

# Water WoRDs

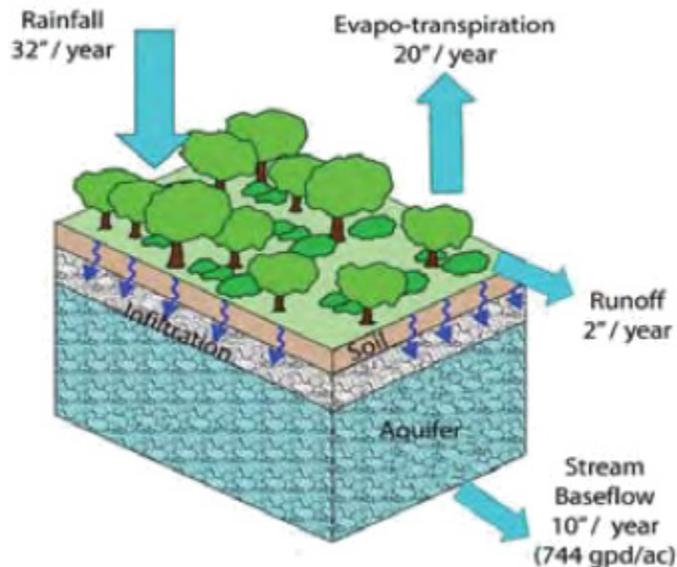
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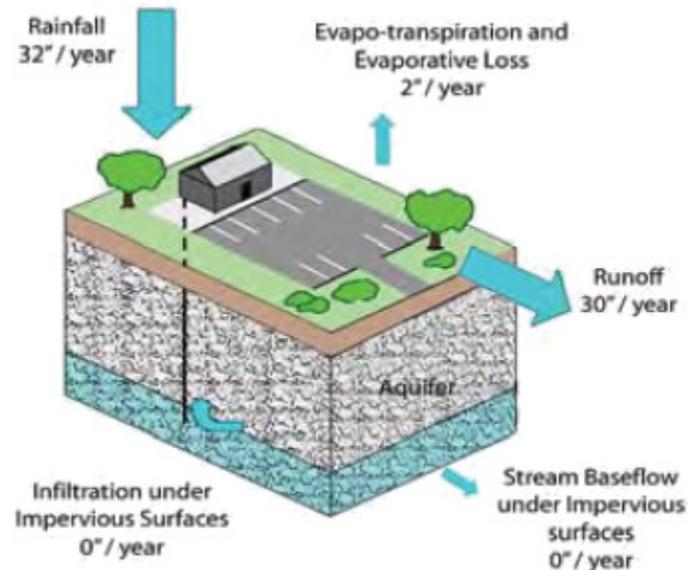
### Green Infrastructure: Transforming a Nuisance into a Community Asset

Whenever we develop land, we disrupt the previously existing environment that includes plants, animals, and other living things, as well as physical features like local air temperature and the water cycle. With respect to water, we typically make our habitats using hard materials that create surfaces designed to keep stormwater away from our immediate surroundings - slanted roofs to keep homes dry; roads and parking lots sloped to sewer drains. By doing this, we alter the movement of stormwater by reducing the pathways for it to soak into the ground or to be taken up by plants. As shown by changing arrow sizes in the figure the result is dramatic increases in stormwater runoff. Stormwater can degrade water resources by eroding river channels, causing habitat loss, and increasing water pollution and flood events. To mitigate these negative impacts, more communities are investing in green infrastructure.

**Approximate annual water cycle for an undeveloped acre in Michigan**



**Representative altered water cycle under the impervious parking lot**



## What is green infrastructure?

The [Low Impact Development \(LID\) Manual for Michigan](#), defines green infrastructure as "a network of open space, woodlands, wildlife, habitat, parks, and other natural areas which sustain clean air, water, and natural resources, and enhance quality of life". In addition, many define it to include engineered systems that are designed to mimic natural systems by reducing and treating stormwater runoff.

