so communities with permits are guaranteed they will receive their water, rain, or shine (or drought). However, Lake Michigan might not be a viable drinking water option for communities that are farther away from the lake; the added distance increases transportation costs , or may make transportation impossible. In addition, under the existing Lake Michigan permit system, Lake Michigan water use is nearly fully allocated.

13 The seven-day, ten-year low flow value, Q(7, 10), is used as the lower limit for Fox River flow; new withdrawals that would reduce flow below this level are not permitted.

14 The main communities that withdraw water from the Fox River in the NWPA region are Elgin and Aurora. Elgin draws almost all of its water supply from the river, while river water makes up over half of Aurora's supply. Meyer et al. (2012). Opportunities and challenges of meeting water demand in Northeastern Illinois. Illinois State Water Survey Contract Report 2012-03; Bastis, N. (2011). The cost of clean water. What Our Water's Worth (Openlands and Metropolitan Planning Council). Retrieved from: **http://blog.chicagolandh2o.org/2011/01/10/the-costs-of-clean-water/**.

15 McConkey, S. et al. (2004). Fox River watershed investigation – Stratton Dam to the Illinois River: water quality issues and data report to Fox River Study Group, Inc. Illinois State Water Survey, Watershed Science Section

16 Northwest Lake County Lake Michigan Water Planning Project: **http://www.lakecountyil.gov/PublicWorks/PublicInformation/Pages/LakeMichiganWaterFeasibilityStudy.aspx**.

17 Wisconsin v. Illinois, 388 U.S. 426 (1967); 449 U.S. 48 (1980).

18 Meyer et al. (2012). "Components of Illinois' Lake Michigan Diversion" in Opportunities and challenges of meeting water demand in Northeastern Illinois. Illinois State Water Survey Contract Report 2012-03.

Connections Between Groundwater and Surface Water

Groundwater and surface water are not separate entities. Surface water bodies, such as rivers and streams, are often characterized by their *baseflow*, the amount of water entering the river or stream through groundwater sources rather than surface water events like rainfall or snowmelt.[19] As is the case with the Fox River, baseflow may come from the drainage of a nearby lake, wetland, or area of soil. However, when precipitation is low, most baseflow comes from groundwater from shallow aquifers. This process can work both ways. In times of high precipitation, when the river flow is much greater than baseflow, water from the river can infiltrate the banks or bed and recharge underlying aquifers.[20]

Intensive groundwater pumping near a river could reduce the river's flow. As groundwater levels lower, this can decrease the amount of groundwater entering the river and increase the amount of water exiting the river into the aquifer. The rise in water use due to urbanization has already decreased natural groundwater discharge to the Fox River by about ten percent, compared to predevelopment levels. The release of treated effluent into the river makes up for this deficit, but flow in tributaries that do not receive treated effluent may be significantly reduced.[21] By working together, Fox River Watershed communities using aquifers and the river as their water source can determine the level of pumping that yields an adequate water supply for those using groundwater without lowering available water to those drawing from the river. Communities face further challenges from changes in river flow and groundwater supply caused by reduced rainfall and snowmelt, which feed both sources.

Because the river and groundwater are connected in the Fox River Watershed, it is important to reduce contaminants on the surface. Pollutants that end up the river can compromise groundwater as well, leading to higher treatment costs. Of particular concern in this area are pesticides, and nutrients like nitrogen and phosphorus. Water quality in the Fox River is already a matter of concern. A study carried out by the Illinois State Water Survey found that nitrogen and phosphorus levels in the river considerably exceed the recommended levels set by U.S. EPA, especially during summer low flow conditions.[22] This leads to increased risk of contamination in the shallow aquifers nearby.

Pressures on Water Resources

The population of Kane County is expected to increase 70 percent from 2000-30, with significant growth expected in the other counties, as well.[23] The 2010 U.S. Census shows that Kane County's population already increased by over 25 percent from 2000-10; DeKalb, McHenry, and Kendall Counties also experienced population growth from 15 percent to over 25 percent in that period.[24]

The Illinois State Water Survey has found that there is significant shallow aquifer drawdown in some locations in the Fox River Watershed, especially in southeastern McHenry County and northeastern Kane County.[25] A drawdown is a depression in the groundwater level caused by pumping water from an aquifer at a greater rate than it recharges. Drawdown is predicted to be much greater and more widespread for deep aquifers than shallow aquifers, owing in part to the slower recharge rate.[26]

Drawdown can also impact water quality. Water quality is also an issue of rising concern for this region, not only because development and land-use change are creating more contaminants on the surface, but also because the geological makeup of the rock layers containing groundwater under north central Illinois (which includes parts of McHenry, Kane, Kendall, and DeKalb Counties) leaves this water particularly susceptible to contamination.[27] In addition, the increase in drawdown means that contaminants will be present in higher concentrations — there may not be enough water to dilute their effects, leading to higher purification costs.

19 Sophocleous, M. (2002). Interactions between groundwater and surface water: the state of the science. Hydrogeology Journal 10, 52-67.

20 Ibid.

21 Meyer et al. (2012). Opportunities and challenges of meeting water demand in Northeastern Illinois. Illinois State Water Survey Contract Report 2012-03.

22 McConkey, S. et al. (2004). Fox River watershed investigation – Stratton Dam to the Illinois River: water quality issues and data report to Fox River Study Group, Inc. Illinois State Water Survey, Watershed Science Section.

23 Meyer et al. (2009). Simulation of groundwater flow in Kane County and Northeastern Illinois. Illinois State Water Survey contract report 2009-07.

24 U.S. Census (2010). 2010 Census Data. Retrieved from: **http://2010.census.gov/2010census/data/**.

25 Meyer et al. (2012). Opportunities and challenges of meeting water demand in Northeastern Illinois. Illinois State Water Survey Contract Report 2012-03.

26 Ibid.

Water Conservation

In 2010, a regional water supply plan for northeastern Illinois, *Water 2050: Northeastern Illinois Regional Water Supply/Demand Plan*, was unanimously approved by the Regional Water Supply Planning Group led by CMAP. As the region's population increases to 12 million, to attain long term sustainability, withdrawals from Lake Michigan, groundwater sources, and inland rivers must be balanced with demand projections. Recommendations from *Water 2050* emphasize the importance of conservation to ensure water supplies for the future.

Following approval of Water 2050, CMAP embarked on implementing the plan. The overarching strategy for the first phase of plan implementation was water conservation, starting with release of the CMAP *Model Water Use Conservation Ordinance*, providing governmental bodies in the northeastern Illinois region a mechanism for adopting measures to promote better water use management. Ordinance adoption can be part of a larger water conservation planning effort. The American Water Works Association identifies ten water conservation planning steps, including [28]:

1. Review detailed demand forecast.
2. Review existing water system profile and descriptions of planned facilities.
3. Evaluate the effectiveness of existing conservation measures.
4. Define conservation potential.
5. Identify conservation measures.
6. Determine feasible measures.
7. Perform benefit-cost evaluations.
8. Select and package conservation measures.
9. Combine overall estimated savings.
10. Optimize demand forecasts.

Communities interested in undertaking a comprehensive water conservation planning effort will consider a suite of potential conservation measures, choosing those that are most suitable and cost-beneficial for their situations.[29] Many communities, however, choose to start by addressing non-essential outdoor uses of water, such as lawn watering during times of drought, when water conservation is most needed.

Why Outdoor Water Conservation?

Increasing population and urbanization corresponds to more land devoted to lawns, as well as more water withdrawals and runoff associated with their maintenance.[30] At first, individual lawns may seem insignificant, but lawn turf makes up nearly one nearly quarter (25 percent) of the urban and suburban landscape, and is the largest irrigated crop by area in the U.S.[31]

Of the 26 billion gallons of water consumed daily in the United States, approximately 7.8 billion gallons, or 30 percent, is devoted to outdoor uses.

Source: http://www.epa.gov/greenhomes/ConserveWater.htm

Outdoor water use:

- Comprises a large percentage of residential water use — the average American family of four uses 400 gallons of water per day, and about one third of that is devoted to outdoor water use.[32] Of that, as much as 50 percent is estimated to be wasted due to inefficient watering.[33]
- Contributes to summer peak use, which can necessitate costly water supply and/or infrastructure expansions. Reducing peak demand reduces impact on water supply distribution and treatment infrastructure, wastewater infrastructure, and energy.
- Has a significant impact on our water resources and environment, particularly since the hotter and drier summers (when these resources are already vulnerable) are the same summers that we see the highest amount of outdoor water consumption.
- Is discretionary (non-essential) and is therefore an easier target for conservation efforts than indoor water use; people are generally more willing to reduce their outdoor water use in response to education and outreach or other community measures, such as those involving price changes or water use restrictions.
- Is a financial risk driver for community water utilities, since weather variability leads to variation in water sales and, therefore, variation in revenue.

While outdoor water conservation is important, communities should also pursue basic water efficiency best management practices, including: universal metering, water accounting and loss control, costing and pricing, and information and education campaigns.[34]

27 Meyer, S. (1998). Groundwater studies for environmental planning, McHenry County, Illinois. Illinois State Water Survey Hydrology Division – Office of Groundwater Resources Evaluation, contract report 630.

28 AWWA Manual M52: Water Conservation Programs - A Planning Manual, 2006.

29 Tools are available to help communities evaluate conservation measures, including: the Alliance for Water Efficiency Water Conservation Tracking Tool (**allianceforwaterefficiency.org/tracking-tool.aspx**).

30 *Nearshore Areas of the Great Lakes 2008, Draft for Discussion at SOLEC.*

31 Robbins, P. and T. Birkenholtz. 2003. Turfgrass revolution: measuring the expansion of the American Lawn. *Land Use Policy* 20(2003) and Milesi, C. et al. 2005. Mapping and Modeling the Biogeochemical Cycling of Turf Grasses in the United States. Environmental Management 36(3).

32 U.S. Environmental Protection Agency (2004). How we use water in these United States. Clean Water Through Conservation chapter 1. Retrieved from: **http://esa21.kennesaw.edu/activities/water-use/water-use-overview-epa.pdf**.

33 See **www.epa.gov/watersense/////our_water/when_its_hot.html**.

34 U.S. Environmental Protection Agency: Water Conservation Plan Guidelines.

Types of Lawn Watering Ordinances

Each type of lawn watering ordinance has its benefits, and many ordinances can be combined.

Lawn watering ordinances are defined by time of year — they typically go into effect during the summer months of peak outdoor water use, from May to October. Each type of ordinance sets a range of time during which watering is permitted, however, watering your lawn during this entire range is by no means necessary and would take away the conservation benefit of the ordinance. Instead, the timespan when watering is permitted allows for flexibility in deciding when your lawn watering will occur each week. The various types of restrictions that can be set for these time periods are discussed below.

Time of day restriction

Outside water use is allowable only during the morning and evening. This prevents water use during the hottest, sunniest part of the day, when water would most likely be lost to evapotranspiration (i.e., to the atmosphere) rather than being taken up by the grass.

Hours per day or days of the week restrictions

Communities can mandate residents to only water their lawns for a certain number of hours per day. Alternatively, communities can permit lawn watering only on certain days of the week. These rules can be difficult to enforce, but can be properly implemented using education and outreach.

Even-odd calendar day restriction

This ordinance allows properties with even-numbered addresses to water their lawns on even calendar days (like June 20), while odd-numbered properties can water their lawns on odd calendar days (like June 21). Even-odd calendar day ordinances often ban all lawn watering on the 31 of any month in which the ordinance applies to prevent watering on two odd days in a row.

Even-odd days of the week restriction

This limits use to certain days of the week. For instance, watering of even-numbered properties could be permitted only on Wednesday and Saturday, while odd-numbered properties would be watered only on Thursday and Sunday.

Status-based restrictions

This approach incorporates restrictions into a set of different tiers that are based on the state of the climate (e.g. precipitation deficit or drought status). These tiers can be color-coded, for example, green indicates normal climate conditions and could correspond to simply a time of day restriction on watering; yellow indicates mild-to-moderately dry weather or drought, and the community could enact an even-odd rule in addition to the time of day restriction. Red indicates extreme dryness or severe drought, leading to a ban on all lawn watering. Status-based restrictions can incorporate more than three levels of climate conditions, but a larger number of tiers makes it more difficult for residents to understand the ordinance and can hinder enforcement.

Emergency restrictions

Restrictions are put into effect when the community declares a water emergency. These restrictions can range from time of day limits to full bans on outdoor water use, depending on the scope of the emergency they are meant to address. Water emergencies can be climate-related (e.g. severe drought) or infrastructure-related (e.g. water main break).

Recommended Regional Lawn Watering Ordinance

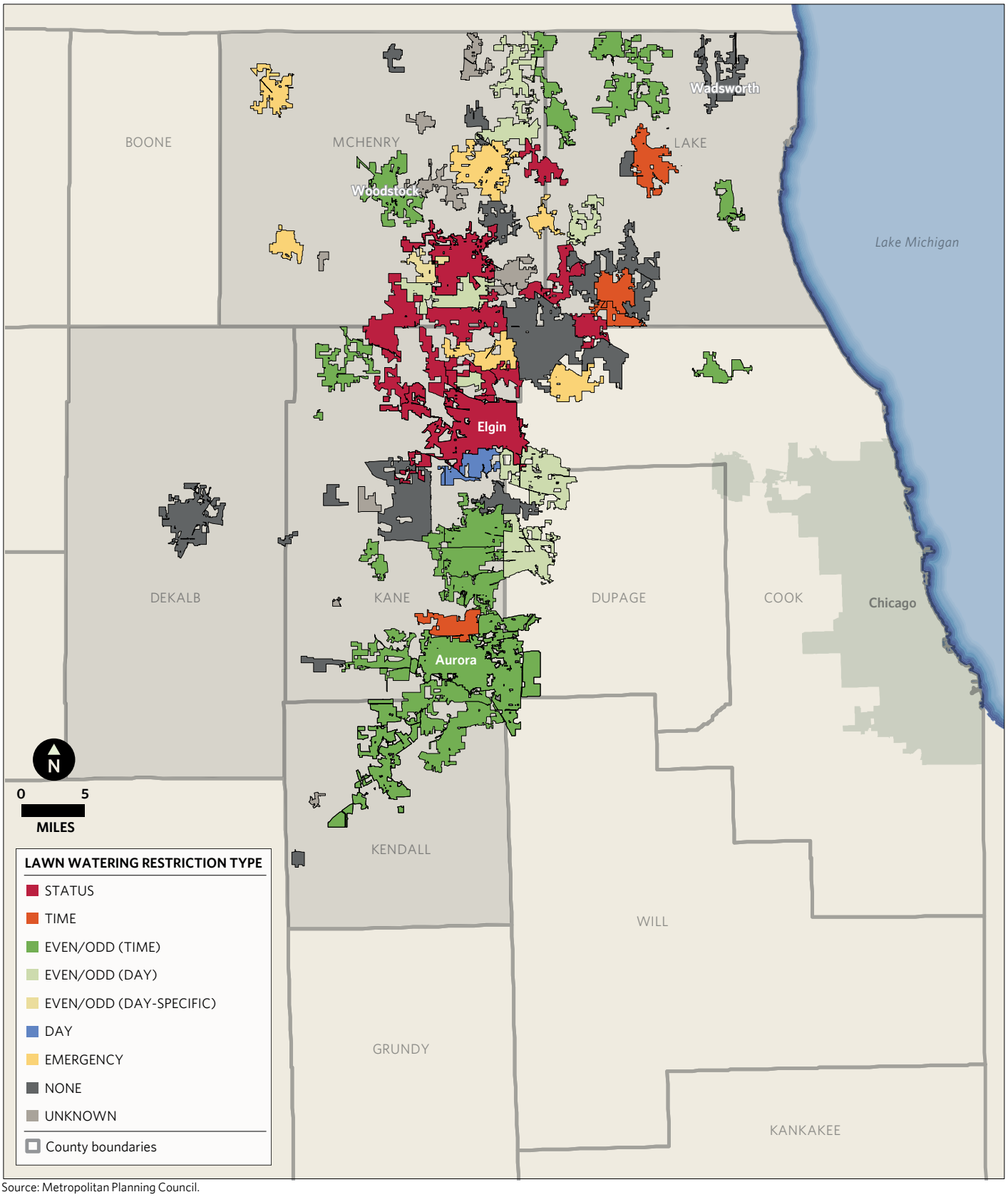
Out of the nearly 80 communities that make up the NWPA region, about 50 communities already have some type of outdoor water use regulation (Figure 3). The NWPA is recommending its member communities adopt a regional lawn watering ordinance that would implement uniform watering hours and drought status criteria across DeKalb, Kane, Kendall, Lake, and McHenry Counties to protect the region's primary water supplies, including underground aquifers and the Fox River.

When nearby communities have different sprinkling restrictions it can make it difficult for the media to remind residents of restrictions for their particular area, and also make it harder to track success in saving water.[35] Moreover, adoption of a uniform policy demonstrates the ability of the NWPA to act in concert as a regional planning entity, laying the foundation for collaborative management successes in the future.

The NWPA is recommending that all member communities, whether they have legislation in place or not, adopt the ordinance explained below because it would provide regional consistency and help residents understand how and why they are conserving water.

35 Kenny, D., R. Klein, and M. Clark (2004). Use and effectiveness of municipal water restrictions during drought in Colorado. *Journal of the American Water Resources Association* 40(1) 77-87.

Figure 3. Existing lawn watering ordinances in the Northwest Planning Alliance region



Source: Metropolitan Planning Council.

Rationale for the NWPA Recommended Lawn Watering Ordinance

The NWPA Technical Advisory Committee (TAC), made up of engineers, community planners, and utility personnel from various NWPA communities, partnered with MPC to create a unique ordinance. The TAC studied practices that had been proposed or implemented in the region to see what might work best. They developed four possible options (Table 2).

The NWPA discussed additional restrictions and provisions, including an exemption for new sod. A survey of NWPA communities, as well as several months of discussion within TAC, revealed that communities want an ordinance that is simple to understand and easy to implement and enforce, while also very conservation-oriented and flexible in cases of drought or near drought.[36] The NWPA incorporated elements from several types of ordinances to create a unique lawn watering ordinance meeting these priorities.

Table 2. Permitted time for lawn watering under each considered ordinance

LAWN WATER REQUIREMENT: 2 HOURS OR LESS				
ORDINANCE TYPE	STAGE (IF APPLICABLE)	PERMITTED HOURS/DAY	PERMITTED DAYS/WEEK	PERMITTED HOURS/WEEK
Even-Odd and Time of Day		**12**	**3 or 4**	**36 or 48**
CMAP Model		**2**	**2**	**4**
Status-Based (Existing Ordinances)	**Green**	**12**	**7**	**84**
	Yellow	**12**	**3 or 4**	**36 or 48**
	Red	**0**	**0**	**0**
Status-Based (with CMAP Model)	**Green**	**13**	**7**	**91**
	Yellow	**2**	**2**	**4**
	Red	**0**	**0**	**0**
NWPA Final Recommendation	**Year-Round (Green): Using sprinkler**	**6**	**3 or 4**	**18 or 24**
	Year-Round (Green): Non-potable reuse, or handheld device	**24**	**7**	**168**
	Drought (Yellow): Using sprinkler	**0**	**0**	**0**
	Drought (Yellow): Non-potable reuse, or handheld device	**24**	**7**	**168**
	Extreme drought (Red)	**0**	**0**	**0**

Source: Metropolitan Planning Council and the Northwest Water Planning Alliance.

