

---

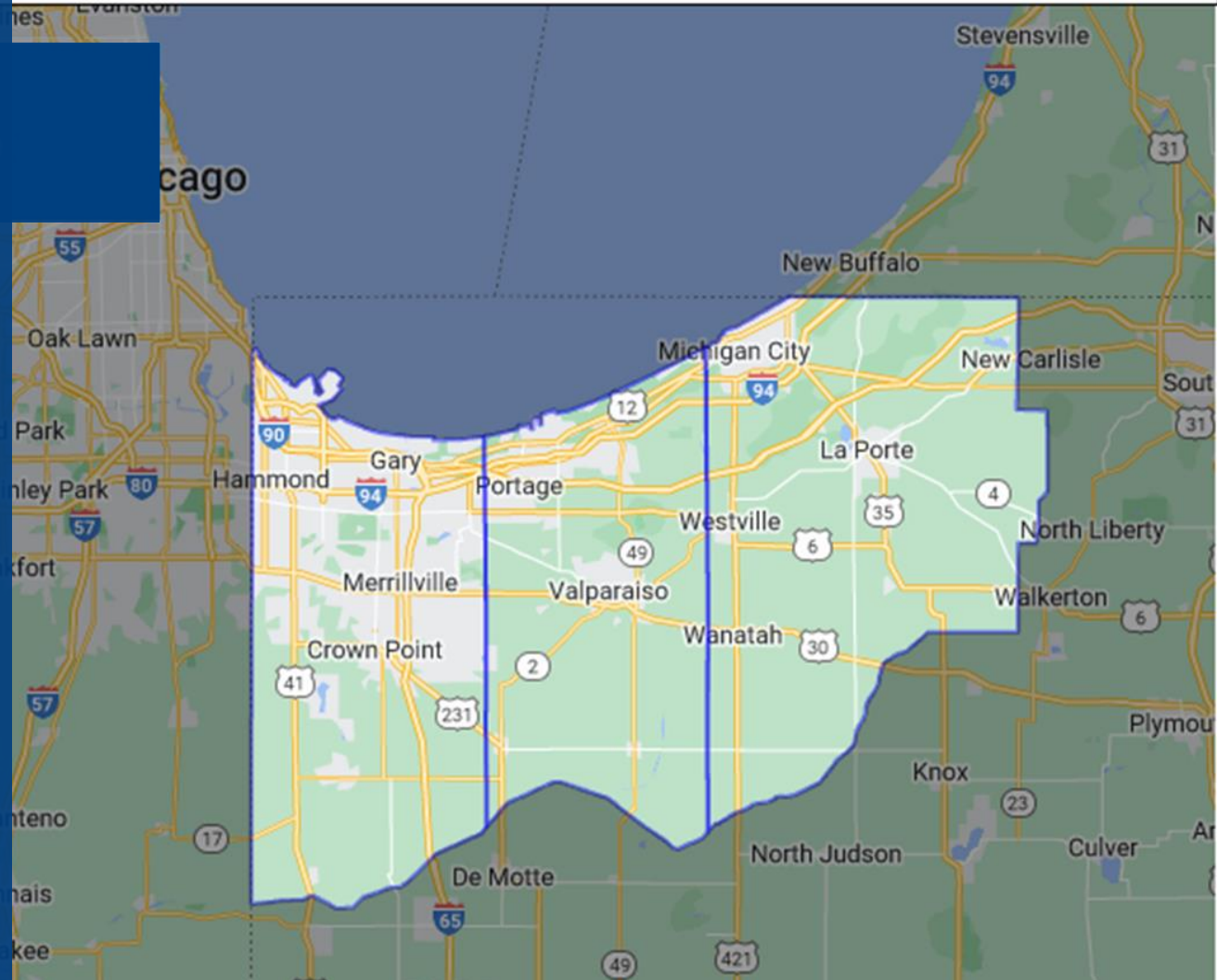
# GREEN INFRASTRUCTURE GUIDELINES FOR TRANSPORTATION PROJECTS

Presented By:  
Rebecca Helfrich

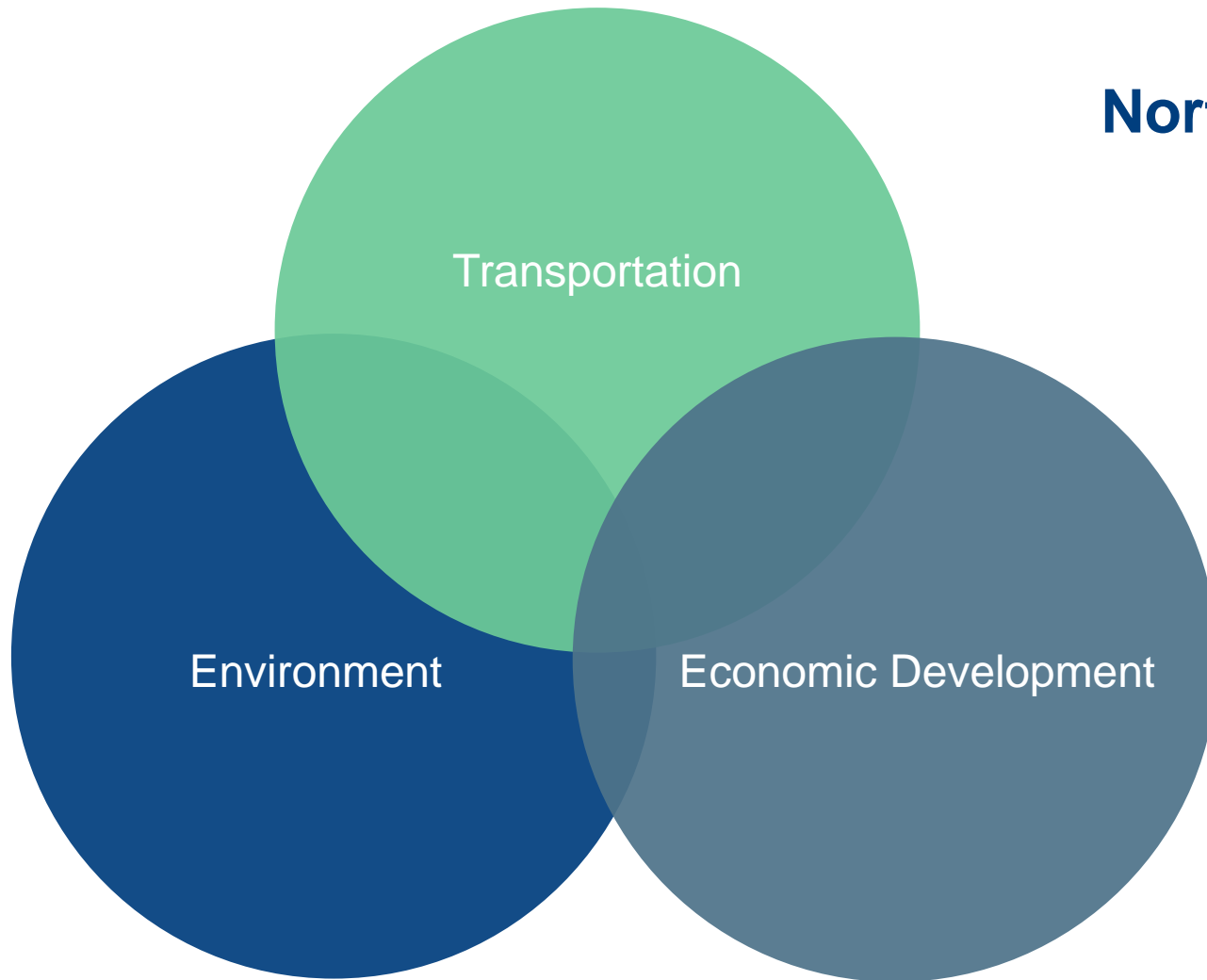
# Project Background

**Northwestern Indiana Regional Planning Commission (NIRPC)** is the regional council of local governments serving the citizens of

- Lake County
- Porter County
- La Porte County



# Project Background



## Northwestern Indiana Regional Planning Commission

- Maintains regional planning
- Coordinates efforts in areas of economic development, environment and transportation
- Responsible for planning and programming transportation projects that utilize federal grants





# Complete Streets Policy

## Complete Streets Policy

- Adopted best practices for incorporating features supporting the use of public streets other than motorized vehicles
- Equitable access for all users including pedestrians, bicyclists, motorists and transit rides
- Adopted nationwide at state, regional and municipal levels





# Green Streets + Complete Streets



## Green Streets

- Represent a stormwater management approach
- Utilizing vegetation, soil, and engineered systems
- Slow, filter, and cleanse stormwater runoff from impervious surfaces



## Complete Streets

- Roadways that accommodate safe, efficient, and equitable access for all users
- Promote multimodal transportation options



