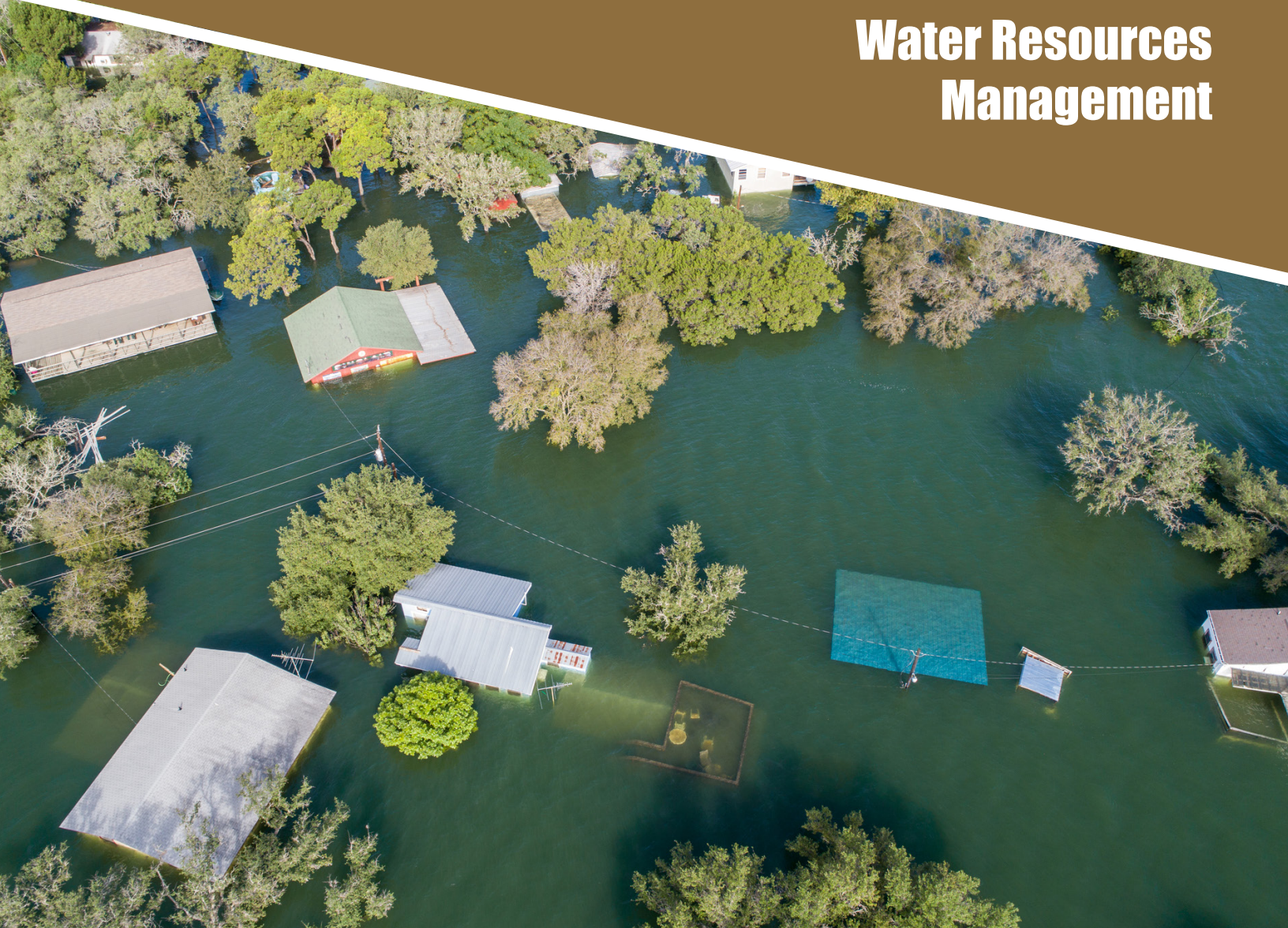


Water Resources Management



LOCAL GOVERNMENT FLOOD POLICY TOOL KIT

Kaitlyn McClain, author

What is localized flooding?