Table 3. Northwest Water Planning Alliance Recommended Lawn Watering Ordinance: Quick View

SPRINKLING IS ALLOWED...		
	EVEN ADDRESSES	ODD ADDRESSES
Year-Round(Green Tier)	**On even calendar days from 6am-9am and 6pm-9pm**	**On odd calendar days from 6am-9am and 6pm-9pm**
During Drought (Yellow Tier)	**With handheld device, non-potable reuse ONLY**	
During Extreme Drought (Red Tier)	**NO sprinkling allowed**	
To Establish New Sod	***with permit (Sept-June):*** **For 8 hours on day 1 From 6am-9am and 6pm-9pm; Daily on days 2-10 Under normal restrictions after day 10**	
	With non-potable reuse: **Any day, any time**	
	With municipal water: **Under current lawn watering restrictions**	
On Impervious Surfaces (sidewalks, driveways)	**NO sprinkling allowed(buckets or handheld devices can be used for car washing)**	

Source: Metropolitan Planning Council and the Northwest Water Planning Alliance..

36 MPC sent out the various ordinance options as part of a survey to NWPA representatives from each community.

NWPA Recommended Lawn Watering Ordinance

The lawn watering ordinance that the NWPA is recommending for its member communities is a year-round one with drought provisions. The NWPA chose an ordinance that stays in effect past the summer to maximize the conservation benefits to the deep aquifer, from which water is being extracted faster than it can be replenished.

Communities that prefer the educational value of a color-coded system can choose to set up the ordinance as a tiered restriction. In this case, the year-round ordinance would be the green tier, with drought provisions going into effect in the yellow and red tiers. The NWPA determined that this type of ordinance, regardless of which form communities choose for implementation, lends itself to education and outreach campaigns, monitoring, and enforcement.

The ordinance is presented below with each section including potential color-coding .

Year-round conservation ordinance — green tier

Properties with even-numbered street addresses may water lawns using sprinkler systems on even calendar days, while odd addresses may water on odd days. Watering with sprinklers is permitted between 6am – 9am and 6pm – 9pm. Handheld watering devices or devices using non-potable water can be used any day or time.

The year-round restriction consists of an even-odd calendar day rule and a time-of-day limit. This combination allows for either 18 or 24 hours a week when lawn sprinkling is permitted, depending on whether there are three odd and four even days in the week or vice versa. Note that 18 to 24 hours is only a *potential time range* for when watering is allowed; by no means should anyone be watering their lawn for the full time allotted. Lawns in northeastern Illinois only need two hours or less of water per week, including rainfall, so the 18- or 24-hour time frames allow for flexibility in terms of times and days watering can occur. This tier is based on the most conservation-oriented models that have been implemented in the region. This is straightforward and can easily be enforced — on any date, residents on only one side of the street are allowed to water lawns.

Drought provision — yellow tier

Outdoor use of water is allowed using drip-irrigation systems, using buckets, watering cans or handheld hoses with automatic shutoff devices for watering trees, shrubs and flowers, or with the use of reclaimed greywater, recycled effluent, or harvested rainwater. The use of sprinkler systems is prohibited.

The drought provision bans sprinkling, but allows alternative methods of outdoor water use. Handheld watering devices generally use less water than sprinkler systems because the watering is directly controlled, whereas sprinkler systems are often left to run on their own. In addition, allowing handheld devices means that gardens, trees, shrubs, and flowers can be watered. However, property owners with large lawns probably will have to allow their grass to become dormant.

Lawn watering is allowed if alternative water sources are used. These sources include reclaimed greywater that has been separated from the wastewater stream. This water is treated so it's safe to use for irrigation, but not to drink. Recycled effluent, municipal wastewater that has been treated to those standards, is also allowed. Since both of these methods reuse water, they are not a drain on the municipal water supply, which is why they are permitted in moderate drought conditions. Harvested rainwater is allowed for much the same reason—it is an alternative source to the municipal water supply. This stipulation encourages water users in the region to install non-potable reuse systems for their properties.

Extreme drought provision — red tier

Total ban on outdoor watering.

The extreme drought provision enacts a full ban on outdoor watering. Regardless of whether a sprinkler system or handheld device is used, outdoor watering is not permitted. This includes watering with alternative sources of water. This restriction will be enacted relatively rarely, as northeastern Illinois does not often experience extreme drought. During these times, it is easier to ban all outdoor watering with no exceptions for the sake of consistency and easy enforcement.

Additional Provisions

The ordinance includes supplementary provisions to the main lawn watering rules. These provisions allow for additional considerations regarding outdoor water use, and they provide flexibility for communities that want to tailor the ordinance to their needs.

Additional provisions: sod laying and seeded lawn installation restrictions

- Sod laying, lawn seeding, and planting/establishing of new landscaping and lawn is prohibited from July 1 to August 31. An exception is made when the source of water is non-potable.
- Excepting July 1 to August 31, a permit is required from the director of public works to install a seeded or sodded lawn.

The provision regarding new sod and seed is similar to the restrictions already present in many NWPA communities. Since allowing new sod or seed to establish requires more water than an already-established lawn, both are prohibited during the most water-stressed months of the year and during drought or extreme drought periods. At other times of year, as long as the community is operating on the normal year-round rules, new sod or seed can undergo unrestricted irrigation with reused wastewater or harvested rainwater. Those who want to install new sod or seed but don't have these alternative water collection systems can obtain a permit that allows significant watering privileges on the first day of establishment. In addition, the permit nullifies the even-odd restriction for the following nine days, although the time restriction is still in place. After the tenth day, the year-round restrictions must be followed.

Additional provisions: waste of water prohibited

- The waste of water is prohibited

This provision bans waste of outdoor water. Spraying or sprinkling on sidewalks, driveways, and roads is a main driver of wasted water. Washing cars contributes to this, as car washing is often done on a driveway. The water cannot be absorbed into the ground because the surfaces are impervious—instead, the water runs off into nearby bodies of surface water, picking up pollutants on the way. This provision prevents unnecessary waste of water while also helping to preserve water quality in our supply source.

Communities can come up with their own additional provisions that make the ordinance more conservation-oriented. There is also the potential for communities to impose a total outdoor watering ban even if they are not experiencing extreme drought. In addition, it is recommended that communities set penalties to enforce the ordinance. Implementing and enforcing a penalty system, where penalties increase with the number of ordinance violations, sends the message that communities are serious about conserving water and gives water users more reason to comply with the ordinance.

See Appendix 1 for the full lawn watering ordinance.

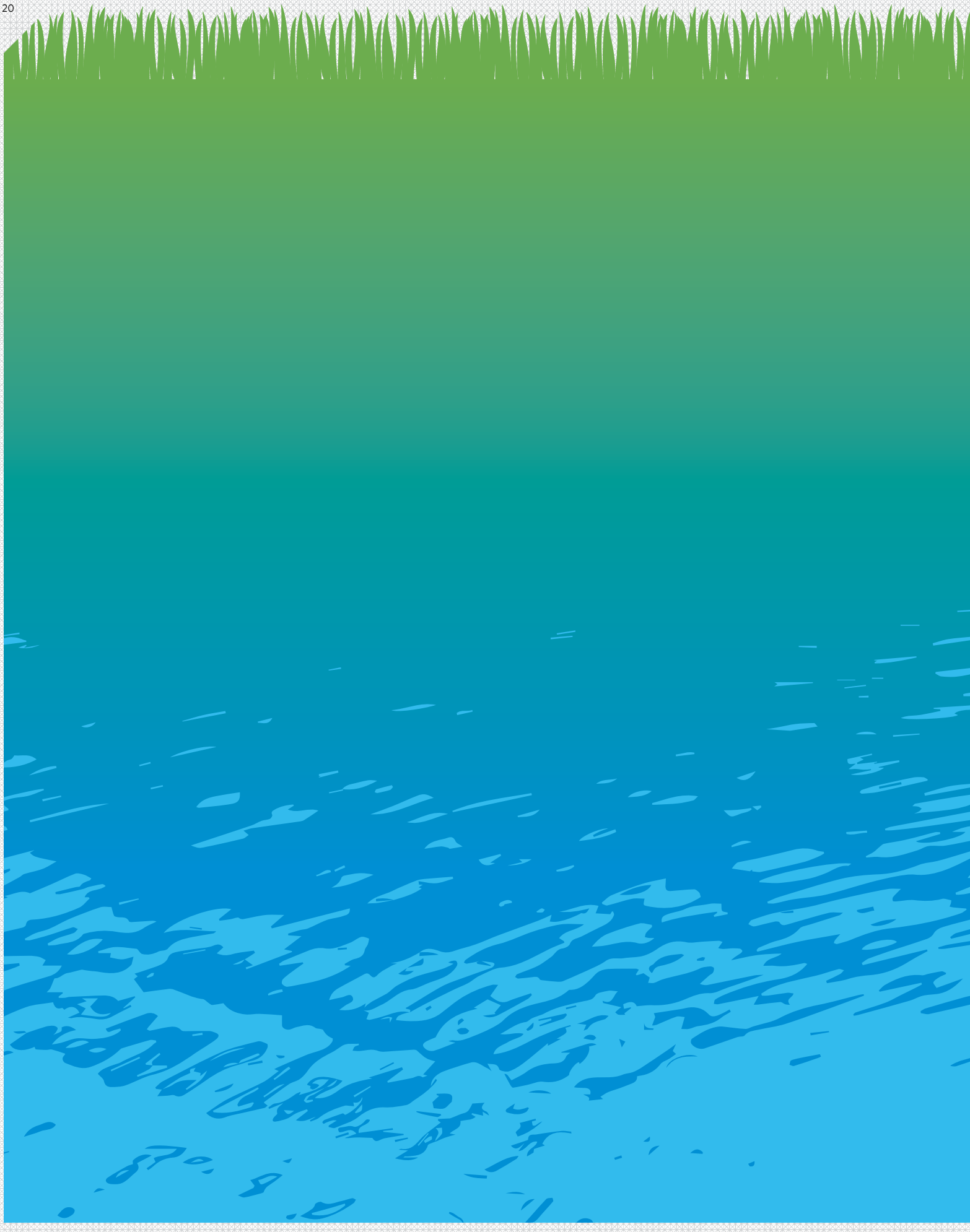
Summary

The adoption and implementation of this regional lawn watering ordinance will allow NWPA communities to make significant advances in improving water supply sustainability. This ordinance is not just a set of restrictions; it encourages a new way of thinking about the necessity and consequences of outdoor water use. Enacting the same lawn watering ordinance across the region is a significant step towards the vision that NWPA has for its member communities—a vision in which communities come together with a shared understanding of conservation needs, as users of the same water resources and members of the same watersheds, to proactively plan for a future of sustainable water.

Adopting the ordinance is not enough, however — education and outreach are crucial for this type of ordinance to induce significant water savings.[37]

The next section presents the Lawn to Lake program, an education program that helps communities promote sustainable outdoor water use.

37 Halich, G. and K. Stephenson (2009). Effectiveness of residential water-use restrictions under varying levels of municipal effort. *Land Economics* 85(4), 614-626.



The Lawn to Lake Program

The Lawn to Lake (L2L) program is an education and training program targeted at reducing polluted runoff from entering our local waters through the promotion of natural lawn care practices. The program's approach to sustainable landscaping emphasizes these principles:

1. Choose right plant, right place

2. Fertilize appropriately

3. Manage lawn pests responsibly

4. Water efficiently

5. Compost

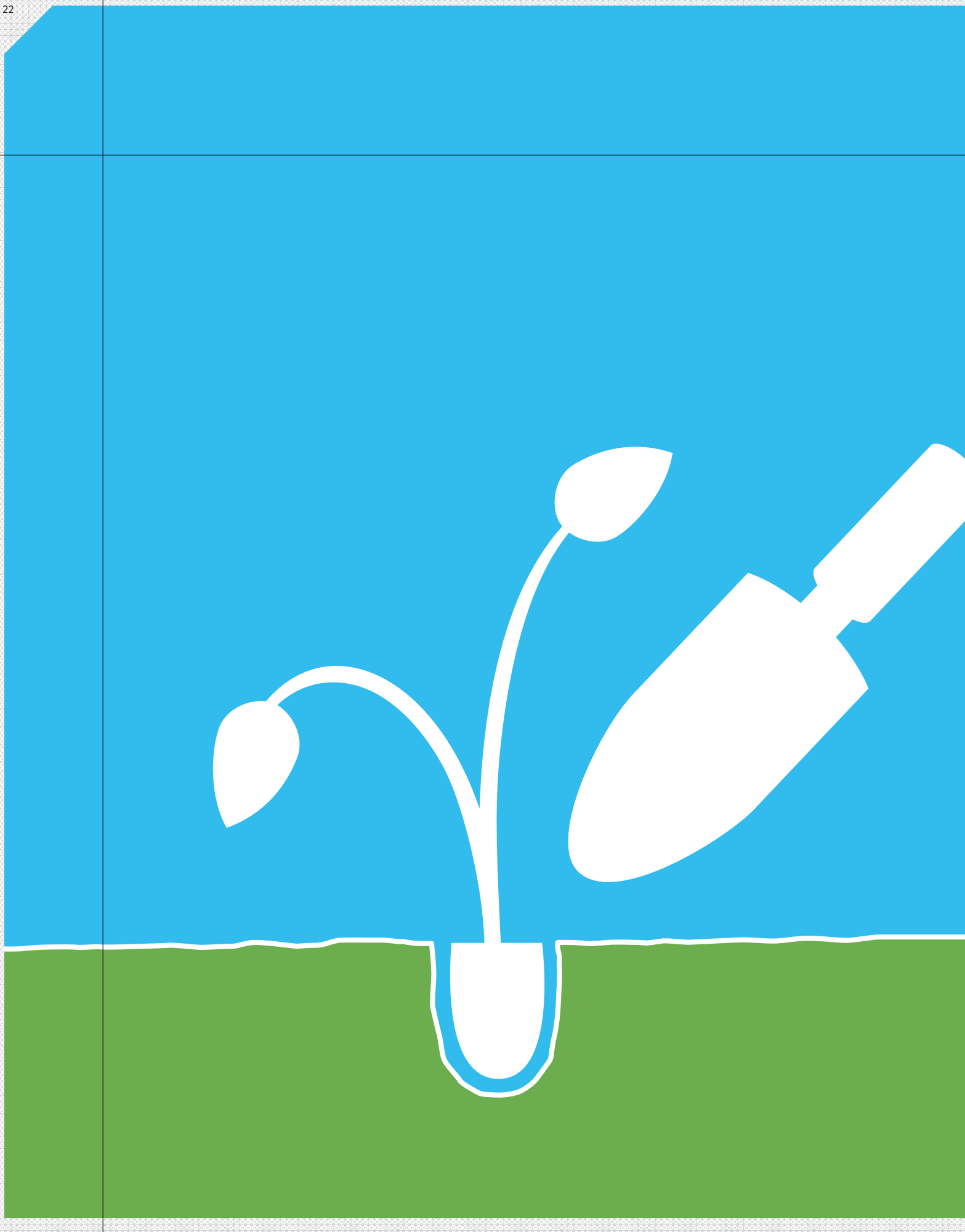
6. Attract wildlife

7. Reduce stormwater runoff

We'll go through many aspects that make up a natural lawn care regime, from choosing grasses and plants for your lawn to applying organic fertilizers and soil amendments. These practices have several benefits—they can save time and money, and they can result in a healthier lawn or landscape in the long term. Moreover, natural lawn care serves as a conservation strategy by changing the way your lawn uses water. Your lawn is healthier and therefore requires less water.

Irrigation requirements on lawns using natural lawn care is reduced by 30–50 percent over conventionally maintained lawns, due to the improved moisture retention capacity of the deeper root structure.[38]

38 The Harvard Yard Soils Restoration Project.



Right Plant, Right Place

Identifying practices that will assist you in choosing the right plant for the right place is the best place to start, as many issues that veer us off course in having a sustainable landscape can be avoided with a little planning. Additionally, choosing the right plant for the right place in your landscape can save you time and money in the long run.

We've all probably gone through the following scenario at some point: You buy a truly stunning plant at the nursery or garden center only to have it die soon after planting it. Or maybe it just never looks as nice as it did when you first brought it home no matter what you try — even moving it half a dozen times. What went wrong? Chances are it wasn't the right plant in the right place. For example, you wouldn't expect a cactus to thrive in a swamp.

The following information outlines some things you should consider when choosing plants for your property. You'll be a step closer to having a sustainable landscape.

Get to Know Your Property

One of the first steps in choosing the right plant for the right place is getting to know your property.

- Where is it sunny or shady during different times of the seasons or day?
- What are your soils like (ex. clay, sand, both)?
- Are there spots that never seem to dry out or are dry all the time?
- Look around — are there plants with problems?
- Where do you want play areas, vegetables, color, views, or privacy?
- How much lawn do you need or want to maintain?
- What kind of plantings would fit your property?

Determine the Exposure

Light can vary greatly depending on the time of day, the season, and whether it is filtered or completely blocked.

- Sunny areas get six or more hours of full sun, resulting in warm, dry soil. If plants are also exposed to wind, they will lose even more moisture.
- Shady areas are under trees or eaves or against north-facing walls. Moreover, these areas can be especially dry if tree roots are competing for moisture or when eaves block rainfall year round.

Test Your Drainage

Understanding how your soil drains is critical to choosing the right plants and knowing how to water them. If your soil drains too quickly, plants may not have a chance to absorb enough moisture, so you will need to water more often. If the soil drains too slowly, the plant's roots can suffocate from being submerged in water, resulting in rotten roots or even plant death. Test your soil drainage by digging a hole six inches wide and one foot deep (see image at right). If you have one, a posthole digger works well for this job. Then fill the hole to the top with water and let it drain. When the water has drained completely, fill the hole again. This time keep track of how long it takes for the water to drain completely from the hole.

- If the water drains in less than three hours, you probably have sandy soil.
- If water is still standing in the hole after eight hours, you probably have clay soil. It will be important to choose plants that don't need good drainage.
- If the water drains within four to six hours, you have good drainage and can choose a variety of plants.

You can amend your soil to help improve drainage, but this will take a little more time and money.

Image courtesy of Joe Mazza.

Know Your Soil

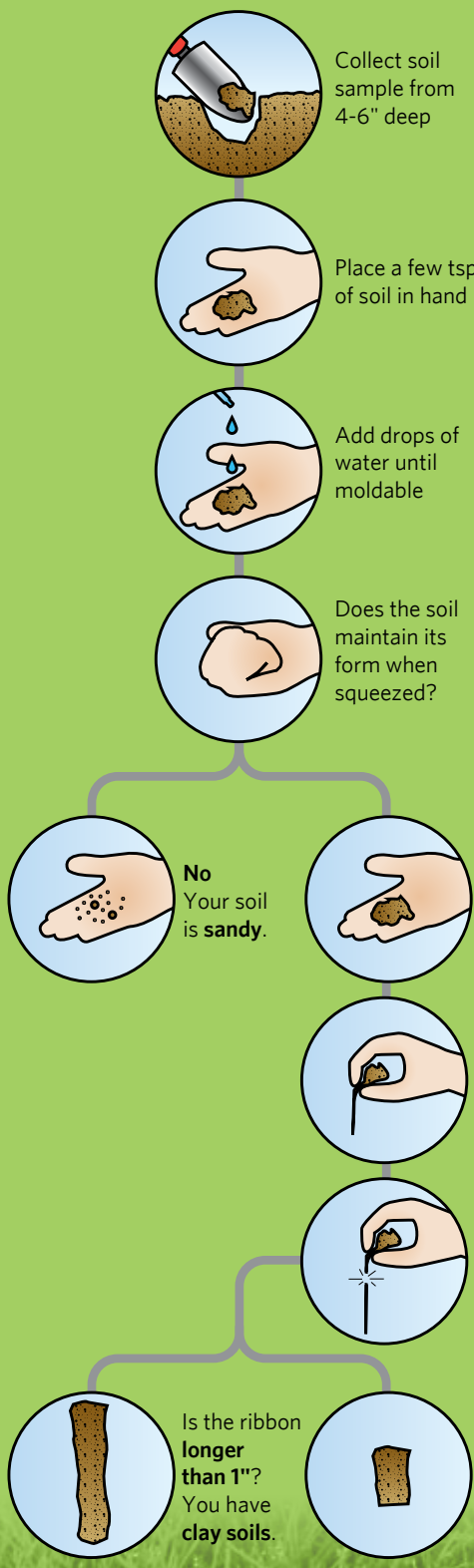
Pick up a handful of moist soil and squeeze. You may have to moisten it with a bit of water. Rub it between your fingers. How does it feel?

