Green Infrastructure in Southeast Michigan

Southeast Michigan Council of Governments (SEMCOG)

In Southeast Michigan, green infrastructure includes two broad categories: the natural and the built. The natural encompasses the undisturbed environment such as wetlands, trees, prairies, lakes, rivers, and streams. The second category includes built green infrastructure such as rain gardens, bioswales, community gardens, parks, and agricultural lands.

It is critical to evaluate both the natural and built elements of green infrastructure as an integrated system. Each green infrastructure element alone provides specific function and value, but as a system, the green infrastructure network provides benefits to our entire region. In addition to significant water quality benefits, green infrastructure provides tangible community, economic, and air quality benefits to Southeast Michigan. These benefits include:

- **Economic:** Using green infrastructure can reduce "grey" infrastructure costs and increase residential property values located near trails, parks, and waterways.
- **Green jobs:** Can promote economic growth and create green infrastructure construction and maintenance jobs.
- **Traffic calming:** Slows traffic visually and provides a buffer between the roadway and pedestrians.
- **Recreation:** Provides opportunities for hiking, hunting, fishing, and bird watching.
- **Habitat linkages:** Provides connections between habitat corridors to strengthen and support rare and important natural areas.
- **Health:** Encourages outdoor physical activity, which can have a positive impact in fighting obesity and chronic illnesses.
- **Energy and climate**: Shade trees reduce energy consumption and save money.
- **Air quality:** Removes air pollutants.
- **Water quality and flooding:** Reduces polluted stormwater runoff entering our rivers and lakes by absorbing the water into the ground.
- **Water supply:** Water absorbed into the soil renews groundwater supplies and increases flow into rivers.

The Green Infrastructure Network Identified
Of the 2.9 million acres of land in Southeast Michigan (i.e., Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne counties), 51 percent are categorized as open space. This includes more than 200,000 acres of parks, and over 1 million acres of agricultural land (SEMCOG, 2014). In addition, the region has 33 percent tree canopy and 14 percent impervious surfaces. The region's impervious surfaces are equally divided between roads, buildings, and parking lots/ driveways. The Center for Watershed Protection has established a target of less than 10 percent impervious surface to protect aquatic life (Center for Watershed Protection, 1998).

Percentage of Land Cover in Southeast Michigan

Figure 1 presents the percentage of land cover by five different categories within the seven-county region. These land cover data help identify potential targets of opportunity for
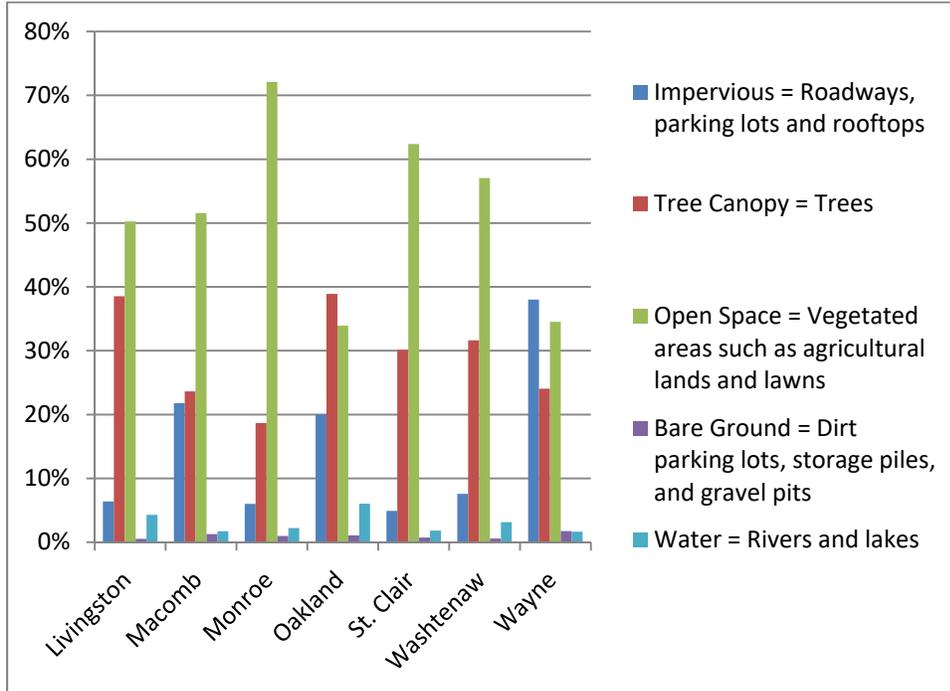
Figure 1. The percentage of land cover by five different categories within the seven-county SEMCOG region (source: SEMCOG).

strategically enhancing the region's green infrastructure. The following two examples -- tree canopy and parks -- provide a snapshot of the data benchmarked and the analysis undertaken that will improve Southeast Michigan's green infrastructure network.