FEMA defines localized flooding as “smaller scale flooding that can occur anywhere in a community.” Localized flooding is most common in areas with high groundwater or poorly drained soils, where urbanization and impervious surfaces have increased runoff or in older sections of communities where original storm sewers were not designed with today’s standards. Localized flooding causes:

- Sheet flow into streets and low-lying areas
- Ponding in yards and on streets
- Sewer backups
- Basement or first floor flooding

Localized flooding is sometimes referred to as “nuisance flooding” or “urban flooding.” Localized flooding can occur outside of Special Flood Hazard Areas (SFHAs), or A Zones, as defined on a community’s Federal



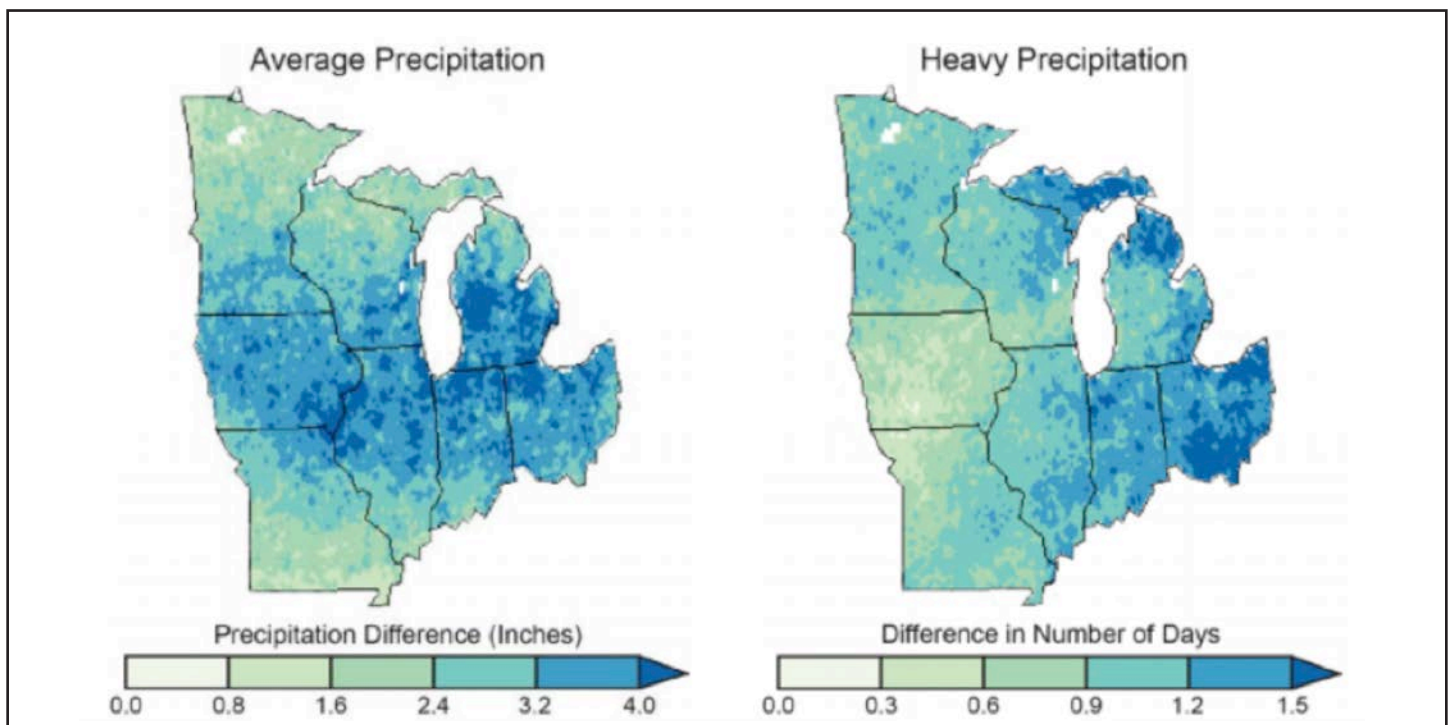
Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM). In fact, between 20 and 25 percent of all National Flood Insurance Program (NFIP) repetitive loss properties are rated as being in B, C and X Zones, outside of the 100-year floodplain (see **Table 1** for definitions). Flood insurance is not required for homes, commercial buildings and other development in these zones. As a result, these structures rarely meet the same development standards of those in SFHAs and are susceptible to damage from even small-scale flood events.

Localized flooding might become more of a problem in the future if communities do not incorporate stormwater management into planning and development decisions. According to the 2014 National Climate Assessment (NCA3), extreme rainfall events and flooding have increased during the last century, and these trends are expected to continue (**Figure 1**). The projected warmer temperatures mean that more precipitation will be falling as rain rather than as snow. Winter and spring will be wetter.