# Living Streets



6100 Southport Road  
Portage, Indiana 46368  
(219) 763-6060  
www.nirpc.org

## RESOLUTION 20-17

### A RESOLUTION IMPLEMENTING LIVING STREETS GUIDELINES FOR NIRPC-PROGRAMMED TRANSPORTATION PROJECTS

July 16, 2020

**WHEREAS**, the Northwestern Indiana Regional Planning Commission (NIRPC) promotes an equitable and effective multimodal, regional land use/transportation system that is safe, as well as energy, environmentally and fiscally efficient, maximizes regional connectivity, serves the mobility needs of all citizens, utilizes stormwater runoff mitigation best practices, improves the health of the general public, and is environmentally sensitive; and

**WHEREAS**, NIRPC promotes sustainable transportation that encourages walking, rolling, bicycling and transit use while promoting safe operations for all users, while improving the natural and built environment via the integration of more energy efficient and ecologically friendly management practices, as increased walking, rolling and cycling offers the potential for better air quality, reduces motor traffic, curbs fossil fuel reliance, fosters a more efficient right-of-way, promotes greater health of the local population and manages stormwater runoff while allowing for the implementation of permeable surfaces, referred to commonly as "Green Streets" concepts; and

**WHEREAS**, "Complete Streets" are roadways that accommodate safe, efficient and equitable access for all users by law including pedestrians, bicyclists, motorists and transit riders of all ages and abilities; and

**WHEREAS**, Complete Streets are achieved when transportation agencies routinely plan, design, construct, re-construct, operate, and maintain the transportation network to improve travel conditions for all users of the roadway, and adopt methods that increase the longevity, accessibility, and efficiency of the roadway in a manner consistent with, and supportive of, the surrounding community; and

**WHEREAS**, increasing active and sustainable transportation (e.g., walking, rolling, bicycling, using public transportation and low-emission vehicles) offers the potential for improved public health, economic development, a cleaner environment, reduced transportation costs, enhanced community connections, social equity, and more livable communities; and

1

**WHEREAS**, Complete Streets principles have been, and continue to be, adopted nationwide at state, regional, and municipal levels in the interest of adherence to federal regulations that promote multimodal transportation options and accessibility for all users, including NIRPC's 2010 *Complete Streets Policy & Guidelines*; and

**WHEREAS**, "Green Streets" represent a stormwater management approach that incorporates vegetation (perennials, shrubs, trees), soil, and engineered systems to slow, filter, and cleanse stormwater runoff from impervious surfaces (e.g., streets, sidewalks); and

**WHEREAS**, NIRPC seeks to combine both Complete and Green Streets principles into a unified policy called "Living Streets;" and

**WHEREAS**, Living Streets provide for the development of pedestrian, rolling, bicycle, transit and electric vehicle charging infrastructure, green stormwater infrastructure, and ecological revitalization which offers long term cost savings, public health improvements, pollution reduction, water quality and habitat improvement, increases green space while reducing fossil fuel demands, and creates safe opportunities for convenient active transportation; and

**WHEREAS**, Living Streets improvements follow Universal Design principles that include, but are not limited to, marked bicycle lanes on the roadway, paved shoulders, signed bike routes, safe access to bus stops, shared use paths, sidewalks, bicycle parking facilities, marked or raised street crossings (including over- and under passes), pedestrian signals, signs and auditory cues, multi-purpose spaces, vegetated swales, green gutters, rain gardens, stormwater curb extensions, pervious paving, stormwater planters, increased green space, and urban street trees; and

**WHEREAS**, providing access for people with disabilities is a civil rights mandate that is not subject to limitation by "exceptional circumstances" where the "exceptional circumstances" requires pedestrian facilities that, when newly constructed or altered, be accessible; and

**WHEREAS**, NIRPC is responsible for planning and programming transportation projects that utilize federal grants which adhere to goals and objectives from previously adopted documents such as the NWI 2050 Plan, *Creating Livable Communities*, *Greenways+Blueways 2020 Plan*, the *Marquette Action Plan*, and other applicable documents; and

2

**WHEREAS**, it is NIRPC's vision to undertake bold planning initiatives that positively impact Northwestern Indiana's future to create a strong, accessible, safe, sustainable, climate-resilient, clean and high-quality environment in which to live, work and play.

**NOW, THEREFORE, BE IT RESOLVED** that NIRPC supports the concept of Living Streets and hereby establish the attached Guidelines to incorporate Living Streets facilities to the most practicable extent as proposed by the project sponsor in all transportation projects using NIRPC-attributable federal funds;

**BE IT FURTHER RESOLVED** that Living Streets Guidelines are hereby established wherein project sponsors need to provide in the written request for federal funding documentation providing for the inclusion of Living Streets facilities in the proposed project seeking NIRPC-attributable funds and application materials must include a description of the facilities;

**BE IT FURTHER RESOLVED** that sponsors using other local, state, or non-NIRPC attributable federal funds be encouraged to accommodate practicable Living Streets facilities, in the planning and design of all proposed transportation projects;

**BE IT FURTHER RESOLVED** that NIRPC-based stakeholder committees responsible for various funding priorities utilize these Living Street Guidelines and review proposed project descriptions to account for Living Streets adherence and providing exemptions to projects where deemed appropriate.