- Sandy soil has the largest particles and feels gritty. This soil is loose, drains easily, and dries out fast.
- Clay soil has the smallest particles. It feels smooth like flour and holds together like Silly Putty. When wet, this soil is heavy, sticky, and often soggy. In winter, it can get waterlogged, causing some plants to rot. In summer, it can be hard to dig into. Clay soil holds onto nutrients and water better than sandy soil.
- Loamy soil is a mix of sand, silt, clay, and organic matter (decomposed plants, compost, or manure). This soil is usually loose, drains well, and holds onto moisture and nutrients.

Alternatively, you can use the simple flow chart on the right to determine what type of soil you have.

Image courtesy of Joe Mazza.

Figure 4. Soil type determination flow chart



Group Plants by Their Needs

Once you know the sun, shade, soil, and drainage conditions of your property, you can choose the right plants. Check with your local nursery for what is available and for plant combination ideas. Be sure to group these new plants with plants that need the same conditions. This will greatly simplify your watering routine. That way you don't have to water the whole property to reach one thirsty plant!

Native Plants

Native plants have evolved to the conditions of our region. Not only do they generally require less maintenance (water, fertilizer, and pesticide use), they also provide food and habitat for resident and migrating wildlife such as birds, butterflies, and bees, many of which are important pollinators. Native plants can also help reduce runoff by helping rain to soak into the ground with their deep root structure.

Go for Diversity

Monocultures, large expanses of the same plant, can be prone to disease and insect infestation. Additionally, if you are planting for wildlife, a diverse selection of plants is very important. As an example, when planting to attract pollinators (ex. butterflies, bees, and hummingbirds), chose flowering plants that bloom at different times of the season. The overlapping bloom periods will help assure that there is a continued food source that draws them to your property.

Avoid Invaders

A number of our region's invasive species were introduced because they looked attractive. Invasive plants have the ability to thrive and spread aggressively outside their natural range. An example is purple loosestrife. While the purple flowers are pleasing to the eye, purple loosestrife has overrun fragile wetland habitats, creating a dense monoculture with little, if any, wildlife value. Get to know what plants are or may be invasive to your area.

Pick Plants That Resist Pests and Use Less Water

Many pest-and disease-resistant varieties are available now — ask at nurseries or Master Gardener clinics. Choose plants that are "low water use" or "drought tolerant." After they're established (2-5 years) many will thrive just on our limited summer rainfall most years, saving you time and money on watering. Native plants are usually the best option.

Made In the Shade

Consider strategically planting trees and shrubs around your home to help offset heating and cooling costs. Deciduous shade trees planted on the south, west, and east sides of your home will cast shade over your home during the hot summer months while also allowing warm sunlight to come in through the windows in the cold winter months. Be sure to account for how big the tree will be once it is mature, especially around power and phone lines. Never plant trees near a septic system if you have one. The tree roots can damage the system, leading to significant repair or replacement costs.

Cope With a Slope

Use groundcover plants or deep rooted native plants and shrubs on steep slopes where turf grass may not thrive or be easy to maintain.

Lawn Grass Species

What is the best lawn grass species? The answer depends on local environmental characteristics, such as amount of shade, type of soil, and climate, and how these interact with the innate characteristics of the plant. Since grasses vary in their characteristics, select grasses that are best suited to the specific characteristics of the lawn or landscape to which they are added.

The variation in turfgrass stems in part from the distinction between warm-season grasses and cool-season grasses. Most lawns in the upper Midwest region are made up of cool-season grasses that are better adjusted to the relatively cooler climate. Most lawns tend to use grass cultivars of species like Kentucky bluegrass, fine fescues, and perennial ryegrass, or a mix of such various cool-season grasses. However, cultivars of native grasses, including buffalograss, prairie junegrass, blue grama, and native-non-native hybrids, such as Texas x Kentucky bluegrass, are being developed for use as turf in the Midwestern region.[39] When planning a new lawn or redoing an old one, it is important to take into consideration which turfgrass or ornamental species are best adapted to regional water availability and the local environment.

Overseed & Top Dress

Reseeding (a.k.a. overseeding) and top dressing your lawn at least once a year with compost can help maintain a dense turf to out compete weeds. Water your lawn daily for approximately two weeks so the new turf grass from seed can become established.[40] In general, spot seeding of bare soil patches can be done in mid-April. Whole lawn reseeding can be done in early summer or early fall.[41] Once it has become established, you can follow the recommendations on water conservation outlined later in this guidebook.

New Sod Establishment

Establishing a new lawn is usually done by seed in our region. However, sod can provide both quick and reliable results in many instances. For the sod installation process to be successful, the site and soil must be properly prepared. You may want to consider doing a soil test before installing the sod to determine the condition of the soil and to see whether it needs any amendments. For instance, compost may be added to a soil lacking adequate organic content. There should be at least six inches of aerated soil for a healthy lawn to grow.[42] It is also important to ensure that perennial weeds are under control and the site has been graded properly.

Once the sod has been put in, the lawn should be watered every day in the morning for about 10-14 days. Use your soil test results to help determine how much fertilizer or other amendments may be needed. It's important to make sure there is enough phosphorus available to support the critical initial development of roots in the soil. Potassium is important for improving stress tolerance in high traffic areas and during drought conditions. Nitrogen is best applied after the sod has become established in about a months' time, followed up with another application in 30 to 60 days.[43] The general target rate for nitrogen fertilizer use is still one pound per 1,000 square feet, even for newly planted sod; however, using less than that amount is recommended for plantings that take place in the summer. Once the lawn is established, you can switch to infrequent watering and twice-yearly fertilizer applications or less, based on your soil testing results.

Why It Matters

Ultimately, when you match the right plants to the right environment, your plants grow stronger roots and are healthier, which in turn requires less watering, reduces or eliminates the need for pesticides, and makes plants more resilient to disease and harsh weather.

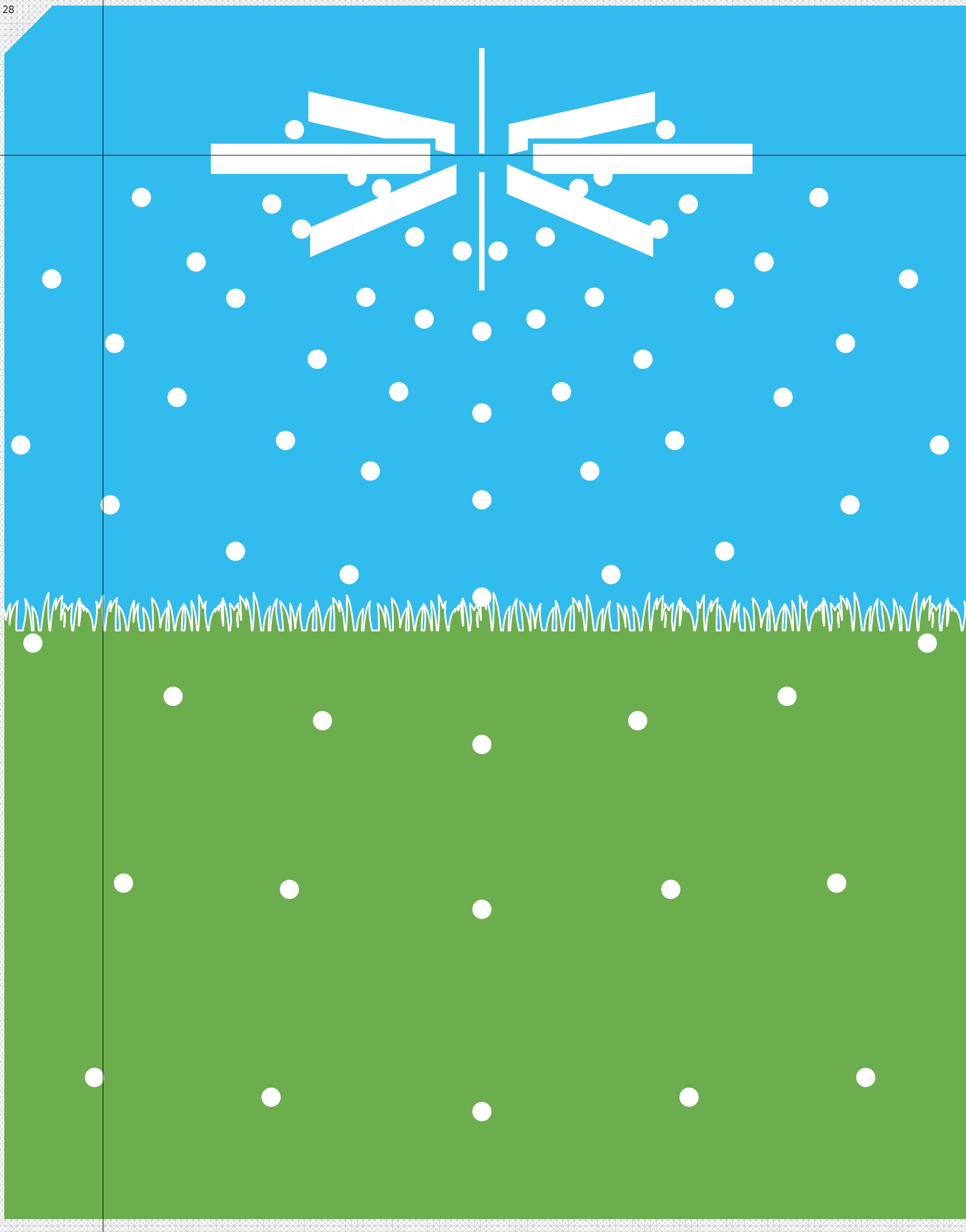
39 Mintenko, A., S. Smith, and D. Cattani (2002). Turfgrass evaluation of native grasses for the northern Great Plains region. *Crop Science* 42(6), 2018-2024; Su, K. et al (2008). Rooting characteristics and canopy responses to turfgrasses including hybrid bluegrass. *Agronomy* 100, 949-956.

40 Safer Pest Control Project: Natural Lawn Care for Homeowners. **www.spcpweb.org/factsheets/NaturalLawnCareforHomeowners.pdf**.

41 Safer Pest Control Project: Municipal Toolkit. **www.spcpweb.org/factsheets/SPCPMunicipalToolkitFinal.pdf**.

42 Missouri Extension. Sodding a home lawn. Retrieved from: **extension.missouri.edu/extensioninfonet/article.asp?id=1051**.

43 Purdue Extension. Establishing a lawn from sod. Retrieved from: **www.extension.purdue.edu/extmedia/AY/AY-28-W.pdf**.



Fertilize Appropriately

All plants need nutrients to grow and thrive. However, it's not always necessary to fertilize them. Your lawn obtains the nutrients it needs from soil minerals, organic matter, fertilizer, and even the atmosphere to a lesser extent. A plant's nutrient needs depend on a number of factors, including species, age, and location in the landscape. Too much fertilizer can weaken a plant, promote disease, and invite pests, in addition to wasting money and harming the environment. It also means more pruning and mowing. So, consider your plants' needs carefully before applying any fertilizer.

In 2011, Illinois instituted a law (the Agriculture Fertilizer Act) prohibiting commercial landscape care industry applicators from applying fertilizer containing phosphorus unless a soil test shows the soil is phosphorus-deficient. Establishment of seed and sod is exempted from the law. While the law does not apply to property owners, it does make property owners more attentive to the products they choose and give them the opportunity to be more careful with their phosphorus applications.

The following tips can help you make the right choices for a sustainable landscape.

Soil Testing

While it may seem trivial, soil testing is perhaps one of the most valuable tips provided in this guidebook for maintaining a sustainable landscape while also protecting the health of our lakes and streams. Fertilizing lawns for many of us is done on autopilot — twice a year, an application in spring and another in fall. However, many soils in Indiana and Illinois already contain enough phosphorus to support a healthy lawn. One way to find out for sure is to do a soil test. Soil tests can help you understand what nutrients (ex. phosphorus) are present in the soil and if additional nutrients need to be applied for the particular area in your landscape. Check with your University County Extension Office to see where testing services are available.

Image courtesy of Irene Miles.

Read the Label

If your soil test comes back saying that your lawn has a nutrient deficiency, make sure that you purchase the correct fertilizer to address that deficiency. All bags of fertilizers will have a label showing the nutrient analysis. It will have three numbers, such as 22-0-15, which correspond to Nitrogen-Phosphorus-Potassium or N-P-K. Nitrogen (N) is important in overall plant health. Phosphorus (P) is integral in root formation. Potassium (K) regulates water movement. Remember, most established lawns in our region do not require phosphorus. You can make sure by doing a soil test. If this is the case, look for a fertilizer with a zero value in the middle of the nutrient analysis (N-P-K), which means it is phosphorus free.

Another important consideration is release rate. Quality nitrogen fertilizers should contain controlled-release nitrogen. You can find out by checking the guaranteed analysis section on the back of the bag. Key terms to look for include controlled-release, slow-release, slowly-available, or water-insoluble nitrogen. Slow release fertilizers reduce the likelihood of nutrients running off into nearby lakes and streams. However, controlled release fertilizers won't have that immediate "greening up" effect.

Follow the Label

Make sure to follow the directions on the label. The label will provide information on calculating how much fertilizer will need to be applied based upon the square footage or your lawn and your soil test results. The label will also provide you with information about the release rate. Over-applying fertilizer can burn your lawn or run off when it rains. The label will also contain some general safety and disposal information. If you need to dispose of any of your lawn chemicals, check with the county solid waste district to see if they have a Hazardous House Hold Waste Disposal Day coming up in your area. There's no charge to dispose of these materials at these events.

Organic Fertilizers

A general "rule of thumb" for assessing organic fertilizer from synthetic is: if any of the three nutrient analysis numbers (N-P-K) is higher than 8, or if all three numbers add up to more than 15, there is a good chance you are dealing with a synthetic source of fertilizer. There are some organic sources that have about 10-12 percent nitrogen.[44] One of the advantages of organic sources of nitrogen (N) is the low chance of burning grass. Some synthetic fast-release sources have high salt levels that increase the chances of burning.[45] Many organic fertilizers come from animal sources but can also include plant and mineral sources. If you can't find it at your local nursery or homecare center, ask them to stock it. Otherwise, there are many options available via mail order or online.

Table 4. Nutrient composition of some organic materials used as fertilizer

MATERIAL	N	P	K	RELATIVE AVAILABILITY
Alfalfa pellets	**3**	**0.5**	**3**	**Slow**
Blood meal	**13**	**2**	**0.5**	**Medium/rapid**
Bone meal	**0.5-6**	**15-34**	**0**	**Slow**
Compost	**1-3**	**0.5-1**	**1-2**	**Slow**
Fish emulsion	**3-5**	**1-2**	**1-2**	**Rapid**
Soybean meal	**6-7**	**1-2**	**2**	**Slow/medium**
Rock phosphate	**0**	**20-32 (2% avail.)**	**0**	**Slow**

Source: Adapted from Purdue University Extension Service: Organic Vegetable Production **www.ces.purdue.edu/extmedia/ID/ID_316.pdf**.

44 University of Illinois Extension: Ask Extension. **web.extension.illinois.edu/askextension/thisQuestion.cfm?ThreadID=17605&catID=154&AskSiteID=34**.

45 University of Illinois Extension: Lawn FAQs. **urbanext.illinois.edu/lawnfaqs/fertilize.html**.

Time to Apply

If you need to apply fertilizer based on soil testing results, September and November are the two best times to fertilize your lawn. An application of nitrogen fertilizer in the fall promotes good root development, enhances your lawn's energy reserves, and extends color retention. The benefits will be seen in the spring with earlier green-up, better turf density, and improved tolerance of turf diseases.

For the September application, pick a product that contains some quick and slow-release nitrogen. The timing of the September application is anytime of the month after the daytime high temperatures are no longer in the 90s °F. The target application rate for this fertilization should be 1.0 lb. N/1000 square feet.

The November application timing should be near or after the last mowing of the year, but while the lawn is still green. Typically, there may be a month or more between your last mowing and the time the grass turns brown or goes under snow cover. Generally, the first few weeks of November are when to apply. Research suggests that the nitrogen must be taken-up by the plant before winter to be most effective. Therefore, a quick-release (or soluble) nitrogen source such as urea, ammonium nitrate, calcium nitrate, or ammonium sulfate is most effective. The target application rate should be 0.5 to 1.0 lbs. N/1000 square feet.[46]

General Considerations

Never apply fertilizer if moderate or heavy rain is forecasted for your area within the next 24-48 hours. Heavy rains can quickly carry fertilizers in runoff to nearby storm drains or waterbodies. If you live next to a lake or stream, do not fertilize within 25 feet of the water's edge. Make sure to sweep up any fertilizer that gets spread onto the sidewalk or street curb.

Calculating Pounds of Fertilizer to Apply

Desired rate (lbs. N/1000 ft^2) / % nutrient = Total fertilizer need (lbs. /1000 ft^2)

Total fertilizer needed (lbs. /1000 ft^2) x Area to be treated (ft^2) = lbs. fertilizer needed

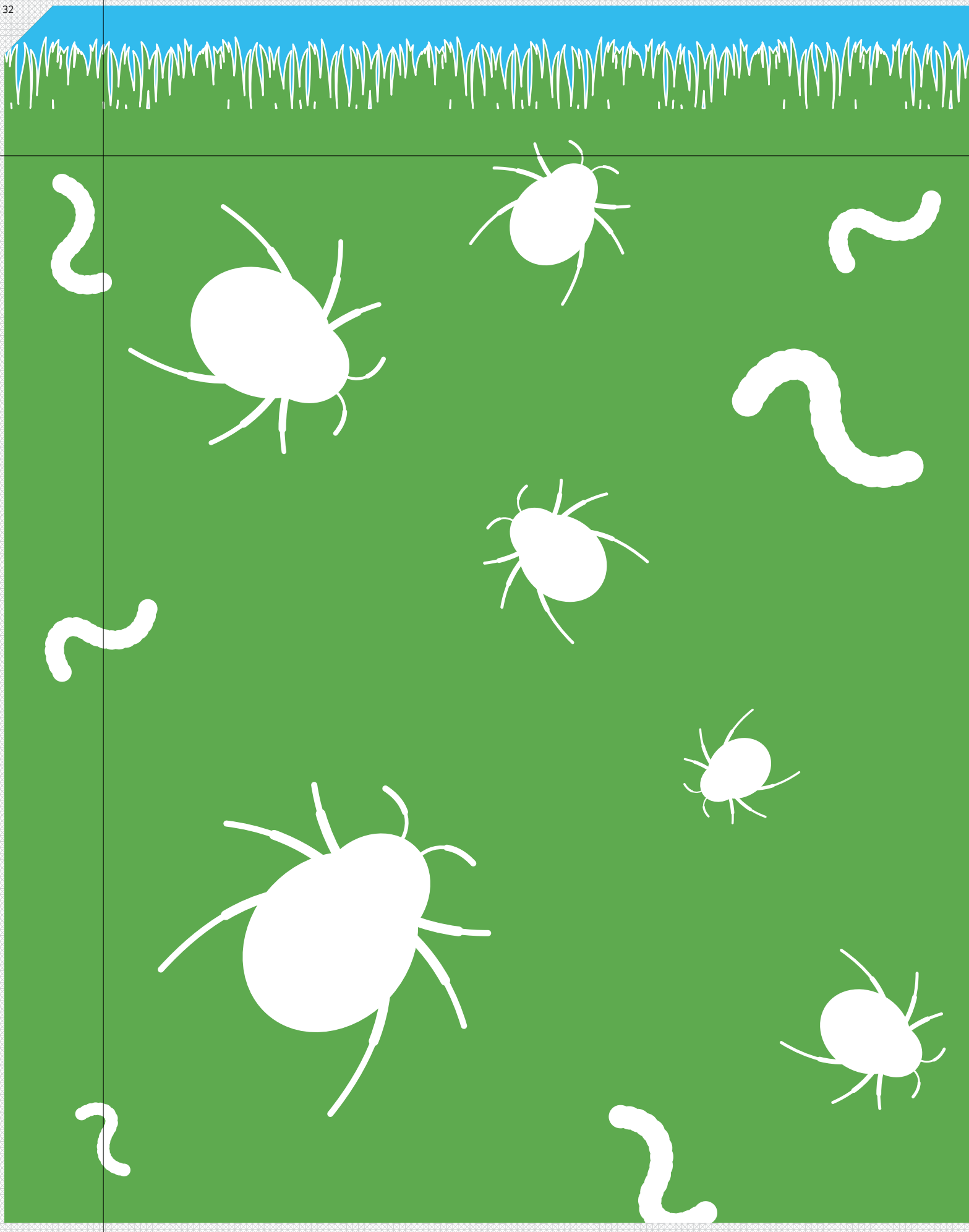
For example, how much fertilizer do you need to apply a 22-0-15 fertilizer at 1 lbs. N/1000 ft^2 to a 5000 ft^2 lawn?