TABLE 1. FEMA FLOOD ZONE DESIGNATIONS

Zone	Risk Level	Description
A, AE, AH, A1-30, AO, A99	High	Areas with a 1 percent annual chance of flooding and a 26 percent chance of flooding over the life of a 30-year mortgage. Flood insurance required.
V, VE, V1-30	High	Coastal areas with a 1 percent or greater chance of flooding and the additional hazard of storm waves. These areas have a 26 percent chance of flooding over the life of a 30-year mortgage. Flood insurance required.
B, X	Moderate	Usually the area between the limits of the 100-year and 500-year flood hazard zones. Zone B is the area of 0.2 percent annual chance flood (500-year). Zone X is the area of 1 percent annual chance flood (100-year) with depths of less than 1 foot or less than one square mile drainage area, or areas of 1% annual chance flood (100-year) protected by levees.
C, X	Low	Zone C may have ponding and local drainage problems that don't warrant designation as base floodplain. Zone X is the area determined to be outside the 500-year floodplain.
D	Undetermined	Areas in which no flood hazard analysis has been conducted.

FIGURE 1: POSSIBLE INCREASES IN PRECIPITATION FROM THE 1971-2000 BASE PERIOD TO THE PERIOD 2041-2070 BASED ON THE A2 HIGH EMISSION SCENARIO.



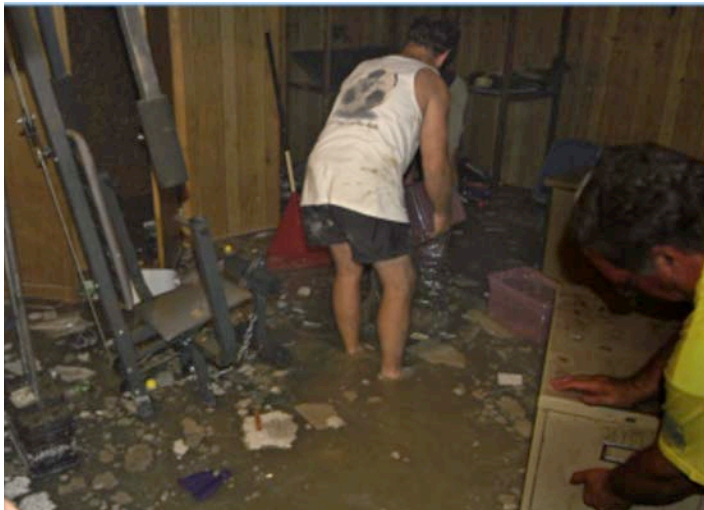
Source: National Climate Assessment, 2014

HOW IS LOCALIZED FLOODING RELEVANT TO ECONOMIC DEVELOPMENT?

The problems associated with localized flooding range from safety hazards and public health concerns, to property damage, to overall community impacts and costs to local governments.

As little as two feet of water can float most vehicles, and adults can be knocked down by as little as a few inches of moving water. Standing water is a breeding ground for mosquitos that can transmit disease. Health problems such as asthma, allergies and respiratory infections can develop or worsen from living in a home that has been flooded and now has mold and mildew. Repetitive flooding can cause great anxiety for individuals and families.

Property damage can be extensive even with small amounts of water. If carpet, walls, insulation and mattresses get wet, they will likely need to be replaced. Most property owners outside of SFHAs do not have flood insurance, and damage from flooding is not covered under standard homeowners' insurance policies. The cumulative damage of these flood events can be significant.



The community as a whole can suffer from localized flooding because areas that are repeatedly flooded are less desirable to live and work in. Property values may be negatively affected. Things like sidewalks, streets, fences and signs wear out sooner and are a cost to local government. Even temporarily flooded streets and damaged buildings can have ripple effects throughout the community and local economy.

In some areas, localized flooding is a chronic problem. While larger floods might cause greater destruction that is more immediate, the repetitive damage of localized flooding can add up over time. Despite the fact that localized flooding can be severely impactful to communities, the bulk of federal and state resources such as funding, technical help and disaster assistance goes to handling large flood events and mitigation. However, there are actions that local governments can take to mitigate the risk and damage caused by localized flooding.