Tree Canopy
Trees are integral to healthy communities and can provide a vast array of advantages, including wildlife habitat, aesthetics in downtown and pedestrian areas, water and air quality benefits, and even increase local property and commercial values.

Thirty-three percent of Southeast Michigan is covered in tree canopy, with individual counties ranging from a low of 20 percent to a high of 44 percent (Figure 2). SEMCOG's 2014 *Green Infrastructure Vision for Southeast Michigan* adopted a 40 percent tree canopy goal for the region. This canopy target will assist in identifying potential targets of opportunity for increasing green infrastructure and help create policy recommendations. Specific tree canopy policies include:

- Increases in tree canopy will be focused in urban areas with tree canopy currently below 20 percent.

- Specific land uses will be targeted for tree canopy increases, such as around industrial property, within riparian areas and central business districts, and along roadways and parking lots.

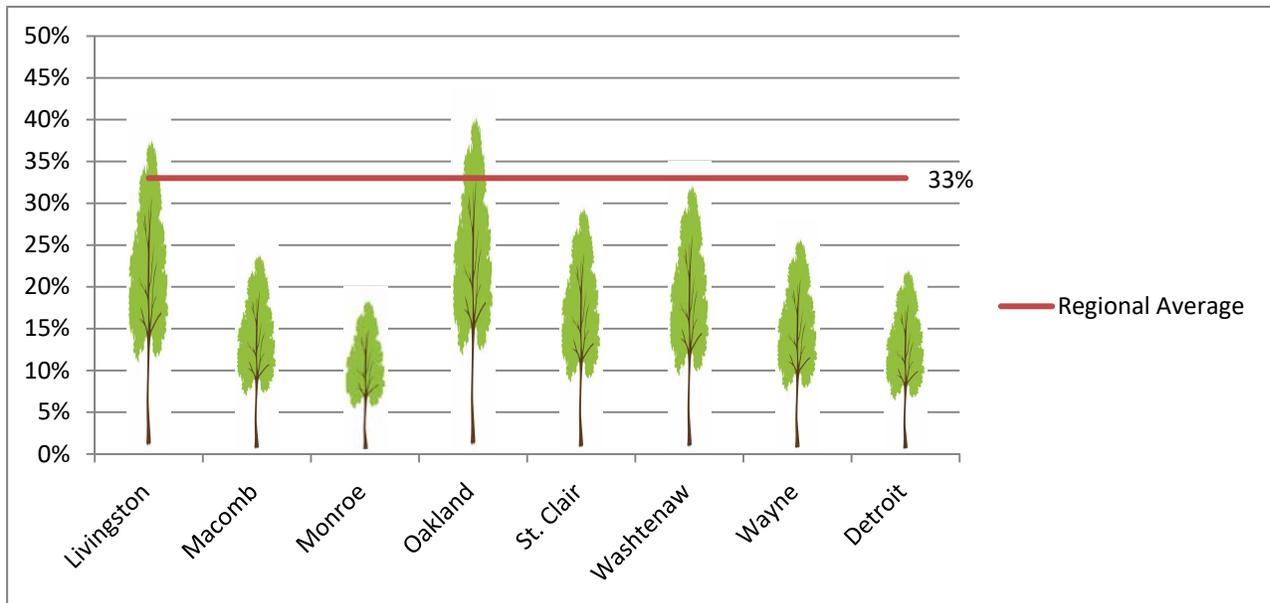**Regional Tree Canopy Figures:**

Figure 2. The percentage of tree cover within each of the seven counties within the SEMCOG region (source: SEMCOG).