Here are some examples:

- [Downspout Disconnection](#)
- [Grassed Swales](#)
- [Green Parking](#)
- [Green Roof](#)
- [Infiltration Trench](#)
- [Land Conservation](#)
- [Permeable Interlocking Concrete Pavement](#)
- [Pervious Concrete Pavement](#)
- [Preserving Native Vegetation](#)
- [Riparian Buffer Restoration](#)
- Rain Barrel/Cistern
- [Rain Gardens \(Bioretention\)](#)
- [Urban Tree Canopy](#)
- [Vegetated Filter Strip](#)
- [Wet Ponds](#)

Together with these engineered systems, the natural types of "green" infrastructure are now receiving greater emphasis at all scales (site, community, and landscape) of land use management and planning. As with other infrastructure, in addition to setting goals for future projects, it is important to start with an inventory of existing natural features and other green infrastructure along with a strategy for maintaining it. To help understand how green infrastructure planning might work for a community, a recent publication provides a straightforward conceptual tool they call the [Green Infrastructure Portfolio Standard](#) and includes the City of Grand Rapids as a case study.

## How does the Water Resources Division (WRD) support green infrastructure?

The WRD promotes green infrastructure as a way of mitigating the impacts of impervious cover in a number of ways.

**Partnerships** -The WRD recently formed a green infrastructure team with several partners: U.S. Environmental Protection Agency, Michigan Department of Natural Resources, Michigan Department of Transportation, Michigan Economic Development Corporation, Southeast Michigan Council of Governments (SEMCOG), and the City of Detroit's Water and Sewerage Department (DWSD). Our team is currently focused on the Southeast Michigan region with a primary goal of serving as leaders by leveraging agency efforts in pursuing opportunities to plan for and invest in green infrastructure.

**Compliance and Enforcement** - We also pursue opportunities for green infrastructure within our existing compliance and enforcement framework, specifically within permits. We recently reissued the wastewater discharge permit to the DWSD, who continuously strives to address combined sewer overflow (CSO) issues. Their current permit's CSO control program requires implementation of green infrastructure practices with a target of removing 2.8 million gallons of stormwater from the system by 2017. We also administer the municipal separate storm sewer system (MS4) permit program, which requires controlling stormwater discharges from certain sites of development and redevelopment after construction is completed (known as the post-construction minimum measure). We work with communities to encourage the use of green infrastructure and low impact development for this permit requirement.

**Financial assistance** - The WRD's Nonpoint Source Unit uses 319, 205j, and Clean Michigan Initiative (CMI) grant money to plan for, and implement, green infrastructure. Here are some examples of projects:

| Grantee                       | Project Description   | Source |
|-------------------------------|---|--------|
| Implementation                |   |        |
| Lansing                       | <u>Stormwater diversion from the road to 30 rain gardens along Michigan Ave downtown</u>                            | CMI    |
| Sturgis                       | <u>Porous pavement, rain gardens and a green roof to improve water quality and stabilize flows in the Nye Drain</u> | 319    |
| Washtenaw County              | <u>19 Rain gardens in Allen's Creek watershed, Ann Arbor</u>  | 319    |
| Planning                      |   |        |
| Huron River Watershed Council | Long-term strategy to promote and implement green infrastructure on county properties, facilities and right-of-ways | 205j   |
| Wayne County                  |   |        |
| SEMCOG                        |   |        |

**Technical assistance** - A final and equally important way the WRD supports green infrastructure is through technical assistance. This takes place primarily through our Nonpoint Source Unit. We make a number of resources available via our [Nonpoint website \(www.mi.gov/nps\)](http://www.mi.gov/nps) and invest significant staff resources. For instance, WRD staff assisted in the development of the LID Manual mentioned above and routinely assist potential and current grantees at various stages of project development and implementation. The WRD helps communities understand green infrastructure opportunities within their MS4 programs. Staff also actively participates in workgroups, like the one currently developing the Stormwater, Asset Management, and Wastewater Program, which includes new sources of green infrastructure funding.