ADDRESSING FLOODING THROUGH COMPREHENSIVE PLANNING

Comprehensive plans should be updated every five to ten years. As a community updates its comprehensive plan, it should incorporate the goals of existing watershed management plans (www.in.gov/idem/nps/3180.htm) and address stormwater management and localized flooding concerns. These concerns can be addressed in comprehensive plans through zoning that discourages sprawl, encourages alternative transportation options that reduce demand for streets and impervious surfaces and upholds No Adverse Impact floodplain management principles (see <https://www.floods.org/resource-center/nai-no-adverse-impact-floodplain-management/>). Developing or updating a comprehensive plan should be a holistic, inclusive process that reflects economic, environmental and societal conditions. What works for one community might not work for another.

No Adverse Impact (NAI) Floodplain Management is a managing principle that has been developed and promoted by the Association of State Floodplain Managers. It gives communities a way to promote responsible development through local decision making. Ideally, a community will develop a comprehensive plan that identifies acceptable levels of flood impacts, specifies appropriate measures to mitigate those adverse impacts and establishes an implementation plan. Under NAI management principles, the actions of one property owner are not allowed to adversely affect the rights of other property owners.

MODEL POLICIES AND TOOLS

The Indiana Department of Natural Resources Lake Michigan Coastal Program has created a web-based toolkit for Indiana communities seeking to address local flooding (see www.in.gov/dnr/lakemich/9609.htm). The toolkit contains a resource library, interactive maps via IndianaMAP and an overview of policy tools that local governments can use to address localized flooding. The resources are geared toward local government staff, elected officials and commissioners, nonprofit staff, planners, developers and interested citizens. The resources are meant to serve as a starting point for understanding a community's flood risk and steps that can be taken to address community needs.

The following policy tools can be incorporated into a community comprehensive plan, sub-area plans or ordinances. Regulatory tools such as ordinances might produce greater results, but they require administration, enforcement, time and resources to be effective. They might also discourage economic development under some circumstances. Incentive tools, including fee discounts and expedited development review processes, might not limit all development that negatively impacts hydrology, but they are often more palatable to developers and community members. For many communities, it is most effective to find a balance between competing economic, environmental and social forces and adopt a combination of regulatory and incentive-based policies, i.e., "carrots and sticks."

STORMWATER/LOCAL ORDINANCE AUDITS AND UPDATES

Summary

Ensuring that local zoning, building codes and ordinances allow green infrastructure and other stormwater management techniques while discouraging building in floodplains is a good start to minimizing localized flooding. A code audit will help identify regulations that prohibit or are silent on the implementation of green infrastructure, open space protection and low-impact development. Code updates could include on-site infiltration standards, wetland and waterbody protection buffers and native landscaping standards. Visit the links in the Further Resources section to find model ordinances.



City of Hobart has designated an area of the city as a Nature District.

Pros

- Potentially low cost
- Audits met with little public resistance
- Proactive measures

Cons

- Depending on the political climate, codes can be difficult to change
- Code changes could need to be phased in or adapted over time

Cost estimate

There is the potential for low cost associated with updating stormwater and building codes.

Further resources

- WI Sea Grant Tackling Barriers to Green Infrastructure: An Audit of Municipal Codes and Ordinances (<https://www.seagrant.wisc.edu/our-work/focus-areas/coastal-communities/green-infrastructure/>)
- U.S. EPA Water Quality Scorecard (<https://www.epa.gov/sites/production/files/2014-04/documents/water-quality-scorecard.pdf>)
- U.S. EPA Smart Growth Fixes for Climate Adaptation and Resilience (www.epa.gov/smartgrowth/smart-growth-fixes-climate-adaptation-and-resilience)

GREEN STREETS/COMPLETE STREETS

Summary

Complete streets, sometimes also referred to as green streets, are streets that incorporate green infrastructure and alternative modes of transportation into street planning as a way to decrease impervious surfaces and increase environmental services. Complete streets help to control stormwater by reducing street width, planting trees, adding swales with native plantings and utilizing permeable pavement.

A good way to start a green streets program is to begin with a pilot program with a main thoroughfare. The pilot allows for the program to gain popularity with the public and for any user conflicts to be detected. The pilot can then be expanded to more streets and the adoption of street design standards for the community.



Bike lanes, green medians and native plantings were added during the Michigan City Wabash Street Improvements project.