1 lbs. N/1000 ft^2 / .22 = 4.5 lbs. /1000 ft^2 of 22-0-15 fertilizer

4.5 lbs. /1000 ft^2 * 5000 ft^2 = 22.5 lbs. of 22-0-15 fertilizer would be needed for a 5000 ft^2 lawn.

Image courtesy of Lake Champlain Sea Grant program.

46 Turf Tips: Fall Fertilization, Purdue University. purdueturftips.blogspot.com/2011/09/fall-fertilization.html.



Pesticides

Pesticides (the generic term for insecticides, herbicides, and fungicides) are among the most widely used chemicals in the world. Pesticides do pose some risk, and their use cannot be made completely safe. The majority of lawn and landscape pesticides are applied with combined pesticide-fertilizer products, such as weed and feed. The following tips will provide you with information on how to minimize the risks associated with pesticide use.

Integrated Pest Management

Home gardeners have many insect pest management options that don't rely on insecticide use. The systematic adoption of these options with attention to pest and beneficial insect life cycles and behavior is a key component of Integrated Pest Management (IPM). IPM is a strategy that helps gardeners prevent and manage pest problems with as few chemicals as possible. Some of its basic principles include: early and accurate identification of pests; regular inspections to gather information used in the management decision process; and having an "action threshold," which describes the level of pest presence that requires control.

After the garden has been planted, harmful insects can be managed in a variety of ways. If the garden is relatively small and the insect pests few, hand picking remains one of the most effective means of insect control. Traps or barriers can be useful for some pests, and biological control agents that are commercially available can be very effective against specific insect pests. Finally, when all other measures have failed, very selective and well-timed spot treatments of individual plant parts with a low-impact insecticide (such as insecticidal soaps or horticultural oils that are relatively safe compounds) may be considered. Even though insects may cause some damage, you may not need to control them if you learn to tolerate a modest level of insect feeding on your garden vegetables.

An Attractive Lawn with Minimal Herbicidal Use

The following steps from the Purdue and University of Illinois Extensions can reduce the need or amount of herbicides used to control dandelions and crabgrass while still maintaining an attractive and healthy lawn. Spot treating or mechanical removal of the occasional dandelion may be all that is needed.

1. **Mow at 3 inches or more.**
2. **Mow frequently, never removing more than 1/3 of the grass leaf blade.**
3. **Return the lawn clippings.**
4. **Fertilize in the fall (nitrogen).**
5. **Irrigate only as needed.**

The best defense against weeds is healthy, dense turf. Overseeding can be used to improve turf density in many existing lawns. The best time to seed cool season turf grasses in northern Indiana and Illinois is generally mid-August to late August.

1. **Mow the area to approximately 1.5 inches.**
2. **Aerate if needed.**
3. **Fertilize (organic alternative: 1/4 to 1/2 inch compost).**
4. **Apply seed at recommended rate.**
5. **Lightly tamp or press to insure seed/soil contact.**
6. **Water newly seeded area lightly and frequently over the first few weeks.**

Source: www.agry.purdue.edu/turf/pubs/ay-13.pdf, www.agry.purdue.edu/turf/pubs/ay-32.pdf.

Management Strategies

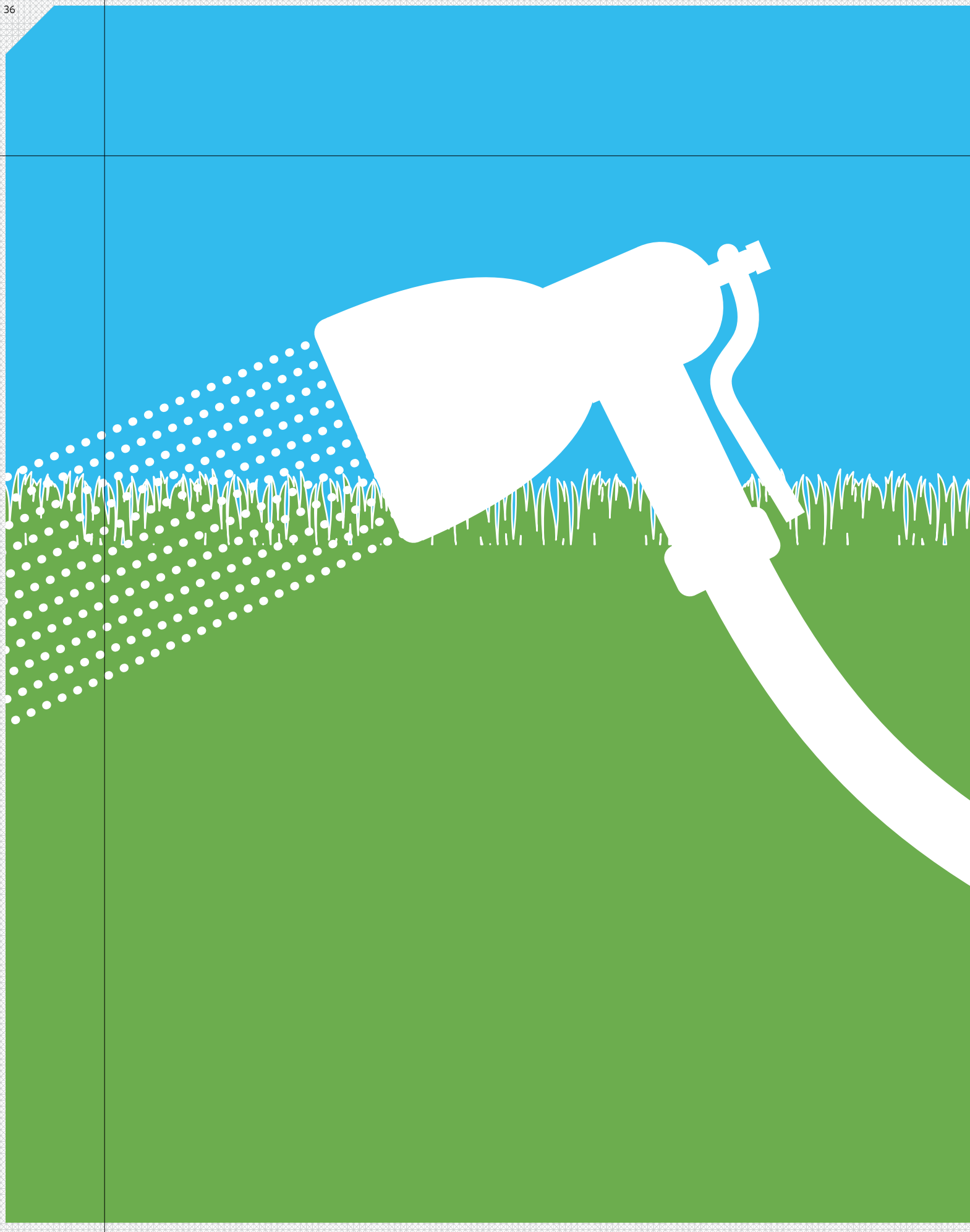
IPM uses a combination of compatible control techniques. These include cultural, biological, mechanical, plant selection, and chemical techniques. In many cases, a combination of these strategies may be necessary.

- Cultural controls are modifications of practices to disrupt or reduce pest populations (ex. maintaining healthy soils, proper watering and fertilization, and sanitation).
- Biological control refers to the use of natural enemies to control pests.
- Mechanical control refers to the use of barriers or traps to exclude or catch pests.
- Plant selection involves the selection and use of plant varieties that are disease and/or insect resistant and compatible with the existing conditions.
- Chemical control, as a last resort, includes the use of pesticides. The least toxic pesticide should be used initially.

Using IPM is the best way to safe, long-term pest management with minimal adverse effects to your family and the surrounding environment.

10 Stewardship Principles for Safe Pesticide Use

1. Read the label before buying the pesticide.
2. Buy only the amount of pesticide needed for one season.
3. As a general rule of thumb, the temperature inside the storage area should not get below 40°F or over 100°F.
4. Calibrate equipment carefully to assure that the pesticide is applied at labeled rates.
5. Be aware of current and probable future weather conditions in order to make the best application decisions to prevent drift.
6. Locate the mixing/loading site away from wells, streams, and lakes.
7. Never leave a tank while it is being filled, and pay constant attention during filling to prevent overfilling and spilling of the pesticide on the ground.
8. When you empty a container, allow it to drain into the spray tank for 10 seconds after it begins to drip.
9. Remember that exceeding the label rate of application is a violation of the law.
10. Follow the label each time you mix and use the pesticide, and when storing or disposing of the pesticide. Do not trust your memory.



Landscape Water Conservation

Talking about water conservation in our area can be a hard sell sometimes, especially with Lake Michigan nearby. While water is relatively cheap here, getting it to you does have costs (ex. infrastructure, maintenance, and processing), and it is, in fact, a nonrenewable resource. In addition to these monetary costs, overwatering your landscape can have negative consequences for your lawn and potentially harm adjacent waterbodies with polluted runoff. The following information outlines some steps you can take to conserve water while maintaining your landscape and protecting local streams and lakes.

Reduce Need for Watering

By choosing drought tolerant plants for your landscape, you will have to water less frequently. One option to consider is going native. Once established, a number of native plant species require little if any watering. A good example is purple coneflower. You can also reduce watering frequency and the amount of water you would otherwise use by grouping plants in your landscape based on watering needs. By using this approach, you can reduce watering needs to only a few flower beds, if you so choose.

Going Dormant

Most people think that a lack of water will damage the lawn, when actually over watering may cause more damage. Letting your lawn go dormant in summer or other dry periods is another strategy to consider, as long as it is established. Turf grass will naturally go dormant as part of a survival mechanism during prolonged dry conditions. Your lawn can survive in this state for about four weeks without substantial thinning once it recovers. However, you will want to consider a thorough watering about once every four to five weeks. Try and avoid foot or lawnmower traffic when your lawn is dormant. Your lawn will green up again after a soaking rain.[47]

Watering Frequency & Amount

If you chose to water your lawn, using a regular schedule probably isn't the way to go. This can lead to overwatering, which can leach vital nutrients away from the root zone and promote disease. Additionally, daily and brief watering discourages deep toot growth that is essential for healthy turf grass. Instead, water your lawn based upon its appearance. Lawns that appear bluish-green or where footprints remain after walking across them could use watering. Watering more frequently has no benefit. If you have an automatic sprinkler system, you should set it for a single cycle then turn it off until the lawn needs watering again. When the lawn does require water, it's best to do a deep soaking (1 – 1 1/2 inches) in the morning to encourage deep root growth for a more drought tolerant lawn.[48] You can easily measure the amount of water applied with a rain gauge.

Irrigation Systems

A variety of high efficiency irrigation systems are readily available to the public. Even a do-it-yourselfer can find many options at a home center, ranging from drip irrigation to misters. These systems allow the property owner to have greater control over the volume of water applied and the timing.

47 Irrigation Practices for Home Lawns, Purdue University Extension Service. **www.extension.purdue.edu/extmedia/AY/AY-7-W.pdf**.

48 Irrigation Practices for Home Lawns, Purdue University Extension Service. **www.extension.purdue.edu/extmedia/AY/AY-7-W.pdf**.

Lawns and Drought

With the shifting weather patterns in the Midwest, we can expect to see more frequent episodes of drought.[49] These hot, dry conditions are uncomfortable for us, but they seem even more uncomfortable for our lawns. What can you do for your lawn to get it through a drought? The most common answer is to just keep pouring on more water, but this "quick fix" is at odds with the increasingly common goal of water conservation. Luckily, there are other ways to equip your lawn for a dry spell.

In general, lawns made up of drought-tolerant grass species tend to fare better in drought conditions. Since these species are adapted to use water more efficiently, they don't usually need extra irrigation to get through periods of low rainfall. However, the climate in the upper Midwest has historically been relatively cool and humid. Accordingly, most lawn grasses used in this region are "cool-season" grasses, like Kentucky bluegrass, that are not very drought-tolerant. This doesn't mean you have to watch your lawn die whenever there is a drought, though. Even if your lawn isn't drought-tolerant to begin with, here are some things you can do throughout the year to help it survive a potential drought.

- **Mow the grass higher.**
  Raise the height setting on your mower and mow the lawn less frequently so that your grass is taller. If you make this a common practice, even when there isn't a drought, your grass will develop deeper roots. This enables the grass to reach and store more water, which is a helpful characteristic when the weather turns hot and dry. Using a sharp mower blade is also recommended; it produces a cleaner cut that heals more quickly, losing less water to the atmosphere.
- **Don't over-fertilize.**
  Using too much nitrogen fertilizer can promote a lot of blade growth above ground without enough root development below ground to be able to support the grass. Too much fertilizer can also make grass more susceptible to disease. Overall, it will be less able to make it through tough conditions.
- **Improve soil structure.**
  Applying compost or organic soil amendments improves soil structure so that the soil can hold more water, which helps keep the lawn going during a drought. Properly treating thatch can also improve soil structure. On a related note, try to limit traffic on the lawn during dry spells, as that compacts the soil and reduces the space where it can hold water.
- **Go dormant.**
  If your lawn goes brown under its normal watering routine, consider allowing it to go dormant. Adding water to green the lawn up again can actually drain its reserves, making it more susceptible to pests and disease; if conditions stay dry, the grass will not be able to build those reserves up again. A dormant lawn is not a dead lawn — far from it. A minimal input of water, about 1/4 to 1/2 inches every month or so, is enough to keep a dormant lawn ready to resume growth when the weather improves.

For more information on managing your lawn during drought conditions check out the University of Illinois Extension Lawn Talk at **tinyurl.com/d93c6pt**.

49 Mishra, V., K. Cherkauer, and S. Shukla (2010). Assessment of drought due to historic climatic variability and projected future climate change in the Midwestern United States. *Journal of Hydrometeorology* 11, 46-68.

Compost

Compost — you hear people talk about it and can sometimes find a bag of something with that word on it at the local lawn and garden store, but what is it really? In the most basic of terms, compost is a mixture of decayed plants and other organic matter used by gardeners for enriching soil. Those in the know call it black gold. For avid recyclers, it is often a forgotten element of the recycling triangle.

Take some greens, browns, yellows, even some purples and reds (explained in detail later), mix it together, and overtime you will get a deep rich black soil full of all of the nutrients left by the decaying matter that was mixed into the pile ready to be spread onto your flowers, vegetables, around trees, and even over your lawn. Is it that simple? Can I do it on MY property? Yes and Yes!

The simplicity or complexity (as well as the amount of effort required) of composting depends on the desired outcome — to reduce the amount of waste sent to the landfill or to create a super high quality product for your property; either way, compost happens. The tips and information below will help guide you in choosing and starting a composting program for your home.

Mowing Height & Thatch Control

Mowing height depends on your lawns grass species. Mowing below the optimum height can restrict root growth, encourage weed growth, and increase susceptibility to drought, disease, insects, and foot traffic. If your lawn is shaded, mow it 1/2-1 inch higher than the recommendations below.

SPECIES	HEIGHT (IN)
Kentucky bluegrass	2 to 3.5
Perennial ryegrass	2 to 3.5
Fine fescue	2 to 3.5
Tall fescue	2.5 to 4

Excessive thatch buildup is a symptom of over fertilization, over watering, and /or soil compaction. To control buildup long-term, you will need to address one or more of these causes. In the meantime, a dethatching machine can be used.

For more information, please see *"Mowing, Dethatching, Aerifying and Rolling Turf."*

www.extension.purdue.edu/extmedia/AY/AY-8-W.pdf

Leave-it-Lay

Rather than bagging your lawn clipping, just leave them there. Not only will you save mowing time and disposal/compost costs, you will save on fertilizer costs. The decomposing grass clippings will release nitrogen, phosphorus, and potassium as well as other elements that will help feed your lawn. The clippings will also lead to an increase in earthworm activity, which will help improve soil aeration.

To recycle your grass clippings, you only need the most basic of lawn care on a regular basis.

- Mow your grass to a height of 3-4 inches high. Try to never cut more than **one-third** of the grass blade's height during any single mowing. This will allow the grass to develop a deeper root system, help block out weeds, defend against drought and disease, and create finer clippings, which will decompose more readily.
- Keep your lawn mower blades sharp. If you do not already have one, next time you purchase a lawn mower, purchase a mulching mower. Mulching mowers chop up the blades into finer clippings that will decompose faster. You may be able to retrofit your current non-mulching mower with a mulching kit.
- Remove any existing thatch using a dethatching machine or core aeration machine. You should only need to do this when the thatch is over 1/2 to 1 inch thick. Returning grass clippings to the lawn does **not** increase thatch. Excessive thatch buildup can be a symptom of other turf management issues such as deficient microbial life in the soil needed to help breakdown organic matter.
- Avoid over-fertilizing or over-watering your lawn. Fertilize your lawn according to the recommendations in the Fertilize Appropriately section of this guidebook.

Sometimes your lawn just gets away from you and grows too tall to mulch. In those situations, consider doing a few passes spread out over a couple of days, lowering the mower deck each time. This will reduce stress on the turf grass and provide a cleaner looking cut. Alternatively, use the grass clippings around flowers, garden plants, and shrubs (as long as the grass was not recently treated with herbicides or pesticides). There may be cases when you should bag your clippings, such as if your grass is heavily infected with a fungus. Do not use them as mulch or in your compost pile.

Image courtesy of Sea Grant.

What Exactly is Happening in a Compost Pile

There are three important factors that are necessary in making good compost: air, water, and heat. Each is important because they help create a good working environment for the real composters. A good compost pile will have a variety of workers, each doing their part to help breakdown the organic material into usable compost. These include a variety of insects, fungi, and bacteria. Each has specific environmental conditions that need to be met within the pile for them to do their part in the breakdown process. Where one group ends in breaking the materials down, another one gets started.

