



Climate Change How will you manage stormwater runoff?



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Introduction

Most climate change scientists agree on one thing: we're going to see more frequent and intense storm and rainfall events along with increased flooding, stormwater runoff, and soil erosion. The increased runoff and flooding will force planners and stormwater specialists to develop strategies to deal with the increased volume and velocity of stormwater.

Some of these strategies may include:

1. Plan for more green infrastructure.
2. Use low impact development strategies to reduce stormwater.
3. Minimize impervious surfaces such as parking lots, roads, and rooftops.
4. Use smart growth and sustainable growth strategies that decrease road building and include transportation choices other than automobiles.
5. Encourage riparian buffers along streams, rivers, and waterways and maintain flood plains.
6. Protect and reestablish wetlands to hold runoff and recharge groundwater.
7. Encourage tree planting, especially in urban settings.
8. Promote landscaping with native vegetation to further reduce runoff and the need for irrigation.
9. Accelerate the move to separate, combined sewer overflows to reduce pollution from sewage, bacteria, and *E. coli* entering waters during storm events.
10. Coordinate planning of infrastructure, housing, and transportation under the new climate change regime.



Plan for More Green Infrastructure

The infrastructure that supports a community includes both the gray infrastructure we build (roads, buildings, sewer/water/electrical lines) and the green infrastructure or the natural environment (water, air, natural resources). When developing a plan for the future, think of green infrastructure as a network of interconnected natural areas and open space that provides critical functions such as groundwater recharge, pollution mitigation, reduced

runoff and erosion, and improved air quality for communities. Forests, wetlands, natural areas, riparian buffers, agricultural land, and flood plains are examples of green infrastructure. Communities may also need to develop strategies for upgrading infrastructure in already developed areas.

Use Low Impact Development Strategies

Traditional approaches to stormwater management include use of pipes, curbs, gutters, storm drains, and detention ponds. With more frequent and intense precipitation events, communities will need to use new strategies such as bioretention, vegetated swales, and porous/pervious/permeable paving alternatives to supplement traditional stormwater conveyance systems.

Minimize Impervious Surfaces

Two-thirds of our impervious surfaces today consist of roads, highways, and parking lots. We'll need new ordinances and building/construction design requirements to reduce imperviousness in the future. Many communities are revising parking lot requirements and designs for new buildings. Road construction is under increased scrutiny across the country as community planners ask for complete streets that include space for pedestrians, bicycles, and mass transit. Increasing our transportation choices reduces the need for more pavement.

Use Smart Growth and Sustainable Growth Strategies

Smart growth strategies direct development near existing infrastructure. By locating new houses near offices and entertainment in downtown and town centers, we reduce the need for new infrastructure (roads, streetlights, electric lines, sewers, waterlines, gas lines, etc.). This lowers greenhouse emissions and ultimately lessens the cost of services for all communities. Combining compact, mixed-use development with commercial, residential, and office space leads to reduced water consumption and runoff. At the same time, it reduces greenhouse gas emissions by reducing energy consumption.



Encourage Riparian Buffers and Maintain Flood Plains

Increased precipitation events will dictate how we mitigate runoff from flooded areas. Changes in climate will force us to maintain natural flood plains and to forbid construction and development in those flood plains. Under certain scenarios, flood plains may need to be expanded to encompass more land area that will accommodate the increased rainfall events. In addition, we'll need riparian buffers (vegetated areas) and filter strips along waterways to further slow runoff and filter non-point pollutants. Otherwise, we could face increased erosion and, with it, increased pollution of streams, rivers, and lakes.



Protect and Reestablish Wetlands

Wetlands could become increasingly important both in drier areas and in high-runoff areas under future climate change scenarios. They'll be highly valued, because they have great capacity to hold water, recharge groundwater, and mitigate water pollutant. Constructed wetlands, as well as natural wetlands, will be valued for these vital functions related to a community's water supply.



Encourage Tree Planting

We should plant more trees in our communities. Trees help us manage stormwater by reducing runoff and mitigating erosion along streams and waterways when they are part of riparian buffers. Other critical functions provided by trees include cooling the heat islands in urban areas and shading pedestrians as they travel on streets and roadways.

Promote Landscaping with Native Vegetation

Traditional landscaping includes high-maintenance turfgrass and other nonnative species that require vast amounts of water during dry periods. In addition, turfgrass and nonnative species require excess fertilizer and pesticide applications that contribute to nonpoint pollution and runoff. This further contaminates surface and groundwater resources of local communities. Communities should promote the use of native vegetation in landscaping.

Accelerate the Move to Separate, Combined Sewer Overflows

Increased frequency and intensity of storm events will result in more combined sewer overflows (CSOs) that release additional, untreated sewage into streams and rivers across the country. That sewage carries with it bacteria, particularly *E. coli*. CSOs are regulated and every community should have a mitigation control plan; however, the need to replace this outdated infrastructure with the new climate change forecasts is much more urgent now due to the increased potential for contamination.



Coordinate Planning of Infrastructure, Housing, and Transportation

Finally, coordination in planning becomes essential as the overall system faces increased stress. Land-use planning is closely linked to transportation planning, and both have tremendous effects on the environment and natural resources. We must use our critical resources efficiently as we face potential climate change that could cause scarcity, depletion, and diminished quality of water, land, and air for communities in the future. With planning we can prevent some of these problems.

Additional Resources

Chicago Wilderness

www.chicagowilderness.org

Chicago Wilderness is an alliance of federal, state, and local governments, environmental and non-governmental organizations, and institutions of higher learning working together to improve the quality of life and to protect natural resources for the citizens of the Chicago region. The group has developed the Climate Action Plan for Nature, which addresses biodiversity and climate change in the Chicago region.

Chicago Climate Action Plan

www.chicagoclimateaction.org

The Chicago Climate Action Plan highlights the plans the city of Chicago proposes to take on relative to reducing the city's contribution to climate change.

NOAA Climate Services

www.climate.gov/#climateWatch

NOAA Climate Services site provides a national perspective on the impacts of climate change.

Intergovernmental Panel on Climate Change

www.ipcc.ch

The Intergovernmental Panel on Climate Change is the leading body for the assessment of climate change, established by the United Nations Environment Program (UNEP) and the World Meteorological Organization (WMO) to provide the world with a clear scientific view on the current state of climate change and its potential environmental and socio-economic consequences.

The Midwestern Regional Climate Center

<http://mcc.sws.uiuc.edu>

The Midwestern Regional Climate Center at the University of Illinois serves the nine-state (Illinois, Indiana, Wisconsin, Michigan, Kentucky, Iowa, Missouri, Minnesota, and Ohio) Midwest region. The center is an excellent source for climate data and research.

Post Carbon Institute

www.postcarbon.org

Post Carbon Institute provides individuals, communities, businesses, and governments with the resources needed to understand and respond to the interrelated economic, energy, and environmental crises that define the 21st century.

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

Planning with POWER Presentation module model ordinances also are available.

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

Local Decision Maker, a new Web-based GIS planning tool and decision support system is now available at: www.purdue.edu/ldm

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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