Pros

- Reduces runoff and pollutant loading
- Improves street aesthetic
- Encourage alternative modes of transportation

Cons

- Time intensive
- Difficulty in coordinating timing of projects between local government and state agencies
- May need to be paired with community education

Cost estimate

Costs are dependent on which features are selected, but generally costs are moderate to high. Features such as permeable pavement and roadway retrofits can be quite expensive, but generally planting trees and native vegetation is not as costly as grey infrastructure.

Further resources

- Northwestern Indiana Regional Planning Commission (NIRPC) Complete Streets Planning & Design Guidelines (<https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=1299&context=roadschool>)
- City of Chicago Complete Streets Design Guidelines (<https://chicagocompletestreets.org/portfolio/complete-streets-chicago-design-guidelines/>)
- U.S. EPA Water Quality Scorecard (www.epa.gov/sites/production/files/2014-04/documents/water-quality-scorecard.pdf)
- U.S. EPA Managing Wet Weather with Green Infrastructure Green Streets (www.epa.gov/sites/production/files/2015-10/documents/gi_munichandbook_green_streets_0.pdf)

GREEN INFRASTRUCTURE BEST MANAGEMENT PRACTICES (BMPs)

Summary

Green infrastructure best management practices (BMPs) mitigate stormwater runoff through practices that use or mimic natural processes. Green infrastructure BMPs slow down runoff and provide storage and infiltration. Most often these practices look like rain gardens, bioswales, vegetated buffer strips and open-space corridors. Green infrastructure ranges in its storage capacity. Disconnecting a downspout from a residence and connecting it to a rain barrel is a low-cost, low-intensity method that is also extremely accessible for citizens. On the other end of the intensity spectrum are options like stormwater parks and permeable pavements.

Pros

- Less costly and time intensive to implement than grey infrastructure
- Improves the aesthetic of public spaces
- Improves water quality

Cons

- Requires coordination between departments
- Maintenance can be difficult to fund over time



Gary's Aetna neighborhood incorporates public art into stormwater management.

Cost estimate

Costs associated with implementing green infrastructure can vary depending on what the community chooses to do. For example, updating local guidelines to encourage residential rain gardens has virtually no cost, whereas installing municipal bioswales could cost between several hundred to thousands of dollars. Installing a rain barrel generally costs less than \$100 but retrofitting a road with permeable asphalt is expensive. All of the costs associated with implementing green infrastructure should be compared with the savings in managing stormwater runoff and the alternative grey infrastructure solutions.

Further resources

- MO DNR Guide to Green Infrastructure (<https://dnr.mo.gov/document-search/missouri-guide-green-infrastructure>)
- WI Sea Grant Tackling Barriers to Green Infrastructure: An Audit of Municipal Codes and Ordinances (<https://www.seagrant.wisc.edu/wp-content/uploads/2018/09/GIAT.pdf>)
- U.S. EPA Green Infrastructure Municipal Handbook – Incentive Mechanisms is listed twice under Further resources.

CRS POLICY TOOLS AND INSURANCE DISCOUNTS

Summary

The Community Rating System (CRS) is a program administered by FEMA. It recognizes communities that go above and beyond the minimum floodplain management requirements by offering reduced flood insurance premiums in the community. To participate in CRS, a community must do some combination of the 19 creditable activities. These activities fall under the categories of Public Information, Mapping and Regulations, Flood Damage Reduction and Flood Preparedness. Based on the amount of credits earned, property owners are eligible for a discount of between 5 and 45 percent.

Pros

- Discounted flood insurance for community members
- Many communities already doing some of the activities
- Flexibility in meeting community needs and goals

Cons

- Creditable activities might not be applicable or feasible for all communities
- Multiple activities are required to earn an insurance discount

Cost estimate

The cost is variable depending on which activities and policies a community chooses to adopt and the resources available to the community.

Further resources

- IDNR Division of Water Floodplain Management & Homeowner Information
- FEMA Community Rating System Local Official's Guide
- FEMA Community Rating System Coordinator's Manual

STORMWATER FEE DISCOUNTS FOR BMP IMPLEMENTATION

Summary

Incentivizing private and commercial property owners to adopt green infrastructure best management practices (BMPs) is one way to expand green infrastructure beyond lands in public ownership and reduce the burden put on public stormwater

management infrastructure. One way to do this and get more properties managing stormwater is to offer a discounted stormwater utility fee for BMP implementation. Common eligible BMPs include rain garden installation, use of permeable pavement and rainwater harvesting. To determine a discount schedule, a community should look at the utility revenue and what their projected reduced burden will be. The BMPs, to varying degrees, should offset the loss of revenue from the discounted utility fees.