The Better the Ingredients, the Better Compost

Before starting your compost project, you should first think about the types of organic wastes you generate, how much time you want to spend composting, how big your property is, and how much of it you are willing to give up to your composting operation. Composting can be as simple as tossing vegetative waste in a pile or as complex as carefully managing your compost pile with hydrometers, thermometers, and various other meters. Be realistic in your expectations of time, energy, and effort.

Simple Compost Recipe

A simple compost recipe calls for blending roughly equal parts green materials with brown materials. Chop or shred when necessary to ensure no piece is over 12 inches in length. Add water to the pile to maintain a moist environment, but make sure it does not get too wet from rain by placing a cover or roof over it. Occasionally, the pile will need to be turned with a pitch fork or rake to add air. In about 3-8 months, your compost should be ready. The usable compost will be located toward the bottom of the pile. It should look like loose dirt or soil, however, you may still see some remnants of the larger and woodier waste, depending on how well you shredded or broke up the materials when you started.

This type of composting has it pros and cons. It is an easy way to compost, requiring little time, effort, or skill. It is a good method for folks who generate little yard waste and can manage yard debris and grass clippings. This is an “add as you go” pile and does not require preplanning or stockpiling of yard waste. This type of compost pile, however, decomposes slowly and is prone to odor problems that can attract pests. It does not offer the rich nutrients that more managed compost piles offer and may not kill nuisance weeds and disease.

Advanced Compost Recipe

This approach will deliver rich, nutrient packed materials but, it requires time, planning, and effort. You will need a minimum of one compost bin, and the more bins the better. You will also need space to stockpile the ingredients so they are available when needed.

To start, consider where you are going to place your bin(s) and stockpiles. You will want them in a convenient location, but where there is access to a water spigot. They should not be in full sun or under larger trees. Air circulation is important, so try not to stick them in the corner blocked by fences or other structures. Insects, worms, bacteria, and, yes, even mice may make their home in the bins, so make sure they are placed away from the home or garage.

Next, consider the ingredients. You will need the right mix of "browns" and "greens." Browns are materials with high carbon (C) content, such as twigs, branches, and dried leaves that are needed to help feed the bacteria that are breaking down the materials. Greens are materials such as grass clipping that are full of nitrogen (N). The correct ratio of C:N is important to maintain a good compost pile. Too much carbon may cause the pile to heat too fast, not allowing the bacteria to do its job. An improper ratio can also affect the quality of nutrients in the compost. A rule of thumb is to use approximately 25-30 parts "brown" materials to one part green materials.[50]

To make sure that you have the ingredients on hand, you will need to have holding bins or a suitable place to stockpile the materials. Store the browns, greens, and food waste separately. These bins or stockpiles should be covered and protected from moisture. Do not seal up grass clippings. Make sure that they are placed in an aerated hold bin or pile.

You can make the batch as big as you want, but remember, once you start the batch you cannot add anymore ingredients. Any new materials will have to be held until you are ready to make a new batch. A basic compost recipe is as follows:

1. Place the coarsest material, such as stalks, twigs, hay, and large weeds, at the bottom. This layer should be about 3 inches thick.
2. Add 2-3 inches of "greens" topped with 2-3 inches of dry "browns."
3. Moisten by using a spray nozzle.
4. Repeat with alternating layers of "greens" and browns," remembering to sprinkle with water after each "brown" layer until the bin is full. Do not overwater. You just want to dampen the pile.
5. Cover the pile to retain moisture and heat. The cover should also be able to keep out pests while still allowing air flow.

Check the compost pile weekly. Use a pitchfork to turn the materials to add air and better incorporate materials. Another option to this would be to purchase a rotating compost bin from a garden center or online. Add water as necessary to keep the pile damp. In about 2-3 months the volume in the bin should have been reduced by about half. It should also start to look like dirt or soil. When it is ready, generally after three months, you should be able to start drawing good compost from the bottom of the pile.

Image courtesy of Susan Ask.

Overwintering Your Compost Pile

Before the ground freezes, you should empty as much material as you can from you compost pile. If you have unfinished compost, you can place it in garden beds under a layer of soil. Store finished compost in a dry place so it is ready to use in the spring. Keep a small layer of finished compost on the bottom of the pile to ready it for spring activities.

50 Household Composting: Methods and Uses for Compost (HENV-103-W), Purdue Extension. **www.ces.purdue.edu/extmedia/HENV/HENV-103-W.pdf**.

Putting Worms to Work

Vermicomposting or worm composting is an easy way to turn food wastes into a nutrient-rich soil amendment. This method of composting is especially useful for families with little or no yard space. Worms like to feed on slowly decomposing organic materials like fruit and vegetable scraps. The worms produce castings that are full of beneficial microbes and nutrients, which make a great plant fertilizer. Worms are very efficient at breaking down food scraps and can eat over half their body weight in organic matter every day.

The equipment needed to vermicompost is minimal. You can purchase a premade vermicomposter, or you can make one at home using a plastic tote storage box. Material lists and "how-to" instructions area readily available online and can be found with a simple internet search. Alternatively, contact your county Soil and Water Conservation District or University County Extension office to see what information they might have available. Some may even offer workshops on creating your own vermicomposter.

Using the Compost

Compost is finished when it looks like a rich dark soil that crumbles easily and has a good loamy smell. Compost, unlike other soil amendments, can be worked into the soil anytime of the year without risk of burning the plants. You can either mix in 1-3 inches of compost into the soil or simply spread the compost in a thick layer around new plants. To use the compost as a lawn top dressing, simply rake in a loose layer over the lawn in the spring and fall. Compost can be used with indoor plants as well. Use caution in where you place your compost based on the sources of material that you composted (ex. grass clipping with herbicide and seedy weed material).

Composting, mulching, vermicomposting, and leave-it-lay are all great methods to increase the health of your lawn and garden and reduce your dependence on chemicals, as well as your costs. Taking a "greener" approach to gardening does not need to be all or nothing. Start with small simple steps. Purchase a premade composter and work with your yard wastes a little bit at a time. Play around with some worms. Vermicomposting is a great experiment for children. And work smarter, not harder. Let the earth do its thing and recycle your grass clippings on site.

Landscaping for Wildlife Habitat

Have you noticed a decrease in the number of butterflies, dragonflies, or other wildlife in your neighborhood? Across the globe, wildlife populations are on a decline due to increasingly fragmented habitat resulting from human development. Generally, habitat includes all the plants, trees, bushes, logs, and other amenities that provide food and cover for wildlife. When we develop land we convert once connected habitat into small isolated pockets, making it difficult for wildlife to travel.

Fortunately, property owners can provide wildlife habitat by landscaping with native plants and trees which, in addition to providing habitat, also enhance water quality. Native plants are plants that grow naturally in a region such as northern Illinois and Indiana. These plants have had thousands of years to adapt to their surroundings and can therefore survive extreme weather conditions and disease better than your average ornamental plant. They also have longer roots that can soak up and filter water. More importantly here, wildlife has also adapted to their surroundings and they depend on these native plants for their survival. For example, native plants provide butterflies with the nectar and foliage they need as caterpillars and adults. Adult butterflies may accidentally mistake non-native, ornamental plants for a good egg-laying site when in fact they do not always provide adequate amenities to support the species.

In order to survive, wildlife requires access to water, food, cover, and places to bare young. With a few simple steps, property owners can help provide these essential habitat components. This section uses a framework created by the National Wildlife Federation to briefly describe the amenities necessary to develop wildlife habitat. However, it is not comprehensive. Once you have a general understanding of the basic habitat components listed here, a simple internet search can shed light on the needs required by your favorite wildlife. With that information, you can recreate habitat using human-made and natural materials. Recreating wildlife habitat is about creating a place for the entire life-cycle of a species. While this requires a bit of effort on your part, you'll be rewarded with an abundance of wildlife to enjoy.

Plants for Pollinators

The following list of perennial flowers, shrubs, and trees are just of few of the many options available to landowners to incorporate into their landscape to provide shelter and food for a variety of pollinators.

PERENNIAL FLOWERS:

- Sunflowers
- Joe-Pye-Weed
- Beebalm
- Goldenrods
- Tickseed (Coreopsis)
- Black-Eyed Susans
- Spiderwort

TREES & SHRUBS:

- Maples
- Service Berry
- Dogwood
- Eastern Redbud
- Sumacs
- Viburnum

For more information please see *"Selecting Plants for Pollinators: A Regional Guide for Farmers, Land Managers, and Gardeners"* available at pollinator.org.

Image courtesy of Amy Roth.

Supply Water for Wildlife

Wildlife requires sources of clean water for many purposes, including drinking, bathing, and reproduction. Water sources may include natural features such as ponds, lakes, rivers, and wetlands. In the absence of natural features, human-made features such as bird baths, installed ponds, or rain gardens work well as substitutes.

Provide Food for Wildlife

Native forbs (an herbaceous flowering plant other than grasses, sedges, and rushes), shrubs, and trees provide the foliage, nectar, pollen, berries, seeds, and nuts that many species of wildlife require to survive. While non-native plants may have many of these features, the timing of their pollination and seed dispersal may not coincide with local wildlife feeding and breeding patterns. Taking this into account, many landscapers utilize native plants and plant for continuous bloom (the selection of a variety of plants so that a garden is in bloom throughout the growing season). Such a practice will ensure both adequate food resources for wildlife throughout the season and a longer period in which to enjoy a vibrant garden. Ask your landscaper or local nursery for more information on selecting plants for continuous bloom.

Provide Cover and other Essentials

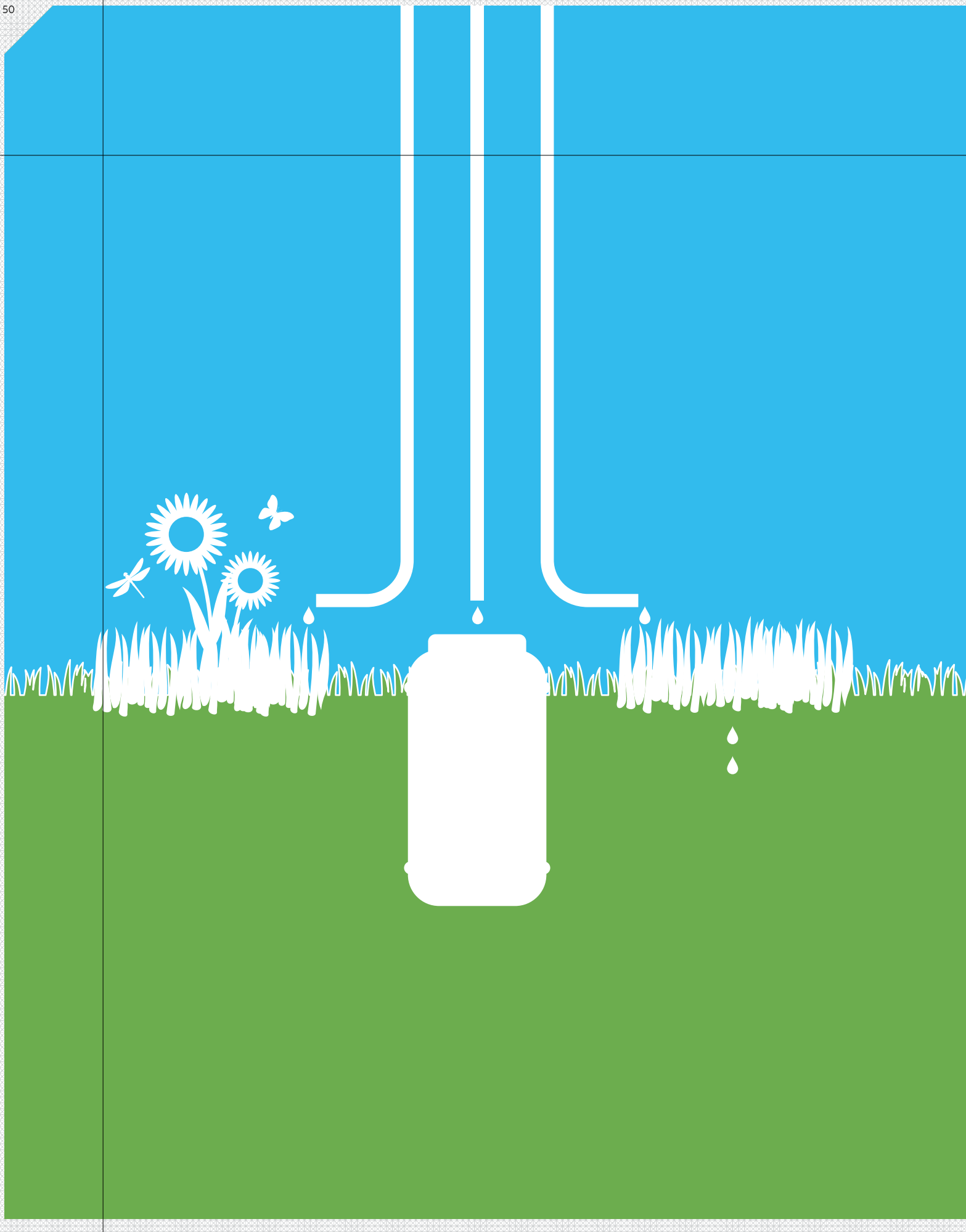
Wildlife needs cover to hide from predators and inclement weather. Native vegetation acts as a perfect cover for terrestrial wildlife. Shrubs, thickets, and brush piles provide great hiding places, as do fallen trees and branches as well. If natural options are not available, consider creating a simple structure to meet the habitat needs of your favorite wildlife. For example, butterflies need flat areas to bask in the sun. Therefore, by incorporating stone pavers into your landscaping, you are helping to meet the needs of this species. Also, human-made structures, such as ponds, provide cover for aquatic life and amphibians. These are just two examples of how property owners can create cover and other essentials for wildlife habitat.

Image courtesy of Victoria Kinder.

Give Wildlife a Place to Raise their Young

It's great to have butterflies, dragonflies, and other wildlife pass through your property, but how can you keep them there longer for your viewing pleasure? For one, you can provide places for wildlife to raise their young. By incorporating the right habitat features into your property, you can contribute to the reproductive success of your favorite wildlife year after year.

For instance, female butterflies lay eggs on plant species that their offspring will eat, so including favored host plants in your habitat helps ensure reproductive success. Also, avoid pesticides and herbicides, which kill not only target species but also beneficial insects and the foods they rely on in order to reproduce.



Rain-Friendly Landscaping

Under natural conditions, most rainfall soaks in where it falls and is naturally filtered by plants and soil. Urbanization has led to an increase in impervious surfaces (hard, paved surfaces that water can't soak through). Precipitation runs quickly across these impervious surface and into nearby streams or stormdrains. Along the way, the precipitation, now considered runoff, picks up and carries whatever pollutants it encounters, such as lawn chemicals. There are many simple steps you can take to reduce the amount of water that runs off your property, as well as the amount of pollution it carries. Even if you don't think you live near water, a stormdrain might channel your runoff quickly to a stream. Many of the practices listed below use soil and native plants to naturally absorb and filter runoff. Refer to the Right Plant, Right Place section of this guidebook for more information about native plants.

Buffer Strips

Do you have water on your property — a pond, a stream, wetland, even a channel that only flows after a rain? If so, consider buffer strips to protect these waterways from runoff and erosion. Buffer strips are best planted densely with native plants and can either be herbaceous (grasses and wildflowers) or woody (trees and shrubs). Plants in the buffer soak up water and filter pollutants before the runoff enters the waterway. The deep roots of the plants hold soil in place, stabilizing banks from erosion. The wider the buffer the better, but even a narrow buffer will help protect the waterway. In addition to water quality benefits, the buffer strip will save you from mowing along the waterway and provide habitat for aquatic wildlife. Can't afford new plants right now? Simply stop mowing the area along the waterway and see what starts to grow.

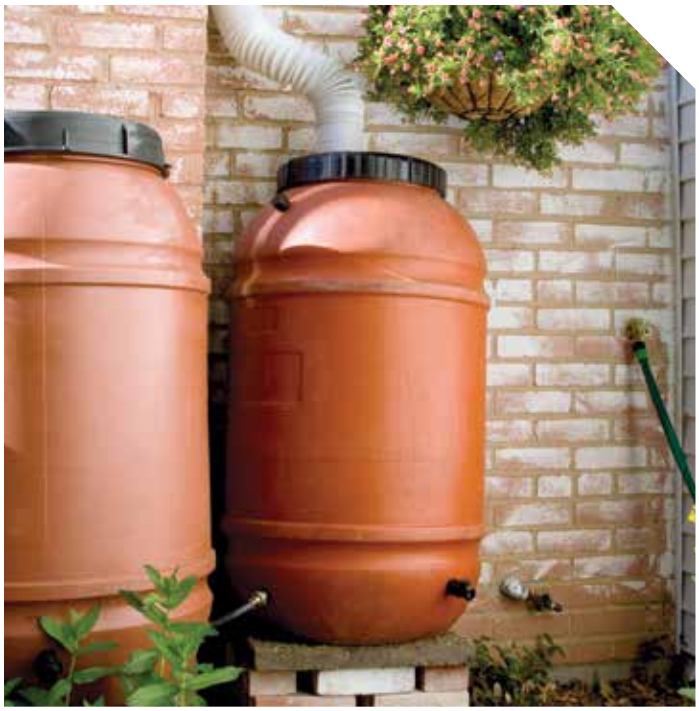
Image courtesy of Lake Champlain Sea Grant.

Rain Gardens

A rain garden is simply a shallow depression planted with deep-rooted native plants. Water from your property is directed toward the garden where it temporarily collects after a rain storm. Pollutants are filtered naturally as the water soaks into the soil or is absorbed by the plant. Creating a rain garden is not complicated. Place the garden in an area where it can accept runoff from your rooftop, driveway, or lawn. Consider diverting your downspouts or sump pump outlet to the rain garden. Dig a shallow depression with a level base so water can spread out and soak in evenly. A perimeter of turf grass around the rain garden can be maintained as a pre-filter to treat runoff and help prevent soil erosion. If your soil doesn't drain quickly, consider amending the soil by mixing in sand, gravel, and compost to improve drainage. Select and plant beautiful native plants that are adapted to your soil, moisture, and sun conditions. Spread mulch around the plants to prevent weeds and retain moisture. The rain garden should drain within two days.

Swales

A swale is similar to a rain garden in that it is a shallow depression planted with native plants. However, a swale conveys water from one point to another. Do you have an area of your property where water flows after a storm? Planting this area as a swale can slow the runoff and reduce erosion.



Rain Barrels

A rain barrel is a container used to capture water that runs off your roof so that you can reuse it later. The barrels vary in shape, size, and style, but all contain similar features: a hole at the top to allow water in from your downspout, a screen to keep bugs and debris out of the opening, a spigot to release water from the bottom, and an overflow mechanism to divert extra water away from your foundation. The barrels work best when elevated a few feet to allow pressure for releasing the water. Consider threading a soaker hose through your landscaping to automatically irrigate your plants when the spigot is opened. You can purchase a barrel for about $100 or make your own from a recycled barrel. Be sure to use the water around your property — water your plants or wash the car — so that the barrel is empty to collect the next storm.

Critical Area Plantings

Do you have areas on your property where turf grass just won't grow? Maybe the area is too wet, too dry, too shady, or too steep? Whatever your problem, there are probably native plants adapted to the conditions. For example, if a patch of your property is too low and wet to grow turf grass, consider planting wetland plants. These plants will help to take up the water and may thrive where turf grass did not. Woodland wildflowers might love that shady area under your oak tree. Deep-rooted native plants can stabilize a steep slope, preventing erosion.