Parks
Green infrastructure in parks can be affective in addressing urban stormwater problems. During public visioning sessions, parks were listed as the top green infrastructure element that stakeholders believe provide the highest economic value to their area. Southeast Michigan has an estimated 224,000 acres of public parkland with an estimated 40 park acres per 1,000 residents (Figure 3). For comparison, urban counties in the State of Indiana range from 4-21 park acres per 1,000 residents; the National Parks and Recreation Association (NPRA) has a median of 9.6 park acres per 1,000 residents. While Southeast Michigan exceeds the national average, there are opportunities to strategically invest in improving green infrastructure in existing parks and even creating new parks.
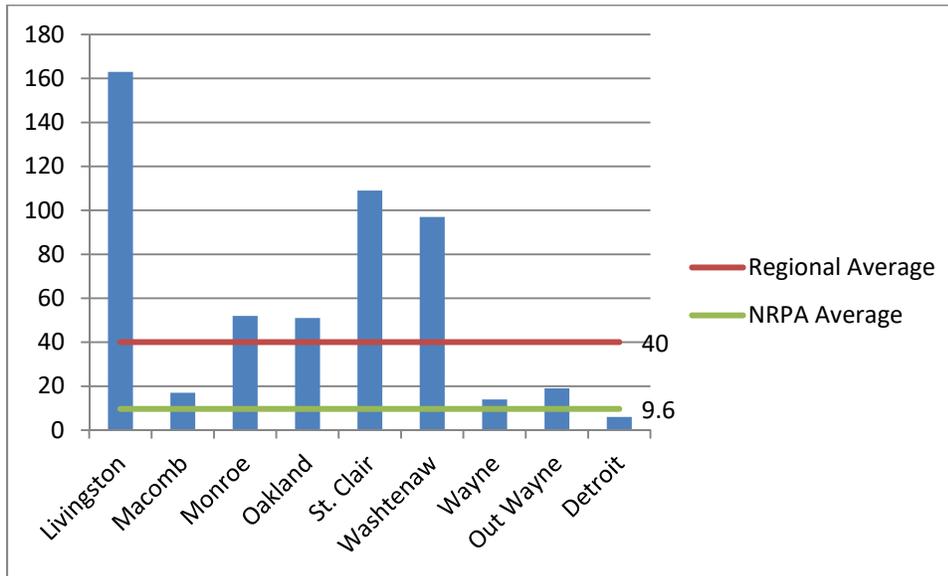
Park Acres per 1,000 Residents

Figure 3. Acreage of parkland per 1,000 residents in each of the seven counties within the SEMCOG region (source: SEMCOG).

Identifying Green Infrastructure Linkages
Once the region's green infrastructure was identified in SEMCOG's 2014 Green Infrastructure Vision for Southeast Michigan, areas of opportunity to link and enhance green infrastructure implementation recommendations were identified through further analysis.

Water
Improving water quality in local waterways is a major focus for implementing green infrastructure in the region. SEMCOG conducted a public opinion survey of green infrastructure; results indicated that improving water quality was the top priority for implementing green infrastructure. This benefit is realized by planting vegetation that absorbs and filters stormwater runoff from urban areas. As water quality is improved, the economic value of adjacent areas is also enhanced.

Flooding
Green infrastructure can help mitigate the risk of flooding. This is particularly important as Southeast Michigan faces increasingly intense rain storms.

Roadways
Roadways provide vital connections within our communities, transport goods, and provide an economic benefit to region. However, roadways are also significant contributors to stormwater runoff, which can negatively impact water quality. In Southeast Michigan, there are over 23,400 miles of roadways generating approximately 700 million gallons of stormwater runoff. This stormwater carries more than 40 tons of phosphorus and 10,000 tons of sediment into local waterways, causing pollution. Traditionally, the focus of managing stormwater runoff from roads has been to remove it through the storm sewer pipes and send it directly to waterways. An

alternative approach is to use trees and bioswales to infiltrate this runoff, thereby improving local water quality. Changing this traditional design standard to one that uses green infrastructure is critical for improved water quality.

Riparian Corridors
There are 53,000 acres of riparian corridors -- the land adjacent to a river or lake -- in Southeast Michigan. Riparian corridors protect and enhance water quality, providing habitat corridors to wildlife, offering access to local waterways and walking and biking trails.

Trees, in particular along a riparian corridor, provide essential water quality benefits including preventing fertilizer and grass clippings from entering the water and shading (cooling) the river/lake, which improves fish habitat. They also prevent streambank erosion through their extensive root structure. There are opportunities along riparian corridors to increase tree canopy or provide public access to the waterway, especially if adjacent publicly owned parcels are vacant

Vacant Land
Southeast Michigan is poised to turn lemons into lemonade as we address vacant abandoned parcels. Vacant property may provide a unique opportunity for connections and enhancements in the local green infrastructure network. As local governments evaluate the types of vacant parcels they have, green infrastructure strategies can be considered as either short-term or long-term improvements. Green infrastructure on vacant property can be used to increase recreational access to rivers and lakes, buffer ecologically sensitive areas such as wetlands, connect parks and trails together, and temporarily serve as community gardens or for native plantings to benefit the environment or the community. For example, in the City of Detroit, the Detroit Water and Sewerage Department is transforming vacant lots into green infrastructure to reduce stormwater from entering the sewer system.

