



Climate Change

How will you manage your water resources?

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The nation's water resources are being challenged by a changing climate. In some regions of the country, current water supplies don't meet societal demands. In other areas, water quality is severely degraded and unfit for drinking. Changing climates will exacerbate these problems, as well as lead to insufficient water supplies for people and the environment in many parts of the country. Water resource managers need to be proactive to adapt to changes occurring today, and to anticipate changes in the future.

Act today to protect your water's health for tomorrow.

Anticipating a Changing Climate

The anticipated scenario for the Midwest is an increase in the frequency and intensity of storm events with increased precipitation, as well as periods of prolonged drought. Increased precipitation, combined with increasing amounts of impervious surfaces from development, parking lots, and road building means less water will infiltrate the ground; instead it becomes runoff, which is far harder to control. Quite simply, water cannot penetrate the hard surfaces and ends up running off the land.

An important result of more rainfall becoming runoff is that not as much is likely to be captured and stored. This, and increased drought, would potentially reduce water supplies. Urban development would magnify the volume of runoff and increase the peak runoff rate—and

ultimately decrease the travel time for runoff (see Fig. 1). Unfortunately, modern water processing facilities are not designed to collect and hold greater volumes of water. Greater precipitation events will lead to:

- Increased peak discharges
- Increased volume of storm runoff
- Decreased time for runoff to reach the stream
- Increased frequency and severity of flooding
- Greater runoff and stream velocity during storm events

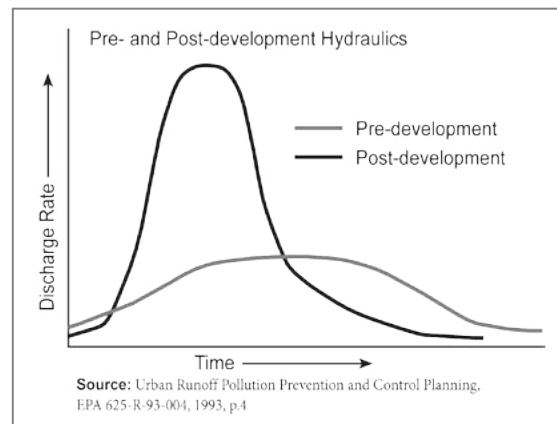


Figure 1

This all prevents precipitation from becoming part of the groundwater supply. Instead, it becomes a waste product directed into sewers and pipes—and eventually ends up in the receiving water body.

There are obvious and quick ways to adjust to the predicted climate changes. The most frequently used include building new surface storage facilities and diverting river/stream flow. Unfortunately, both will be affected by increased evaporation and reduced precipitation. An alternative approach to managing our water resources is through water conservation, rainwater capture, and waste water recycling, which are more resistant to the effects of climate change.



Finding Alternatives

Drought is nothing new for this country. However, some regions of the United States may have never experienced a drought. In the Midwest, more intense, frequent rainfall events are expected in the winter and spring months and less precipitation in the summer. Elevated temperatures, increased rates of evaporation and, possibly, longer dry seasons will alter rainfall patterns so that the supply of useable water diminishes.

Besides water conservation and recycling, there are other ways to manage the challenges of providing potable water supplies to communities and aquatic ecosystems.

- **Think about efficiency.** Water is a precious, limited resource. In the Midwest, water for our growing population competes with other uses that often depend on the same water source. Other uses include agriculture, industry, recreation, and maintaining an adequate streamflow for fish and other aquatic species. Using water efficiently is particularly important during summer months when it rains less and user demand is high. Efficient use of water begins with the three pillars of a water conservation program; education, pricing, and leak detection and audits. Helping people learn how to correct a leaking faucet and to mow their grass at a height that requires less maintenance are two ways to use water more efficiently. By becoming efficient consumers, the community will protect their water supplies and reduce energy costs.