Minimize Impervious Surfaces

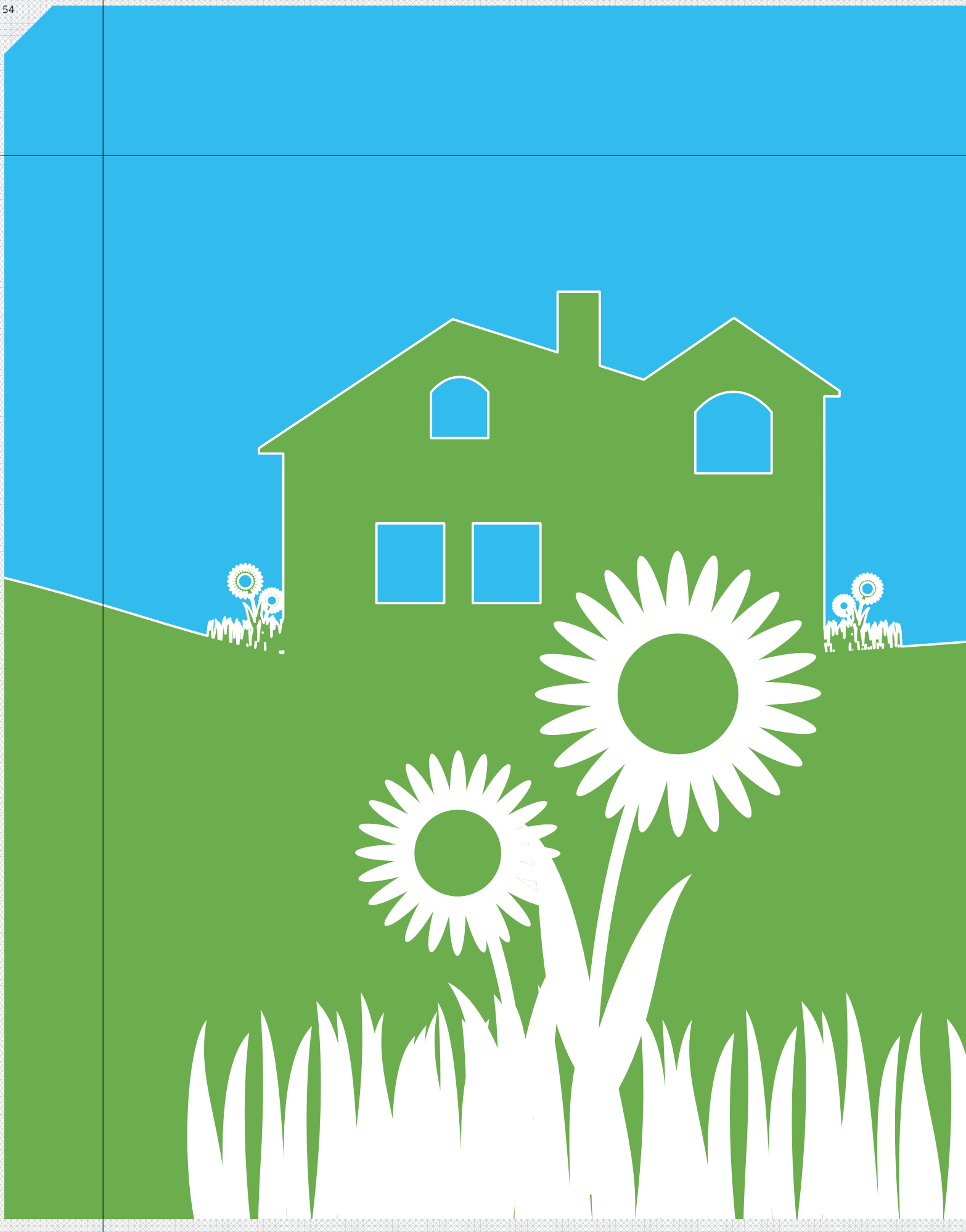
Minimize the amount of impervious surfaces (hard paved surfaces that water can't soak through) in your property. Thinking of adding a new patio? Consider using brick pavers. Cracks between the bricks allow water to soak into the ground. Time to replace your driveway? There are materials on the market that look just like regular asphalt or concrete, but allow water to soak though. Or, consider gravel instead. For areas that you can't make pervious, such as your rooftop, direct the runoff into a rain garden or area where it can soak in rather than to the road or a storm drain.

Don't Over Water

Remember, water that doesn't soak into the ground or get soaked up by plants can run off of your property carrying pollutants. Refer to the Landscape Water Conservation section of this guidebook for tips on watering efficiently to avoid overwatering and generating runoff.

Reduce Pollutants

Remember that whatever is on your lawn — fertilizer, pesticide, pet waste, yard clippings — can leave your lawn in runoff. The overall goal of the L2L Program is to reduce the amount of pollutants from reaching our waterways. Refer to the Pesticides section of this guidebook for tips on the appropriate use of lawn chemicals.



Landscaping and Property Values

If you're a property owner, chances are you've undertaken a landscaping project to enhance your property's esthetic appeal. But in addition to beautifying property, landscaping has the potential to increase property values and accelerate a home's sale. Research demonstrates that landscaped properties consistently have a positive effect on selling price. Therefore, potential buyers place a premium on completed landscapes.

In one study by the University of Michigan, researchers reported that people are willing to pay more for well-designed properties with mostly native plants than for properties dominated by lawn.[51] A study conducted by the University of Vermont found that landscaping can add as much as 15 percent to your homes resale value. Additionally, by spending 5 percent of your home value on landscaping, you may see a 150 percent or more return on your investment upon sale.[52]

Another study by Clemson University documented the impact of landscaping on resale value of single-family residences. A house that obtained an "excellent" landscape rating from a local landscaping professional could expect a sale price 4 to 5 percent higher than equivalent houses with "good" landscaping. Homes with landscaping ranked as "poor" could expect a sale price 8 to 10 percent below equivalent homes with good landscape appeal.[53] Overall, studies consistently find that landscaping can add anywhere from 3 – 20 percent to your homes selling price depending on geographic region, neighborhood type, and many other variables.

51 Heilfand, Gloria E. et al. "The economics of native plants in residential landscape designs". *Landscape and Urban Planning* 78 (2006): 229 - 240. Print.

52 Perry, Dr. Leonard. "The Economic Value of Landscaping." *The Green Mountain Gardener: Anytime News Article*. University of Vermont Extension. Department of Plant and Soil Science. Web. 4 Oct. 2011. **perrysperennials.info/articles/econvalue.html**.

53 Henry, Mark S. "The contribution of Landscaping to the Price of Single Family Houses: A Study of Home Sales in Greenville, South Carolina." *Journal of Environmental Horticulture* 12(2) (1994): 65-70.

A second reason landscaping can have a positive effect on selling price is that a landscaped property may decrease the time it takes to sell your home. A study completed by the National Association of Realtors found that the longer a home sits on the market, the lower its selling price.[54] Since we know property owners place a high value on landscaping, a landscaped property may sell quicker and at a premium compared to non-landscaped properties.

In addition to having a positive effect on selling price, properly selected and placed plants can lower costs for heating and cooling homes by up to 20 percent or more.[55] Benefits vary based on the orientation and size of the plantings, as well as their distance from a building. For instance, large trees planted close to the west side of a building will generally provide greater cooling energy savings than other plants. The U.S. Department of Energy recommends four landscaping objectives based on our particular climate to help reduce your homes energy: 1) maximize the warming effects of the sun in the winter, 2) maximize shade during the summer, 3) deflect winter winds, and 4) funnel summer breezes toward the home.[56]

In addition to energy savings, landscaping can also reduce water usage costs. According to the U.S. Environmental Protection Agency, the average U.S. household uses about 30 percent of its water outdoors. Using native plants appropriate for a property can reduce outdoor water use by 20 to 50 percent, reports the agency.[57] In contrast, many grass lawns require a lot of water because they are usually non-native and have, therefore, not adapted to the conditions in our region. For example, grass lawns cannot survive drought or disease as well as native plants that have adapted to such conditions. Additionally, native plants do not require fertilizer and the costs associated with its use.

The financial benefits from landscaping depend on many variables, such as those mentioned above. But one thing is certain: research has proven that no matter your situation, landscaping positively effects the value of your home, and the potential for energy savings is very real. Consider these facts when considering the design of your next landscape project.

Image courtesy of Susan Ask.

54 Sirmans, Stacy et al. "The Value of Housing Characteristics." *National Center for Real Estate Research* (2003): 33 . Print.

55 Perry, Dr. Leonard. "The Economic Value of Landscaping." *The Green Mountain Gardener: Anytime News Article*. University of Vermont Extension. Department of Plant and Soil Science. Web. 4 Oct. 2011. **perrysperennials.info/articles/econvalue.html**.

56 U.S. Department of Energy. *Your Home, Landscaping*. Feb. 2011. Web. 9 Oct. 2011.

57 U.S. Environmental Protection Agency. Outdoor. Water Use in the United States. Aug. 2008. Print.

How big should you make your rain garden?

Rain gardens can come in all shapes and sizes. As with a conventional garden, property owners can tailor the size of their rain garden to the space they have available and the amount of time they want to spend creating and maintaining it. However, rain gardens serve a somewhat different purpose from conventional gardens. Though both features can be aesthetically pleasing, rain gardens help prevent flooding and water contamination by absorbing and filtering rainwater. As rain gardens become increasingly popular, property owners often wish to take full advantage of this ability in order to avoid problems such as basement flooding and ponding — but how large should a rain garden be in order to absorb 100 percent of a property's drainage?

We don't have an exact answer, but there is a way to estimate the necessary rain garden size to accomplish this goal. We'll focus on drainage from the rooftop, since that often represents the main source of rainwater that would run off into a rain garden.

First, you should identify the portions of roof that will drain in the direction of the garden. Multiply the length of each section of roof by its width. Add up the results to get the total square footage of roof that will drain into your garden.

Then, you should assess the land where you would like to install your rain garden. You'll need to determine your soil type. Conduct a soil ribbon test as shown in "Know Your Soil" (pg. 11) to find out whether you have sand, silt, or clay soil.

Make sure this area is suitable for a rain garden by testing how quickly water can infiltrate ("Test Your Drainage," pg. 10). If your water-filled hole drains within 24 hours, you can put a rain garden there. You'll have to figure out the slope of this land as well. To do so, insert two stakes into the land — one downhill and one uphill (see diagram below). Use the height of the downhill stake and the level width between the two stakes to complete the following calculation:

$$\frac{\text{height}}{\text{width}} \times 100 = \%\ \text{slope}$$

Once you know the slope, you can determine the depth of the rain garden:

SLOPE	DEPTH
< 4%	**3-5 in**
5-7%	**6-7in**
8-12%	**8 in+**

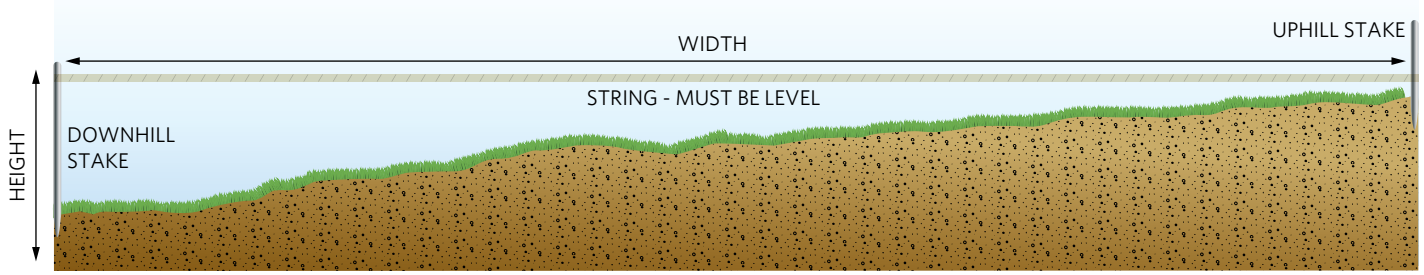
Then, use the depth and your soil type to find a size factor:

DEPTH	3-5 IN	6-7 IN	8 IN +
SAND	**0.19**	**0.15**	**0.08**
SILT	**0.34**	**0.25**	**0.16**
CLAY	**0.43**	**0.32**	**0.20**

Finally, use the size factor for your required garden depth and soil type, as well as the drainage area from your roof that you found earlier, to estimate the necessary size of your rain garden:

Size Factor x Drainage Area (sq. ft.) = Size of Garden (sq. ft.)

The string should be tied to the base of the uphill stake, then tied to the downhill stake at the same level.



SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

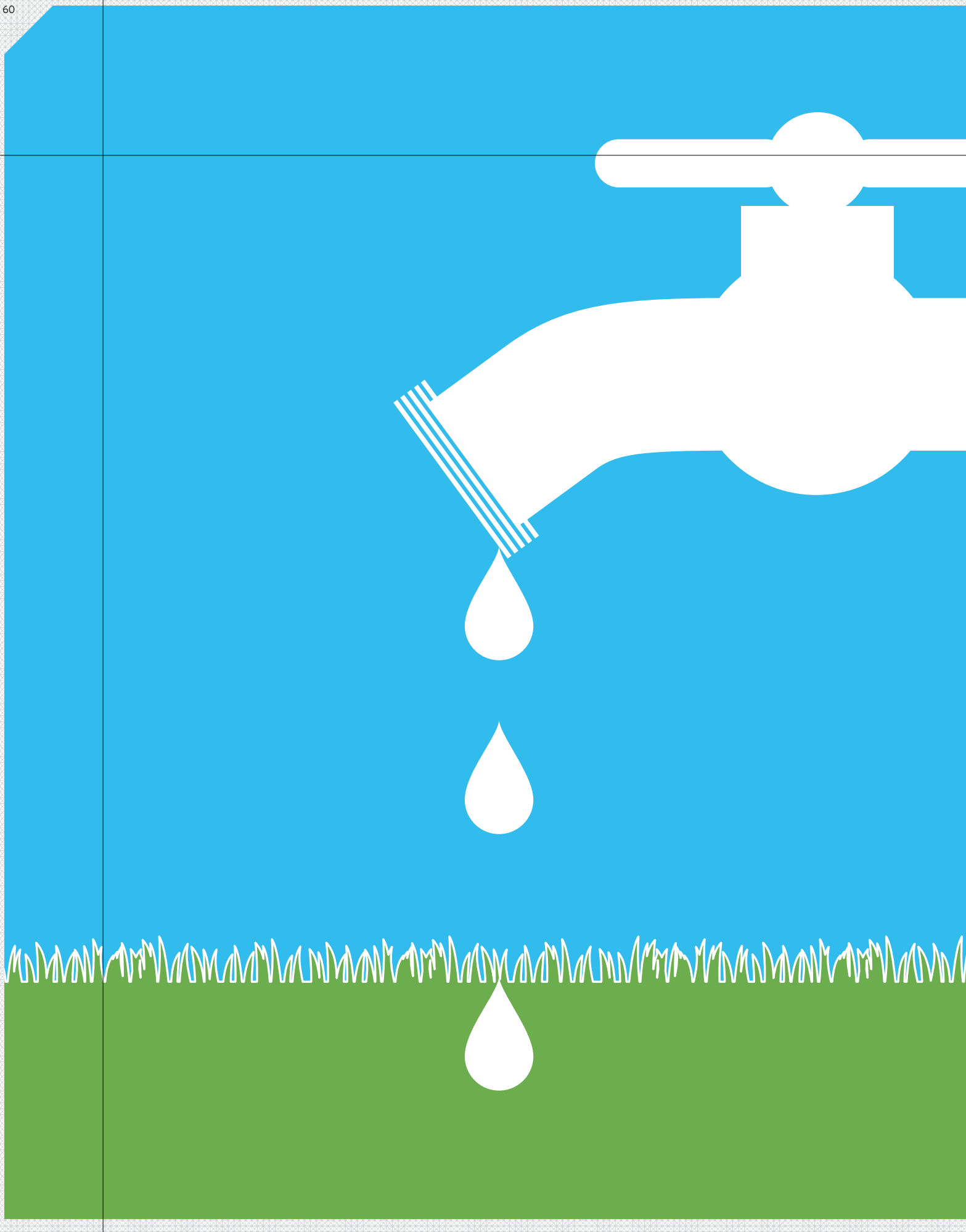
Natural Lawn Care Calendar for Homeowners

The following table can be used by homeowners to help guide them through when some of the typical natural lawn care practices should be done over the course of a year.

Table 5. Natural lawn care calendar for homeowners

March	Sharpen mower blades. Clean up winter debris (leaves, twigs, etc.).
April	Mowing – remove only 1/3 of the leaf blade or less at a time. First mowing – grass height of 2 inches. Regular mowing – grass height of 3 inches (or taller). Apply corn gluten in early April to prevent weed seeds from germinating. Hand pull or spot spray weeds with an organic herbicide. Fill in bare spots with a 50/50 mix of compost and soil and seed with grass. Apply compost tea to entire lawn.
May	Test soil for pH and nutrients. First fertilization — top dress with a compost/soil mix OR fertilize with a natural organic fertilizer. Aerate lawn. Grub control — apply beneficial nematodes or milky spore (Japanese beetle grubs only).
June	Begin irrigation as needed applying 1 to 1 1/2 inches of water in the a.m. Recycle grass clippings on your lawn or in a compost bin. Hand pull or spot spray weeds. Apply compost tea to entire lawn. Insect problems — tolerate some; use natural controls, organic insecticide, or appropriate least-toxic pesticide.
July	Fertilize (1st through the 15th) — slow release (natural organic) at half rate so as not to promote excessive growth and disease. Look for signs of weed, disease, or pest problems — address underlying soil or turf health issues.
August	Look for signs of weed, disease, or pest problems — address underlying soil or turf health issues. Continue irrigation or allow lawn to go dormant. Over seed entire lawn (after the 15th).
September	Limit irrigation. Aerate as needed (grass should be actively growing). Fertilize (1st through the 15th).
October	Late season fertilization — generally 1 week before final mowing of the year.
November	Mow until lawn goes dormant. Last mowing — grass height of 2 inches. Apply compost tea to entire lawn.
December	Reduce lawn traffic — let it rest through February.

Source: Adapted from Safer Pest Control Project- Natural Lawn Care for Homeowners Calendar & Modified with Feedback from Dr. Aaron Patton- Purdue University, Turfgrass Extension Specialist.



Complementary Outdoor Water Conservation Tools

Water Reuse

Drinking-quality water, also called *potable* water, is used for many purposes beyond drinking, such as lawn watering. Reusing water in the outdoor landscape can help conserve potable water supplies. Combining this with water-efficient lawn and landscape practices, as described in the Lawn to Lake section above, can be particularly effective.

Lawn and Land Irrigation

Irrigating with rainwater or reclaimed wastewater is the most common form of on-site treated non-potable water reuse.[58] Lawns and other landscape features that require irrigation do not necessarily need potable water, therefore, states and municipalities that regulate wastewater reuse set fewer treatment standards for reclaimed water that is used in irrigation. Rainwater is not subject to treatment standards, since rain naturally irrigates land.

Regulations on reclaimed wastewater quality can vary based on the particular irrigation project. For example, the water used on a playground or other outdoor recreational space is subject to higher standards than the water used on the lawn of a business park. In areas that see high traffic—particularly where people are more likely to have significant contact with the grass—restrictions are more stringent on water reuse for irrigation. Golf course irrigation is a fairly common use of reclaimed wastewater in the U.S.; the estimated number of golf courses that practice water reuse across the country ranges from 300 to 1,000.[59] Some golf courses in the NWPA region participate in this practice, including facilities in Huntley and Lakewood.[60]

Currently, agricultural irrigation comprises the largest demand for wastewater reuse. Even this use is divided into further subsets that have their own requirements for water quality. For example, reclaimed water that is used on non-food crops has fewer requirements, while reclaimed water used on food crops has more. This is especially true for water reused on food crops that may be eaten uncooked.[61] These requirements minimize the health risks associated with using reclaimed wastewater to irrigate crops.