Duly adopted by the Northwestern Indiana Regional Planning Commission on this sixteenth day of July, 2020.

**"NIRPC seeks to combine both Complete and Green Streets principles into a unified policy called "Living Streets"'"**

Justin Klei  
Secretary

3





# Teaming Partners

## Small workgroup collaboration with NIRPC staff and partnered with Planned Environment Associates

- Coordinated on a regular basis
- Discuss vision, objectives, and project approach



GEOSYNTEC CONSULTANTS



# Project Process

## Initial Vision

- Guideline Manual
- Factsheets
- Typical Details
- Maintenance Recommendations
- Tree and Plant Lists

## Project Approach

- Regular coordination meetings
- Ensure understanding of objectives, selection process, and existing policies
- Leverage our expertise on past work
- Facilitate active collaboration

Technical Green Infrastructure Guidelines  
For Implementing NIRPC's Living Streets Policy 2022

### Native Vegetation



**Application**

- Vegetative Swale
- Vegetative Detention Basin
- Bioinfiltration
- Flow-Through Planters

**Advantages**

- Provides habitat and food for wildlife
- Promotes infiltration
- Prevents erosion
- Reduces regular maintenance

**Limitations**

- Requires specialized maintenance
- May appear messy or unkempt

**DESCRIPTION**

Native vegetation consists of plants that are naturally occurring in the area. The use of native vegetation in the Green Infrastructure Guidelines primarily relates to its benefits with stormwater. Native plants have deep root systems which help break up clay and compacted soils to promote infiltration and prevent erosion. Native plants additionally assist in storing runoff water, reducing flooding and filtering pollutants. Beyond stormwater benefits, native plants are highly adapted to the local climate and provide habitat and food for local wildlife.

**CONDITIONS WHERE PRACTICE APPLIES**

**Application**

Native Vegetation for the Green Infrastructure Guidelines applies to the following:

- Vegetative Swale
- Vegetative Detention Basin
- Bioinfiltration
- Flow-Through Planters