Visioning Out: Implementing Green Infrastructure
The voices of key stakeholder groups and the general public have helped shape the direction for green infrastructure in Southeast Michigan. SEMCOG, with the help of each of the seven Southeast Michigan counties, conducted eight in-person visioning sessions and an online public poll to identify important green infrastructure elements and desired outcomes for a regional vision. The online poll garnered 854 responses, while the in-person visioning sessions saw over 250 people actively participate in mapping their green infrastructure priorities. The results of this intensive outreach revealed that the public highly values protecting and enhancing the following top three elements:
- Natural areas,
- Biking/hiking trails, and
- Trees along roads and in downtown areas.

In terms of specific targets of opportunity to increase green infrastructure (trees, bioswales, and other vegetation), the public indicated the following priority locations:
- Along rivers and lakes,
- On major roadways,
- Near parks, and

- On vacant property.

The region's green infrastructure network consists of many pieces, and many people have different roles in moving the regional vision forward. As a result, integrating green infrastructure planning into a local community structure requires collaboration across multiple municipal departments and agencies. Successful implementation incorporates elements from local government planning, engineering and public works, recreation, public outreach, and finance departments, in addition to numerous outside agencies. The following list of roles provides a sense of how these different pieces can begin to come together:

Local Government Roles
Governing Bodies/Councils
- Adopt policies that promote green infrastructure in the community and showcase its use and benefits to the public.
- Establish a community-wide policy that all publicly-funded construction projects will consider green infrastructure at the concept stage.
- Establish funding incentives to implement rain gardens and bioswales strategically throughout the municipality/county

Planning and Engineering
- Update zoning ordinances and land-use plans to encourage use of green infrastructure. At a minimum, include the use of green infrastructure in stormwater ordinances.

Community and Economic Development
- Evaluate vacant parcels for greening potential and/or opportunity to link or enhance parks.
- Partner with the business community to increase and/or maintain green infrastructure.
- Evaluate local natural assets to determine if ecotourism can be used or enhanced as an economic tool.
- Participate in state grant programs to increase tree canopy in residential neighborhoods.

Road Agencies/Department of Public Services
- Review road, water, and sewer infrastructure projects to identify potential opportunities to incorporate green infrastructure.
- Participate in infrastructure collaboration opportunities between road, water, sewer, and stormwater activities at a local, regional, and state level for efficient use of limited resources.
- Evaluate public service yards for green infrastructure opportunities, such as installing bioswales near aggregate storage piles.

Recreation
- Review the local park system to enhance or link park and recreation opportunities.
- Identify tree canopy coverage across the community and determine targets of opportunity for potential enhancements.

- Evaluate all community-owned properties, such as city hall, schools, and libraries for green infrastructure opportunities such as native plant grow zones and rain gardens/bioswales.
- Identify ways to enhance public access to parks and waterways.
- As local recreation plans are updated, identify specific goals for green infrastructure.
- Participate in regional parks and recreation planning.
- Provide a regional assessment of recreational needs in concert with park assessments.

Downtown Development Authority
- Plan and work with road agencies for integrated techniques, such as street trees, tree infiltration trenches, and bioswales that manage stormwater runoff.
- Educate businesses on the wide range of benefits of green infrastructure.

Historic District Commissions
- Consider using native plants that are historic to the region as a landscaping opportunity on historic sites.

State Government Roles
- Consider regional green infrastructure priorities when allocating grant resources.
- Prioritize green infrastructure implementation when making investments in state property.
- Emphasize the use of green infrastructure in state-regulated stormwater programs.
- Convene broader statewide and regional forums on green infrastructure.
- Encourage pervious surfaces and technologies.
- Encourage "blue/green" roofs to reduce urban heat island effects.

Academia Roles
- Increase research on performance levels, range of multiple benefits, and cost analyses of green infrastructure techniques.

Environmental Groups
- Organize volunteers to implement green infrastructure.
- Identify funding opportunities for implementing green infrastructure.

Business Community Roles
- Incorporate green infrastructure on commercial/industrial property, such as planting trees, bioswales, and rain gardens.
- Support community-based green infrastructure initiatives.