58 Leverenz, H. and T. Asano (2011). "Wastewater reclamation and reuse system" in *Treatise on Water Science* vol. 4, 63-71.

59 Anderson, P. and Y. Meng (2011). Assessing opportunities for municipal wastewater reuse in the metropolitan Chicago area. Illinois Sustainable Technology Center Report.

60 McHenry County Groundwater Protection Action Plan (2009). Section 5: Wastewater.

61 Ibid.

A rain barrel will save the average homeowner about 1,300 gallons of water during the peak summer months, or 40% of total household water use.

Source: Image courtesy of Chicago Metropolitan Agency for Planning.

Types of Water Reuse

Rainwater Harvesting

The simplest way to capture rainwater is with a rain barrel, which captures water that runs off your roof so you can reuse it later. These barrels have a hole at the top to allow water to enter from your downspout, a screen to keep bugs and debris out of the opening, a spigot to release water from the bottom, and an overflow mechanism to divert extra water away from your foundation. Rain barrels work best when elevated a few feet to allow pressure for releasing the water. You can thread a soaker hose through your landscaping to automatically irrigate your plants when the spigot is opened. More complex rainwater harvesting systems usually involve large storage cisterns or basins.

Greywater Reuse

Household wastewater from bathroom sinks, showers, and bathtubs as well as laundry room sinks and clothes washers is called *greywater*.[62] Greywater reuse involves directing this water to a storage tank and saving it for later outdoor use.

Wastewater reuse can be undertaken on single properties or by groups. For example, an apartment building in a Chicago near north neighborhood has a greywater reuse system for all of its tenants.[63] Construction of a new neighborhood in an area that generally requires septic tanks might instead incorporate a community wastewater treatment and reuse system.[64] Where wastewater treatment plants provide this service, communities can transport greywater to participating homes or facilities through a secondary pipe system or via tanker trucks. In the NWPA region, both Algonquin and Barrington allow tanker trucks to pick up non-potable water from their treatment facilities for reuse.[65]

62 Revitt, D., E. Eriksson, and E. Donner (2011). The implications of household greywater treatment and reuse for municipal wastewater flows and micropollutant loads. *Water Research* 45(4), 1549-1560.

63 Sokol, D. "Second acts: Murphy/Jahn rethinks low-income housing for a revitalized Cabrini-Green in Chicago." *GreenSource*.

64 Asano, T. and A. Levine (1996). Wastewater reclamation, recycling, and reuse: past, present, and future. *Water Science and Technology* 33, 1-14.

65 Village of Algonquin Wastewater Treatment Facility Contractor Handbook (2005). Use of treated effluent as a non-potable water source; Village of Barrington Wastewater Treatment Facility Contractor Manual (2009). Use of treated effluent as a non-potable water source.

Regulation of Water Reuse

The viability of water reuse efforts can be affected by state and local water reuse policies and laws. Each state treats water reuse differently, for example, Illinois has regulations for applying reclaimed wastewater to land (in other words, for irrigation); the use of rainwater for irrigation is allowed, but not explicitly regulated. Illinois has recently updated the plumbing code to include standards for on-site non-potable water use of greywater and rainwater.[66] Previously, rain barrels were allowed, but property owners who wanted to set up rainwater collection and distribution systems — to pipe rainwater indoors to their toilets, for instance— could only do so by getting special permission (obtaining a variance) from the Illinois Department of Public Health (IPDH), who sets the plumbing code.

In July 2012, Governor Pat Quinn signed House Bill (HB) 4496 requiring the IDPH to update the plumbing code to reflect advances in technology and methods that allow water reuse for non-potable purposes. At the time of writing this manual, IDPH is in the process of adopting this updated set of revisions to the Illinois Plumbing Code. The code update (expected to be complete in mid-2013) will be a step in the right direction toward unlocking the potential of non-potable water reuse. The standards for non-potable water reuse are expected to be part of a "green plumbing supplement" to the state's plumbing code.

Once Illinois sets the minimum standards, municipalities can adopt more stringent standards at their discretion. The Village of Richmond in McHenry County has an ordinance that outlines what types of wastewater reuse are allowed in the community.[67] In the NWPA region, landscape irrigation presents, potentially, the most significant demand for alternative water sources.

Wastewater Reuse Potential from Treatment Plants in the NWPA Region

One of the largest demands that can be met by wastewater reuse is irrigating golf courses. This is not necessarily a new concept in Illinois — the Elk Grove Village Park District, for example, has been using treated effluent to irrigate their driving range and golf course since 1982.[68] If every golf courses in the NWPA region were irrigated with reused water, it would save nearly 8 million gallons of drinking water a day. Other significant users in the area that can switch to irrigation with reused wastewater include: outdoor recreational spaces, cemeteries, and correctional facilities. Figure 5 shows the overall demand for irrigation that can be fulfilled by wastewater reuse in the NWPA region.

66 Lancaster, B. (2006). Rainwater harvesting for drylands and beyond – volume 1,appendix 3: water-harvesting calculations. Chelsea Green Publishing: Vermont. Retrieved from: **http://www.harvestingrainwater.com/wp-content/uploads/Appendix3Calculations.pdf**.

67 IAC Title 35, Subtitle C, Chapter II (IEPA), Section 372; Illinois General Assembly HB4496. In Illinois, minimum standards for safe and effective installation and operations of plumbing systems are set by the Illinois Department of Public Health. Illinois, unlike most states, writes and modifies its own plumbing code.

68 Anderson, P. and Y. Meng (2011). Assessing opportunities for municipal wastewater reuse in the metropolitan Chicago area. Illinois Sustainable Technology Center Report.

How much rainwater can you harvest on your property?

If you have a large-scale rainwater collection system, calculating the amount of rainwater that can be captured and used is an important part of designing the size of the storage elements of your system. However, this is equally useful information for someone who wants to simply use rain barrels for rainwater harvesting. Knowing how much rainwater can be captured on your property can help you figure out how much storage capacity you need and which end-uses would be appropriate for that rainwater.

An easy way to estimate the amount of rain you can capture is by multiplying the amount of rainfall by the drainage area of your roof. You can perform this calculation using either annual rainfall amounts or the rainfall amount from one event (for instance, how much rainwater can be collected during a 2-inch storm). To find your roof's drainage area, multiply the length of each section by its width. You can add the sections together to get the square footage of your entire roof, but it might be more helpful to stick with the sections that will actually drain into your planned rain storage system. Multiply the roof drainage area by your rainfall value, which you will have to convert from inches to feet. Then, multiply the resulting number by a conversion factor to get the maximum number of gallons of water that you can capture off of your roof.

roof drainage area (sq. ft.) x
rainfall (ft.) x 7.48 gallons/ft3
= maximum runoff (gallons)

or

(roof length (ft.) x roof width (ft.)) x
(rainfall (in.)/12 in/ft.) x 7.48 gal/ft3
= maximum runoff (gallons)

The resulting number of gallons from these calculations is referred to as maximum runoff because we've assumed so far that you're getting every single bit of rain that falls on your drainage area. In reality, however, some of the rain will evaporate off of the roof or be absorbed into the roof surface. To account for this loss, you can use a *runoff coefficient* that reflects the percentage of total rainfall that does run off the roof. The runoff coefficient varies with different roof materials. For instance, the runoff coefficient for a concrete roof could be 0.9 (90 percent), meaning that 10 percent of rainfall is evaporated or absorbed by the roof.[47] To calculate the *net runoff*, just multiply your maximum runoff by the runoff coefficient — make sure you use the decimal value, rather than the percent (ex. 0.9, not 90 percent).

Maximum runoff (gallons) x runoff coefficient
= net runoff (gallons)

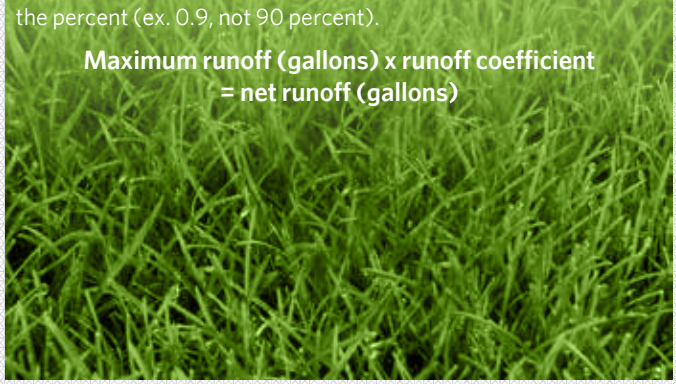
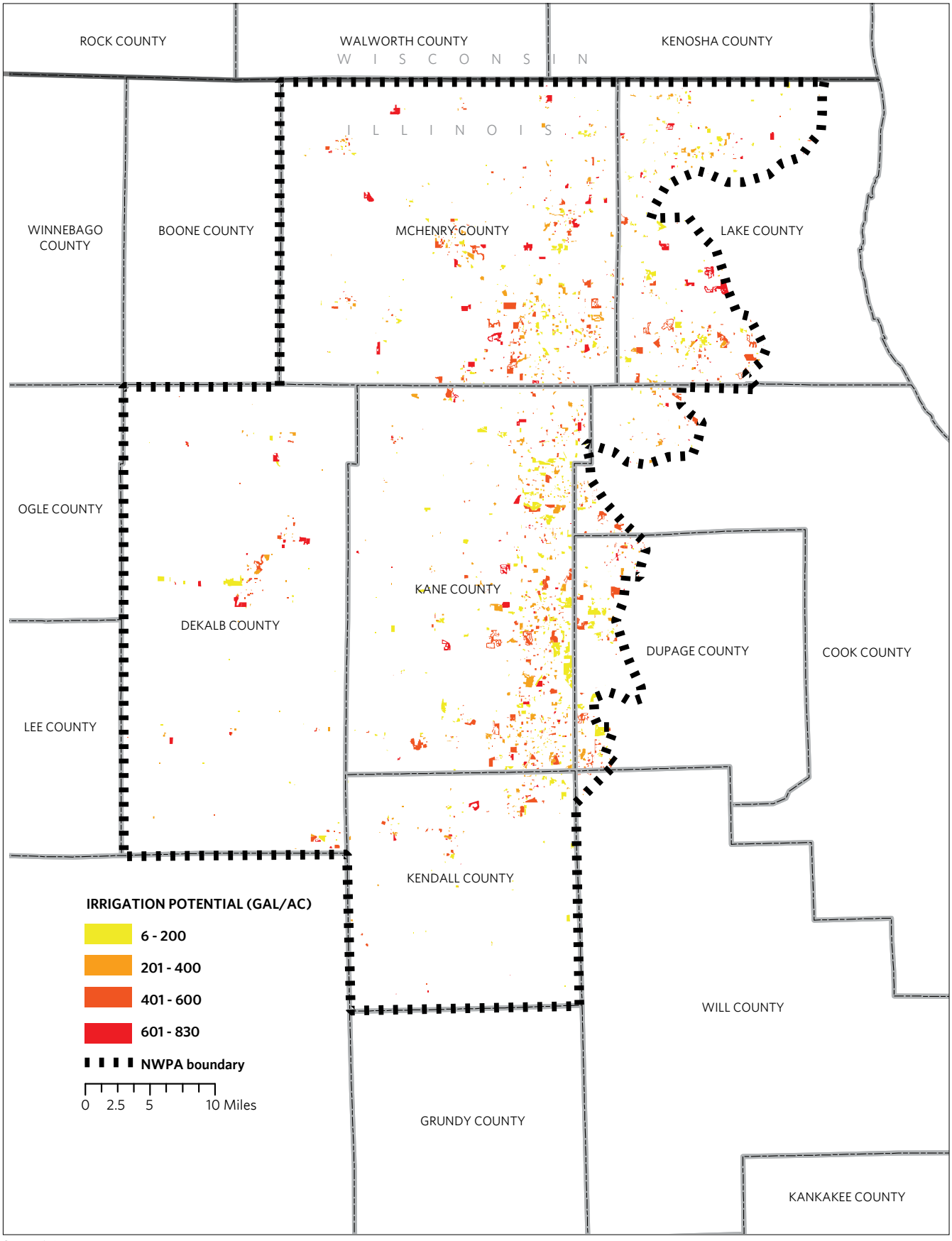


Figure 5. Total irrigation demand that can be met through wastewater re-use in the Northwest Water Planning Alliance region



Source: Water 2050.

Seasonal Water Pricing

Just as there are many ways for homeowners to use water efficiently, there are ways for community leaders to support water conservation. For example, communities can use rate design to encourage efficient outdoor water use.[69] Conservation-oriented water pricing is gaining traction as an effective way of encouraging water conservation and balancing water supply with water demand.[70]

Full-cost pricing is a necessary foundation for a conservation rate. When water rates do not reflect the full cost of providing water services, the price of water is lower than it should be. The price does not send the correct signal to customers about the water's actual value and encourages excess water consumption. Following approval of *Water 2050*, as part of plan implementation, CMAP, in partnership with Illinois-Indiana Sea Grant and the University of Illinois Extension, developed an expert-reviewed manual — *Full-Cost Water Pricing Guidebook for Sustainable Community Water Systems* — that explores full-cost pricing as a tool for local decision makers interested in sustainably managing community water supply and includes a discussion of conservation and seasonal water pricing.

Conservation pricing involves designing water rate structures that provide consumers with incentives use water efficiently. Through behavior changes (reducing discretionary water uses such as outside watering) and installation of water saving devices, demand for water is reduced. When pricing is designed to target outdoor water use, this is referred to as *seasonal water pricing*. A summary of some types of conservation rate structures is shown in Table 6.

Table 6. Summary of conservation rate structures

TYPE OF RATE	DESCRIPTION
Increasing Block	**Price per unit increases as consumption increases; targets high volume users to reduce use, typically in the residential customer class. When an increasing block rate is used for residential use:** • **Charge the entire consumption amount at the block rate of the last unit of water consumed, rather than charging for use at the rate within each block.** • **Design blocks to fall within the range of actual residential use with rate differences significantly large to communicate a change in water use.** • **Give special consideration to large families and multi-family residences to avoid adverse effects.** • **Implement ordinance permitting temporary rate increases during water shortages (drought), taking care to specify the exact triggers of this response.**
Seasonal	**Charge a higher price for residential consumption in the summer months (peak periods). Can be used to reduce peak consumption and possibly defer expensive capital expansion/capacity projects. Seasonal rates can mean:** • **Charge higher rates for use during periods of peak demand.** • **Design increasing block rates, charging higher rates on use above normal indoor for residential customers.** • **Charge excess use or water budget type rates.**
Time-of-Use	**Use during specified times is charged at a higher rate. Requires time-of-use meters.**
Excess Use Rate	**Price is significantly higher for use above a specified threshold. Used to target high consumption during peak periods (such as summer). Sends strong price signal during periods of low water availability.**
Water Budget	**Block rate structures are increased; the blocks specific to each customer are based on their historical average indoor/winter water use, so more is charged for irrigation use.**
Scarcity Pricing	**Price per unit increases as available water supply decreases (such as during drought).**
Spatial/Zonal rates	**Price is based on spatial variations in cost. Used where the distribution system is expanding rapidly in difficult to serve areas to account for associated costs.**
Humpback rate	**Rates first increase, and then decrease. Can be used to meet the dual objectives of decreasing residential irrigation use, and also providing economic development rates for commercial and industrial customers.**

Source: Chicago Metropolitan Agency for Planning.

69 Public municipal utilities approve rates at the local level with board/council approval.

70 California Urban Water Conservation Council (1997). Designing, implementing, and evaluating conservation rate structures.

Why Use Seasonal Water Pricing?

Seasonal pricing is aimed mainly at reducing discretionary outdoor water use, which is responsible for the difference between peak and off-peak demand.[71] Since discretionary uses are not absolutely necessary, they are more responsive to price changes; when water becomes more expensive, these uses are usually the first to be curtailed.

The more extreme version of seasonal pricing is drought pricing. Where seasonal rate structures aim to balance demand and supply sustainably, the goal of drought pricing is to balance demand with whatever supply is available. Depending on the severity of the drought, prices can be altered to reduce water use as needed to ensure that there is enough supply to outlast the drought. Communities that have implemented drought management plans define the actions they take by stages of drought, as recommended by the American Water Works Association.[72] These are often represented by colors. For instance, the yellow tier could correspond to a 5-10 percent water shortage and a relatively small hike in price. Similarly, the red tier could correspond to a 20-35 percent water shortage and a relatively larger price increase. Several drought management plans incorporate water use restrictions into these color-coded stages, as well. The colors make it easier to communicate drought status and resulting policies to the public.

There are a few real-world examples of utilities using seasonal water pricing. For instance, the Phoenix Water and Wastewater Utility incorporated seasonal rates into their pricing structure in 1982. By 1994, they observed that average monthly residential water use in the summer had gone down by about 30 percent.[73] The Seattle Water Department also saw a rise in conservation when they implemented seasonal pricing.[74] Studies have measured conservation impact using the *peak day ratio*, which is the amount of water demanded on the peak day (the day with the highest demand over a year), divided by the average daily demand amount. Such studies, conducted in the U.S., Canada, and Spain, show that application of seasonal prices results in reduction of the peak day ratio, ranging from 8-14 percent.[75] Price changes affect both peak demand and average demand, so if both decrease by the same amount, the ratio would stay the same. That the ratio decreases indicates that peak demand must be decreasing more than average demand, which contributes to closing the gap between peak and off-peak water consumption.

While there is no one-size-fits-all conservation rate, some general rate design recommendations can promote water efficiency. For residential customers, a 10 percent rate increase will most likely result in 1 to 3 percent reduction in water use. Research indicates that an outreach and education campaign can increase customer response to price by 30 percent.[76]

71 Gleick et al. (2003). Waste not, want not: the potential for urban water conservation in California. Appendix B, outdoor residential water use and the potential for conservation. Pacific Institute.