- **Conserve water.** In the Midwest, where it is relatively wet, planning agencies are predicting increased streamflow in the winter and spring, which may be used to alleviate groundwater over-pumping. However, water conservation is still an important component of sustainability. Unfortunately, many communities in the western and southern suburbs of Chicago already face water quantity and quality shortages. In these areas, people must carefully manage of water resources, because severe water shortages by 2020 are projected for at least 22 townships in the Chicago metropolitan area. Innovative approaches to water management in the Midwest under a warmer climate regime include water recycling, rainwater collection, and groundwater banking, as well as the traditional river and stream diversion and surface storage facilities.
- **Work together.** It is time for various agencies to come together and take a multi-level approach to the problem. Source water protection, for example, is an excellent beginning. But, other variables such as the principles of smart growth, low impact development, and green infrastructure need to be factored into the problem. All of these factors combined will benefit water supply, water quality, habitat for fish and wildlife, flood management, and reduced energy consumption. All make positive contributions towards water management and climate change. Just as areas in the Midwest have created integrated regional transportation plans, the time may have come to think about taking the same integrated, regional approach with water management. This approach would benefit many stakeholders and agencies and will distribute the implementation costs on a much broader scale.
- **Use low-impact designs.** The floods of 2008 in the Midwest resulted in billions of dollars worth of damage. Unfortunately, land-use development has put people and property on floodplains and in filled in wetlands. In order to alleviate some of the flooding problems, future developers must look at low-impact development designs to help reduce flooding. We should provide incentives to older developments to capture and retain surface waters. Other ways to reduce the impacts of flooding fall back on preserving existing wetlands, restoring wetlands, and maintaining flood plains, as well as other natural barriers, to reduce the impacts of storms.
- **Consider the environment.** Evaluate the vulnerability of current water facilities to changes in water flow and increased water demand. Determine possible environmental impacts to the surrounding ecosystems.



- **Plan for Climate Change.** Managing today's water supplies can be a daunting task, because of increased demand due to population growth, new technologies, variable regional and nationwide economies, and changing conditions within watersheds due to land use and accompanying water management decisions. Climate change adds an extra layer to the uncertainty of water quantity and water quality and the future of water resource management. State and local governments have plans for managing current water supplies that they continue to modify to address future water resource management issues. However, adaptation measures such as water conservation, use of markets to allocate water, and the application of appropriate management practices will play an important role in determining the impacts of climate change on water resources.

We definitely do not advocate treating or transporting water, or anything else that increases the need for energy. Our goal is to make the system more efficient and, thereby, to reduce energy use. Reducing energy use reduces carbon emissions and other greenhouse gases, which, in turn, reduces the impacts of climate change.



Resources

U.S. Environmental Protection Agency

www.epa.gov/climatechange/

The U.S. Environmental Protection Agency website that provides climate change information to communities, individuals, businesses, states, localities, and governments.

Water: Demand and Supply

<http://chicagowildernessmag.org/issues/winter2007/water.html>

This report from The Chicago Wilderness looks at the water concerns in the Chicago region.

U.S. Global Change Research Program

www.globalchange.gov/

This report examines the effects of climate change on agriculture, land resources, water resources (water quantity and quality), and biodiversity, and provides the reader with the ability to estimate impacts of future climate change on the three systems.

Freshwater Resources and Their Management

www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter3.pdf

This report examines the impacts of climate change on freshwater resources.

Handbook: Urban Runoff Pollution Prevention and Control Planning

www.epa.gov/nrmrl/pubs/625r93004/625r93004.pdf

This handbook presents a step-by-step planning approach that municipal officials can use to develop technically feasible, targeted, affordable, and comprehensive urban runoff pollution prevention and control plans.

EPA Water Sense

www.epa.gov/watersense/

This is a new initiative promoted by the Environmental Protection Agency to be water efficient.

Water Conservation and Landscaping

<http://revelle.net/lakeside/lakeside.new/landscaping.html>

This link provides an excellent overview of water conservation and alternative landscaping practices.

For More Information

ID-255 *Protecting Our Water and Environmental Resources*

ID-256 *Nonpoint Source Pollution: A Threat to Our Waters*

ID-257 *Impacts of Development on Waterways*

ID-258 *Strategies for Coping with Runoff*

ID-259 *How to Get Started: Protecting Your Community From Polluted Runoff*

ID-260 *The Relationship Between Land Use Decisions and the Impacts on Our Water and Natural Resources*

FNR-245 *Brownfields: A Rural Community Problem*

FNR-255 *Stormwater Runoff*

FNR-256 *Stormwater and Non-Point Source Pollution*

FNR-257 *Open Space Planning*

FNR-409-W *Smart Growth and Protection of Natural Resources*

FNR-415-W *Sustainable Land Use: Impact on Climate Change and Health*

FNR-425-W *Climate Change: Are you preparing for it?*

FNR-426-W *Climate Change: How will you manage stormwater runoff?*

FNR-427-W *Climate Change: Where does it fit in your future plans?*

Planning with POWER Presentation module Model Ordinances are available.

These publications are available on the *Planning with POWER* Web site: www.planningwithpower.org

Also, a new Web-based GIS planning tool and decision support system is now available at: www.purdue.edu/lm

If you are interested in pursuing the Smart Growth Principles, the protection of natural resources and natural resources based planning, contact Robert McCormick at (765) 494-3627 and or rmccormi@purdue.edu.

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