Public Roles
- Plant a tree, install rain gardens, or use rain barrels to reduce stormwater to local streams.
- Volunteer in local watershed activities, such as park cleanups, tree plantings, or water quality monitoring activities.

Green Infrastructure Progress

Green infrastructure is still in its infancy in southeast Michigan. However, measurable progress is being made. Table 1 presents selected examples of progress in implementing green infrastructure in southeast Michigan. Long-term commitments, sustained financial incentives and technical assistance, and continuous and vigorous oversight will be required to meet Southeast Michigan's long-term green infrastructure goals and targets.

Table 1. Examples of trends in green infrastructure indicators in southeast Michigan.

Organization	Green Infrastructure Indicator Trends	Reference
Michigan Natural Resources Trust Fund (MNRTF)	Between 1976 and 2012, MNRTF has invested $240 million in 415 projects dedicated to natural resource protection and public outdoor recreation development in Southeast Michigan	SEMCOG (2014)
Alliance of Rouge Communities (ARC)	Since 1985, ARC and its partners have installed over 24.3 ha of native plant grow zones throughout the watershed, planted over 15,000 native herbaceous plants and 3,500 trees/ shrubs, distributed over 8,600 tree seedlings, and removed over 7,646 m3 of invasive plants	Ridgway et al., (2018)
Greening of Detroit	Since 1989, the Greening of Detroit has planted more than 100,000 trees in Detroit as part of green infrastructure in support of a healthy urban community	www.greeningofdetroit.com
Detroit Water and Sewerage Department (DWSD)	DWSD's National Pollutant Discharge Elimination System permit required an investment of $15 million in green stormwater infrastructure between 2013-2017 to reduce 2.8 million gallons of stormwater flow. Detroit Water and Sewerage Department will invest $50 million by 2029. This permit identifies a number of specific green stormwater infrastructure project types, including downspout disconnections, demolition and removal of vacant structures, bioswales along roadways and parking lots, tree planting and other projects.	detroitmi.gov/how-do-i/find-information/green-infrastructure
Detroit Sustainability Action Agenda	In 2018, the City of Detroit spent $3 million on green stormwater infrastructure and requires private properties to control stomwater on	https://detroitmi.gov/government/mayors-office/office-sustainability/sustainability-action-agenda

| | site.

Further, as of 2018, Detroit managed approximately 900 acres through green stormwater infrastructure, direct discharge, and impervious removal (excluding demolitions). The City aims to double the acres managed through green stormwater and related techniques citywide in 10 years, resulting in at least 1,800 acres managed by 2029. | |
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| Huron River Watershed Council (HRWC) | Throughout the watershed, the HRWC works with communities to protect and enhance green infrastructure. For example, on Norton Creek the Council is now enhancing green infrastructure by building rain gardens and bioswales, enhancing shoreline plantings, and installing rain barrels. The Council has also created partnerships with local and regional parks systems, land conservancies, and local governments to protect over 10,000 acres in the watershed. | hrwc.org/what-we-do/programs/green-infrastructure/ |
| Clinton River Watershed Council (CRWC) | In 2014, CRWC partnered with the Great Lakes Stormwater Management Institute of Lawrence Tech University to enhance its existing WaterTowns community program by providing conceptual green infrastructure plans for public spaces in participating communities. The conceptual plans include specific green infrastructure improvements (such as rain gardens, porous pavement, bioswales, etc.) along with community placemaking suggestions (such as gathering spaces, trails, etc.). The green infrastructure plans were accompanied with estimates of volume of water retained on site. Between 2014 and 2018, 15 communities have made green infrastructure improvements. | www.crwc.org/watertowns/ |
| Green Macomb Urban Forest | The Green Macomb initiative supports implementing green infrastructure in | https://green.macombgov.org/Green-UrbanForestPartnership |

Partnership	the county. Its first project, the Green Macomb Urban Forest Partnership, builds local capacity to manage and grow healthy urban forests in the county's most urbanized areas. In the more developed communities south of the Clinton River, tree loss has been intensified by urban development, Dutch Elm Disease, and the Emerald Ash Borer. By prioritizing improvements in this area, the county is focusing on a watershed-based planning approach. To this extent, the Urban Forest Partnership is working to expand public awareness of the benefits that urban forests provide, develop technical tools and resources for sustainable local forestry programs, and advance creative partnerships to increase tree canopy.	

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