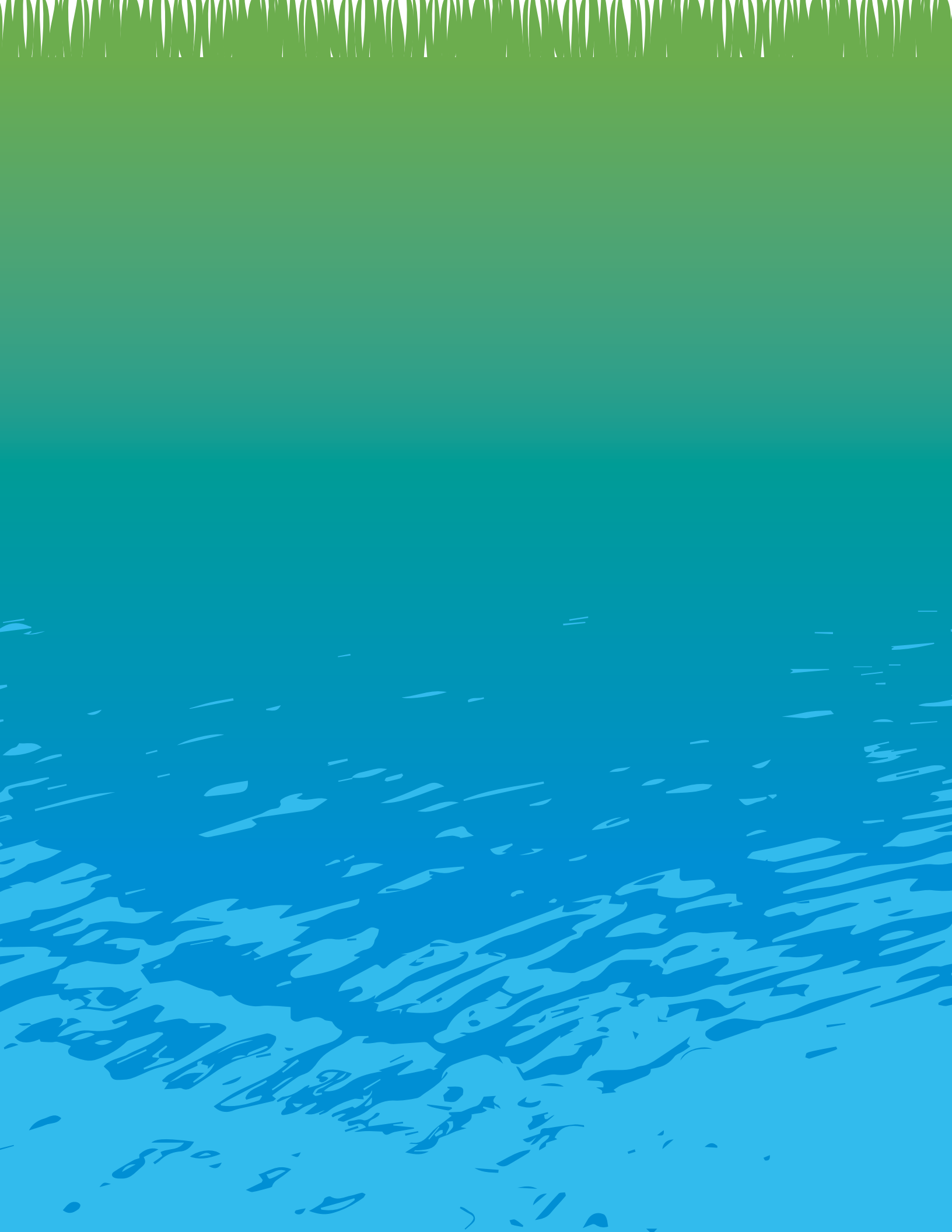
72 American Water Works Association (2012). Drought fact sheet. Retrieved from: **http://www.drinktap.org/consumerdnn/Home/WaterInformation/Conservation/DroughtFactSheet/tabid/199/Default.aspx**.

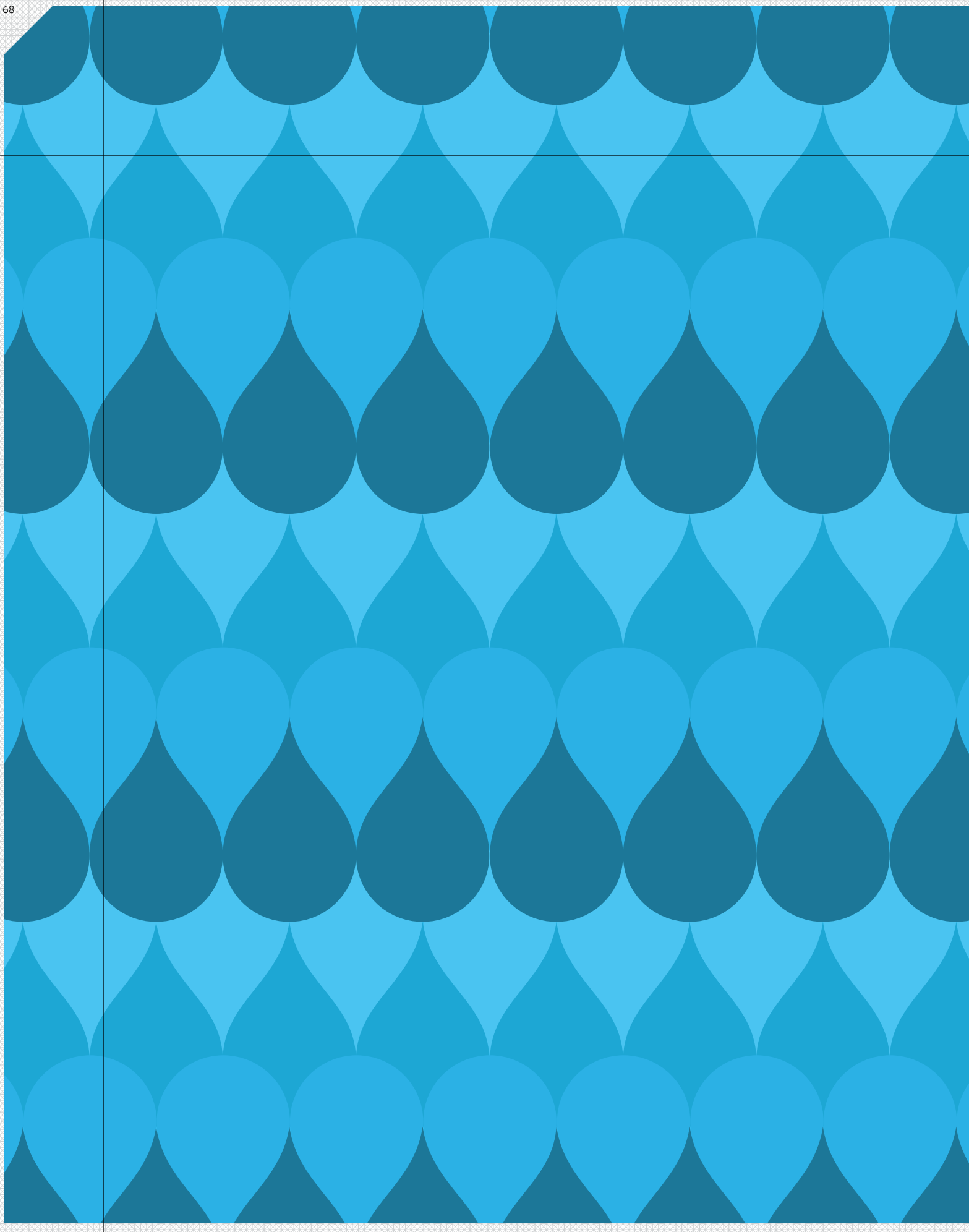
73 Cuthbert, R. and P. Lemoine (1996). Conservation-oriented water rates. *Journal of the American Water Works Association*, 88(11), 68-78.

74 Ibid.

75 Herrington (2007). Waste not, want not: sustainable water tariffs. Centre for Sustainable Energy.

76 American Water Works Association (AWWA). (2000). Principles of Water Rates, Fees, and Charges. *American Water Works Association Manual of Water Supply Rates, M1*. (Fifth Edition) and Gaudin (2006) Effect of price information on residential water demand. *Applied Economics* 38: 383-393, respectively.





Appendix 1: The Northwest Water Planning Alliance Regional Water Conservation Lawn Watering Ordinance

Outdoor limitation on the use of water

A. Purpose: Based on research from the Illinois State Water Survey, the Chicago Metropolitan Agency for Planning, local counties and other organizations, [Name of local government] recognizes that potable water is a finite natural resource; that communities within the Northwest Water Planning Alliance rely on shared groundwater and river water sources; and that water conservation is a necessary component of a sustainable water supply.

B. Definitions: The following words and phrases when used in this section shall, for the purposes of this section, have the following meanings:

CITY or VILLAGE: [name of local government]

DRIP IRRIGATION SYSTEM: An IRRIGATION SYSTEM that saves water by allowing water to drip slowly to the roots of plants, either onto the soil surface or directly onto the root zone. Such systems include but are not limited to soaker hoses.

HANDHELD WATERING DEVICE: A means of watering that requires the watering device to be held in order to operate, including watering cans, buckets, and hoses equipped with automatic shutoff valves. This also includes the handheld use of a hose, provided it is continuously attended.

HARVESTED RAINWATER: Water that is accumulated and stored during times of precipitation, such as through rain barrels and cistern systems, is prevented from entering the stormwater treatment system and is redirected for reuse onsite.

IRRIGATION SYSTEM: A system consisting of pipes, valves and sprayers connected to the potable water supply to manually or automatically irrigate lawns or landscaping.

LANDSCAPE: The area of the property planted with vegetation other than grass.

LAWN: The area of the property planted with grass.

LAWN SPRINKLER: A device attached to a hose designed to allow for the unattended watering of lawns or landscaping, but does not include a drip irrigation system.

LAWN WATERING: Any means or methods of applying water to a lawn.

NORTHWEST WATER PLANNING ALLIANCE (NWPA): An interjurisdictional alliance of five counties, five councils of government, and roughly 80 municipalities that collaborate and cooperate on regional water resource planning issues, particularly concerning shared groundwater aquifer resources.

PERSON: Any individual, firm, partnership, association, corporation, company, organization, or entity of any kind.

RECLAIMED GREYWATER: Water that is produced by treating onsite wastewater generated by household activities, such as laundry, dishwashing, and bathing, is prevented from entering the municipal wastewater treatment system, and is redirected for reuse onsite.

RECYCLED EFFLUENT: Water that was formerly municipal wastewater and has been treated to remove solids and impurities for reuse for non-potable purposes.

C. Application Of Regulations:

1. The provisions of this section shall apply to any person using water within [name of local government], and:
   a. The property is supplied by the [city or village]'s water system, regardless of whether:
      i. The property is located within the municipal boundaries of the [city or village] or
      ii. The person using the water has a contract for service with the [city or village]
   b. The property is located with the municipal boundaries of the [city or village] and uses water other than municipal water that is supplied by the same aquifers as the municipal water supply.
2. The provisions of subsection (D) of this section shall apply year-round, subject to any modifications thereof, including application of these or other regulations during this or any other time, by an emergency proclamation.

D. Permitted Hours And Days For Specified Uses:

1. All persons using water shall adhere to the following schedules for lawn watering:
   a. All properties with even numbered street addresses (i.e., numbers ending in 0, 2, 4, 6, or 8) may use water for lawn sprinkling only on even numbered calendar dates between the hours of 6:00 a.m. and 9:00 a.m. or 6:00 p.m. and 9:00 p.m.
   b. All properties with odd numbered street addresses (i.e., numbers ending in 1, 3, 5, 7, or 9) may use water for lawn sprinkling only on odd numbered calendar dates between the hours of 6:00 a.m. and 9:00 a.m. or 6:00 p.m. and 9:00 p.m.
   c. All properties which cannot be readily identified as having even- or odd-numbered street addresses are hereby designated as even-numbered for water conservation purposes.
   d. No property will be allowed to use water for lawn sprinkling on July 31 and August 31 of the calendar year.
2. There shall be no restrictions as to hours or days when water may be used for any of the following:
   a. Lawn watering where such watering is done using reclaimed greywater, recycled effluent, or harvested rainwater;.
   b. The watering of landscape, such as trees, shrubs, flowers and gardens, with a handheld hose not larger than one-inch diameter or by means of an automatic root feed or drip irrigation system.
   c. Lawn watering where such watering is done with the proper, attended use of a handheld watering device.
   d. Vehicle or equipment washing, provided that all water hoses are equipped with positive shutoff nozzles.
   e. Any other lawful use of water such as bathing, clothes washing, or other normal household uses not otherwise specifically restricted by the provisions of this section.

E. Sod Laying And Seeded Lawn Installation Restrictions And Permit Requirements:

1. Notwithstanding the above provisions, sod laying, lawn seeding, and the planting of other landscaping for the establishment of a new lawn or new landscaping is prohibited from July 1 through August 31 each year, unless the source of watering for said sod, lawn seeding or planting of landscaping is derived from reclaimed greywater, recycled effluent, or harvested rainwater. The prohibition shall not apply to soil erosion and sedimentation plans required pursuant to city ordinances (with approved plans) or for restorations due to required repairs of public utilities (e.g., water main breaks).
2. Except for the period of July 1 through August 31 of each year or during an emergency proclamation event, water from the city water distribution system or private wells may be used for the establishment of sod or seeded turf lawns planted or installed in the current year, only as follows:
   a. A permit issued by the [director of public works] (or his designated representative) is required for the installation of all seeded and sodded lawns. The application shall include the following information:
      i. The address of the property where the sod is to be laid.
      ii. The name and address of the owner of said property.
      iii. The name and address of the contractor.
      iv. The number of square feet of sod to be laid.
      v. The date on which the sod is to be laid.
   b. On the day new sod or seed has been placed on a property, a person may use a lawn sprinkler to apply water to the sod or seed for a total period of time not to exceed eight hours. For the next nine days thereafter, a person may use a lawn sprinkler to apply water to said sod or seed each day during permitted hours of water use. Following the first ten days after the sod or seed is placed, the provisions of subsection (C) and (D) of this section shall apply.

F. Waste of Water Prohibited: No person shall allow a continuous stream of water to run off into any gutter, ditch, drain, or street inlet while using water for restricted purposes, nor shall a person spray or sprinkle streets or sidewalks.

G. Exceptions: The provisions of this section shall not apply to any commercial or industrial entity for which the use of water is necessary to continue normal business operations or to maintain stock or inventory. This exception shall not apply to any uses of water not essential to normal business operations or maintenance of inventory or stock and specifically shall not apply to lawn watering.

H. Emergency Proclamation: Whenever the water supply is diminished from any cause, including, but not limited to, prolonged dry period or drought, increased water demand, equipment failure, or water quality concerns, to an amount which in the opinion of the city engineer or director of public works is or is likely to become dangerous to the health and safety of the public, the [mayor or manager] is hereby authorized and empowered to issue an emergency proclamation specifying different or additional regulations on the use of water.

1. In the case of regional dry periods or drought, the mayor shall take into account the recommendations of the regional water supply planning group, NWPA, on making the decision to issue an emergency proclamation.
2. Such regulations may provide for limitations on the usage of water, limitations on days and hours of use of water for some or all purposes, and the prohibition of specified uses of water. The following shall constitute the default emergency regulations:
   a. In the case of moderate to severe drought conditions or similar regional water supply constraints as advised by the NWPA, the use of sprinkler systems shall be prohibited. Outdoor use of water shall still be allowed for those exempted uses in subsection (D)(2) and do not have to follow hour or day restrictions.
   b. In the case of extreme to exceptional drought conditions or similar regional water supply constraints as advised by the NWPA, the use of water outdoors for any purpose shall be prohibited.
3. Upon issuing such proclamation, the [mayor or manager] shall make the contents thereof known to the public by posting a copy at the [city or village] hall, and by news release to local newspapers and radio media, and may also endeavor to notify the [city or village] residents and other persons in any other practical manner that he or she shall devise. Further, the [mayor or manager] shall immediately deliver notice of such proclamation, and the regulations that have been imposed by such proclamation, to all members of the [city council or village board].
4. The emergency proclamation of the [mayor or manager], and the regulations imposed thereby, shall remain in full force and effect until any one of the following shall first occur:
   a. The [mayor or manager] determines that the emergency no longer exists and that the emergency proclamation, and the regulations imposed thereby, shall no longer continue in effect.
   b. The [city council or village board] modifies or repeals the emergency proclamation, and the regulations imposed thereby, by means of an ordinance enacted at any regular or special meeting of the [city council or village board].
5. Any [city or village] employee or officer may, at the direction of the [mayor or manager], notify and warn any person of the effect of said emergency proclamation and direct said person to comply with said watering or sprinkling restrictions. If any said person, after having first been warned about said restrictions of the emergency proclamation, shall continue to violate said restrictions of the proclamation, they shall be deemed to be in violation of this section.

I. Authority: The authority to prohibit and further regulate the sprinkling of lawns, shrubbery, and gardens shall be expressly reserved and may be amended from time to time, as necessary, by the [mayor or manager] and [city council or village board].

J. Violation And Penalty:

1. Any person who violates, disobeys, neglects, fails to comply with, or resists enforcement of the provisions of this ordinance shall, within ten days of receiving notice of such violation, pay the [city or village] a fine, as follows:
   a. $50.00 for a first offense.
   b. $100.00 for a second offense.
   c. $200.00 for each subsequent offense.
2. Each day a violation occurs or continues shall be considered a separate violation for purposes of this section.
3. In addition to penalties provided herein, the city may recover reasonable attorney fees, court costs, court reporter fees, and other expenses of litigation.

Alternatively, the ordinance may be constructed as a color-coded ordinance, whereby subsection (D)(1) would be adjusted to add language about "Condition 'Green,'" and subsections (H)(2)(a) and (b) would be adjusted to add language about "Condition 'Yellow'" and "Condition 'Red,'" respectively and to remove language about the process for issuing an emergency proclamation. In addition, the following section would be added:

K. Signs: The [city or village] shall cause signs to be posted in conspicuous public places at entrances to the [city or village], as well as posting information on the [city or village] website, advising residents of the watering conditions then in effect.

Additional Online Resources

The following are just a few of the many additional resources available to those wanting to dig a little deeper into outdoor water conservation.

Drought Preparedness

AWWA Drought Resource Community
www.awwa.org/resources-tools/water-knowledge/drought.aspx

Native Plants & Trees

Illinois Native Plant Society
ill-inps.org

Plant Native
www.plantnative.org/index.htm

Illinois DNR- Division of Forestry
dnr.state.il.us/conservation/forestry

Univ. IL Extension- Forestry
web.extension.illinois.edu/forestry/useful_links.html

Lawn Care

University of Illinois Extension- Lawn Talk
urbanext.illinois.edu/lawntalk

Safer Pest Control Project
www.spcpweb.org

Outdoor Water Conservation

EPA Water Sense
www.epa.gov/watersense/outdoor

Pest Management

North Central IPM Center
www.ncipmc.org/index.cfm

Safer Pest Control Project
www.spcpweb.org

University Extension Service

University of Illinois Extension Service
web.extension.illinois.edu/state

Illinois County Extension Service Offices
web.extension.illinois.edu/state/findoffice.html

Rain Gardens

Indiana Coastal Area Rain Garden Documents
www.in.gov/dnr/lakemich/6084.htm

Wisconsin DNR Rain Garden Website Links
dnr.wi.gov/topic/stormwater/documents/rgmanual.pdf

Soil & Water Conservation Districts

Illinois SWCD Offices
www.agr.state.il.us/Environment/LandWater/swcddirectory.pdf

Stormwater Management

EPA Green Infrastructure
water.epa.gov/infrastructure/greeninfrastructure/

Water Pricing

CMAP/IISG Full Cost Water Pricing
www.iisgcp.org/topic_watersupply.html

UNC Environmental Finance Center
efc.unc.edu/projects/water_efficiency.htm

Water Reuse

EPA Water Recycling and Reuse
www.epa.gov/region9/water/recycling

List of Acronyms

CMAP	Chicago Metropolitan Agency for Planning
COG	Council of Government
GLRI	Great Lakes Restoration Initiative
HB	House Bill
IDPH	Illinois Department of Public Health
IISG	Illinois-Indiana Sea Grant
L2L	Lawn to Lake
LMCP	Lake Michigan Coastal Program
MPC	Metropolitan Planning Council
NIRPC	Northwestern Indiana Regional Planning Council
NWPA	Northwest Water Planning Alliance
TAC	Technical Advisory Committee
U.S. EPA	U.S. Environmental Protection Agency

Notes

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312.454.0400
info@cmap.illinois.gov

www.cmap.illinois.gov

LAWN TO LAKE

Take the Lawn to Lake Pledge! Visit lawntogreatlakes.org for the pledge and more program information.

Sea Grant
ILLINOIS - INDIANA

Illinois-Indiana Sea Grant Program
University of Illinois
374 NSRC, MC-635
1101 West Peabody Drive
Urbana, IL 61801

www.iiseagrant.org

www.lawntogreatlakes.org

NORTHWEST WATER PLANNING ALLIANCE

NORTHWESTERN INDIANA REGIONAL PLANNING COMMISSION

Northwestern Indiana
Regional Planning Commission
6100 Southport Road
Portage, IN 46368

www.nirpc.org

MetropolitanPlanningCouncil

Metropolitan Planning Council
140 S. Dearborn St.
Suite 1400Chicago, Ill. 60603
312 922 5616

www.metroplanning.org

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