The broadening appeal of green infrastructure is linked to an increasing understanding and awareness of the wide range of ecological, economic and social benefits (see a summary of some of the benefits in the publication The Value of Green Infrastructure, 16 MB PDF). For those of us in the water world, the good news is that whatever the original motivation for the practitioner (reduced water cost by harvesting stormwater; greater access to recreation opportunities; moderating the urban heat island effect), there is almost always a benefit to water resources as well. The WRD is excited to take part in the broad development of green infrastructure that is shifting the stormwater paradigm from nuisance to resource.

## Green Infrastructure Benefits and Practices

This section, while not providing a comprehensive list of green infrastructure practices, describes the five GI practices that are the focus of this guide and examines the breadth of benefits this type of infrastructure can offer. The following matrix is an illustrative summary of how these practices can produce different combinations of benefits. Please note that these benefits accrue at varying scales according to local factors such as climate and population.

| Benefit                  | Reduces Stormwater Runoff     |                        |                                   |                  |                                  | Improves Community Livability  |                  |                    |                      |                                     |                           |                     |                                    |                         |                             |                   |                  |   |   |
|--------------------------|-------------------------------|------------------------|-----------------------------------|------------------|----------------------------------|--------------------------------|------------------|--------------------|----------------------|-------------------------------------|---------------------------|---------------------|------------------------------------|-------------------------|-----------------------------|-------------------|------------------|---|---|
|                          | Reduces Water Treatment Needs | Improves Water Quality | Reduces Grey Infrastructure Needs | Reduces Flooding | Increases Available Water Supply | Increases Groundwater Recharge | Reduces Salt Use | Reduces Energy Use | Improves Air Quality | Reduces Atmospheric CO <sub>2</sub> | Reduces Urban Heat Island | Improves Aesthetics | Increases Recreational Opportunity | Reduces Noise Pollution | Improves Community Cohesion | Urban Agriculture | Improves Habitat | Cultivates Public Education Opportunities |   |
| Practice                 |                               |                        |                                   |                  |                                  |                                |                  |                    |                      |                                     |                           |                     |                                    |                         |                             |                   |                  |   |   |
| Green Roofs              | ●                             | ●                      | ●                                 | ●                | ○                                | ○                              | ○                | ●                  | ●                    | ●                                   | ●                         | ●                   | ●                                  | ●                       | ○                           | ○                 | ○                | ●   | ● |
| Tree Planting            | ●                             | ●                      | ●                                 | ●                | ○                                | ○                              | ○                | ●                  | ●                    | ●                                   | ●                         | ●                   | ●                                  | ●                       | ○                           | ○                 | ○                | ●   | ● |
| Retention & Infiltration | ●                             | ●                      | ●                                 | ●                | ○                                | ○                              | ○                | ●                  | ●                    | ●                                   | ●                         | ●                   | ●                                  | ●                       | ○                           | ○                 | ○                | ●   | ● |
| Permeable Pavement       | ●                             | ●                      | ●                                 | ●                | ○                                | ○                              | ○                | ●                  | ●                    | ●                                   | ●                         | ○                   | ○                                  | ○                       | ○                           | ○                 | ○                | ●   | ● |
| Water Harvesting         | ●                             | ●                      | ●                                 | ●                | ○                                | ○                              | ○                | ○                  | ○                    | ○                                   | ○                         | ○                   | ○                                  | ○                       | ○                           | ○                 | ○                | ○   | ○ |

● Yes      ○ Maybe      ○ No

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## What do you do in the WRD?

### Meet Andrew Bahrou

Andrew Bahrou works out of the WRD's Southeast Michigan District Office, located in Warren. "The hard work and successes of our colleagues and predecessors - as evidenced by vast historical improvements in our lakes and streams - is inspiring to many of us. In taking on significant challenges that remain, one exciting aspect of this work for me in Southeast Michigan is the opportunity to collaborate with many great people (in communities, watershed groups, private entities, organizations, and individuals) who have built and continue to sustain a tradition of water resources protection. My current work activities focus on municipal stormwater and nonpoint source pollution control efforts, which both benefit from green infrastructure. At home and in my combined sewer community, I am exploring opportunities for green infrastructure so that I too may connect more directly with ecological water cycling through supportive habitat elements."



Andrew Bahrou