Pros

- Private property contributes to stormwater management
- Not a regulation, so property owners can choose whether or not to participate

Cons

- Stormwater utilities are typically underfunded, so discounts might not be feasible
- Resource intensive to set up rate structure and verify BMP functionality

Cost estimate

The cost of implementation is dependent on current stormwater utility fees, if any, and the discounts offered. Program administration must be factored in too. A consultant may be needed to set the program up.

Further resources

- U.S. EPA Managing Wet Weather with Green Infrastructure Municipal Handbook: Funding Options (www.epa.gov/sites/production/files/2015-10/documents/gi_munichandbook_funding.pdf)
- U.S. EPA Managing Wet Weather with Green Infrastructure Municipal Handbook: Incentive Mechanisms (www.epa.gov/sites/production/files/2015-10/documents/gi_munichandbook_incentives.pdf)
- U.S. EPA Managing Wet Weather with Green Infrastructure Municipal Handbook: Incentive Mechanisms (https://www.epa.gov/sites/production/files/2015-10/documents/gi_munichandbook_incentives.pdf)
- U.S. EPA Water Quality Scorecard (<https://www.epa.gov/sites/production/files/2014-04/documents/water-quality-scorecard.pdf>)
- MO DNR Guide to Green Infrastructure (<https://dnr.mo.gov/document-search/missouri-guide-green-infrastructure>)

DEVELOPMENT INCENTIVES FOR LOW-IMPACT DEVELOPMENT AND BEST MANAGEMENT PRACTICES

Summary

Low impact development (LID) refers to strategies that emphasize conservation and management of stormwater runoff on-site. Development incentives for LID and BMPs are a good way to incorporate stormwater management into new development and retrofits. These incentives can take many forms, such as a credit against open space requirements, subsidies or tax abatements in exchange for LID and BMP implementation, and expedited permitting and review processes. Common eligible activities include incorporating sustainable site design features, green infrastructure such as green roofs or rain gardens and stormwater management features that double as public recreational spaces.

Pros

- Relieve stress on public infrastructure
- Improve water quality
- Can improve aesthetics of developments

Cons

- Can be resource intensive to set up incentive program
- Might place extra pressure on staff to review development plans quickly. In rural areas, there may be minimal staffing or limited expertise to review plans.
- Might not have large impact on stormwater management because only applies to new or redevelopment, and is voluntary

Cost estimate

The cost of development incentives is dependent on which incentives are chosen. For example, if a community decides to reduce fees for developers that incorporate stormwater management into their development, then the cost would be the difference between the reduction in revenue from the reduced fee and the savings from the reduced stormwater management burden. In another example, if a community decided to offer an expedited development review period for projects implementing LID and/or BMPs, then the cost of the incentive would be low.

Further resources

- U.S. EPA Managing Wet Weather with Green Infrastructure Municipal Handbook: Incentive Mechanisms (www.epa.gov/sites/production/files/2015-10/documents/gi_munichandbook_incentives.pdf)
- U.S. EPA Water Quality Scorecard (www.epa.gov/sites/production/files/2014-04/documents/water-quality-scorecard.pdf)
- MO DNR Guide to Green Infrastructure (<https://dnr.mo.gov/document-search/missouri-guide-green-infrastructure>)

GRANTS, REBATES AND INSTALLATION FINANCING FOR RETROFITS

Summary

Grants are attractive funding options for small-scale or pilot projects. Grant programs are administered through philanthropic organizations, nonprofits and federal and state government.

Another form of financing for retrofits and development is rebates and installation financing. These mechanisms provide incentives for property owners to install green infrastructure on their properties. They often target areas that have demonstrated the greatest need for green infrastructure through excessive runoff and flooding. Rain barrel distribution is a common example of this policy tool.

If a community is planning a larger project, they could also consider low-interest loans. The State Revolving Fund (SRF) loan program provides low-interest loans to Indiana communities for projects that improve water infrastructure and flood control.

Pros

- Good for pilot projects
- Creates incentives to implement BMPs
- Opportunities to leverage limited resources

Cons

- Grants and SRF loans are competitive
- Grant funding is not reliable or limited to specific regions
- Revenue is required; grants often require match funding and loans must be repaid over time

Cost estimate

The cost associated with grants, rebates and loans are dependent upon the size of the project. Generally, the cost will be less than doing nothing or administering the program without using these funding options.

Further resources

- IDNR Coastal Program Grant Referral Service (www.in.gov/dnr/lakemich/6044.htm)
- Indiana Department of Homeland Security Mitigation Grant Program (<https://www.in.gov/dhs/emergency-management-and-preparedness/mitigation-and-recovery/>)
- Indiana Finance Authority State Revolving Loan Fund: Flood Control (www.in.gov/ifa/srf/2957.htm)
- U.S. EPA Managing Wet Weather with Green Infrastructure Municipal Handbook: Funding Options (www.epa.gov/sites/production/files/2015-10/documents/gi_munichandbook_funding.pdf)
- U.S. EPA Managing Wet Weather with Green Infrastructure Municipal Handbook: Incentive Mechanisms (www.epa.gov/sites/production/files/2015-10/documents/gi_munichandbook_incentives.pdf)

AWARDS AND RECOGNITION PROGRAMS

Summary

Awards and recognition programs highlight successful examples of green infrastructure as a means of stormwater management and flood mitigation in a community. Winners can be businesses, government agencies, schools, property owners, community organizations and non-profits. These awards can be good opportunities to receive press coverage and share information about effective programs with other groups.

Pros

- Raise awareness about stormwater and floodplain management
- Recognize exceptional organizations and individuals
- Create an incentive for groups to improve projects

Cons

- Low impact on stormwater management

Cost estimate

Awards and recognition have little to no cost associated with them.

Further resources

- Indiana Governor's Award for Environmental Excellence (<https://www.in.gov/idem/partnerships/governors-awards-for-environmental-excellence/>)
- INAFSM Stormwater Management Award (www.inafsm.net/inafsm-awards)
- Chicago Wilderness Force of Nature Awards (<https://www.chicagowilderness.org/page/GBRForceOfNature>)
- U.S. EPA Managing Wet Weather with Green Infrastructure Municipal Handbook: Incentive Mechanisms (www.epa.gov/sites/production/files/2015-10/documents/gi_munichandbook_incentives.pdf)

CITY OF GARY GREEN INFRASTRUCTURE PLAN

The City of Gary is currently implementing a number of programs across different departments to address environmental and economic issues within the city. With strong support from the mayor, the Division of Environmental Affairs and Green Urbanism and the Department of Planning and Development are leading these efforts.

In 2017, with a grant from the IDNR Lake Michigan Coastal Program, the city embarked upon the development of a citywide green infrastructure plan with the intent to create a strong guiding document and decision-support tools that will allow city staff to effectively prioritize green infrastructure installation and maintenance.

The city will use the plan and tools to tackle:

- Negative impacts from urban stormwater runoff on water quality, residential flooding and environmental health
- Negative social and economic impact of blighted properties and corridors
- Managing vacant land, given a weak redevelopment market
- Outdated zoning regulations that do not account for green infrastructure solutions
- Fragmentation of high-quality remnant dune and swale and wetland ecosystems

The City of Gary is using a number of the incentive-based and regulatory tools explained in the previous section to meet its stormwater management, localized flooding mitigation and community development goals.

The city is considering changes to its zoning code, planting demonstration gardens and engaging the community in the process to educate and build support. This approach can be replicated in any community across Indiana and modified to meet community-specific goals.



The City of Gary Division of Environmental Affairs and Green Urbanism's Vacant to Vibrant green infrastructure installation in Gary's Aetna neighborhood combines public art with stormwater management. This garden sits on a lot that previously held a home that had not been occupied for 15 to 20 years.

RESOURCES

- Association of State Floodplain Managers CRS for Community Resilience Green Guide www.floodsciencecenter.org/products/crs-community-resilience/green-guide/
- Extension Disaster Education Network <https://extensiondisaster.net/>
- FEMA Reducing Damage from Localized Flooding: A Guide for Communities <https://www.fema.gov/pdf/fima/FEMA511-complete.pdf>
- Illinois-Indiana Sea Grant Flood Vulnerability Assessment for Critical Facilities <https://iiseagrant.org/work/climate-ready-communities/programs-initiatives/flood-vulnerability-assessment-for-critical-facilities/>
- Indiana DNR Lake Michigan Coastal Program Localized Flooding Planning Resources www.in.gov/dnr/lakemich/9609.htm