Green Infrastructure Fact Sheet

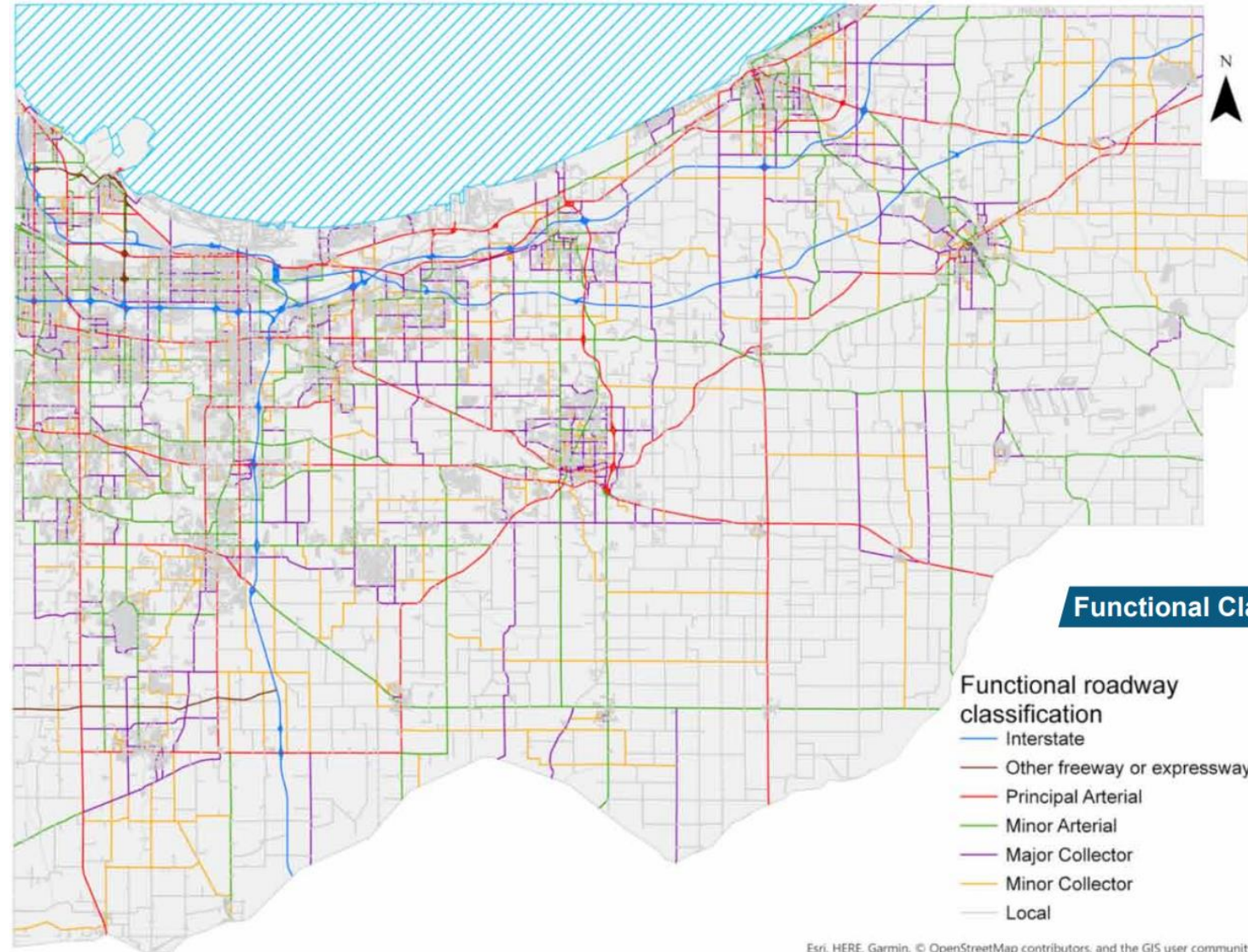
 Native Vegetation





# Classification of Roads

- Method to inventory function
  - Principal (Primary Arterial)
  - Minor (Secondary Arterial)
  - Collector
  - Local Streets
  - Intersections + Roundabouts
  - Parking and Alleys
- Classification based on:
  - Traffic Volume
  - Speed
  - Number of lanes
- Determines eligibility for federal highway dollars

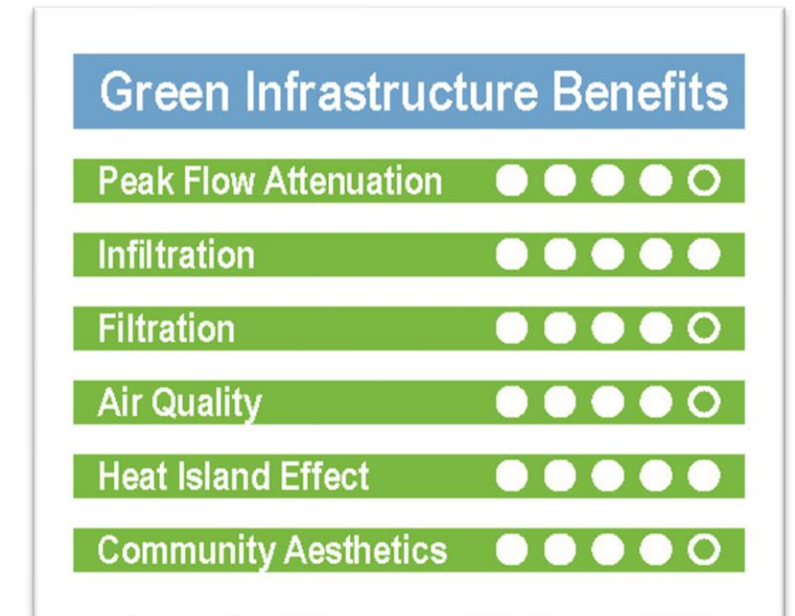


What type of road do you use most often?

# Green Infrastructure Benefits

**Mimics natural processes of slowing or storing stormwater utilizing vegetation, soil, and engineered systems and provides ecological services**

- **Peak Flow Attenuation**  
Slows stormwater leaving a site, providing relief to the local sewer system, reduces flooding
- **Infiltration**  
Reduces volume of stormwater runoff and contributes to groundwater recharge
- **Filtration**  
Reduce erosion and filter pollutants (nutrients and sediment)
- **Air Quality**  
Vegetation removes air pollutants that can reduce health impairments
- **Reduce Heat Island Effect**  
Uses vegetation to shade/cool communities, can sequester carbon to combat climate change
- **Community Aesthetics**  
Improve quality of life, improve public health, support diverse ecosystems





# Stakeholder Engagement

## Stakeholders

- NIRPC Staff
- Local Municipalities and MS4 Representatives
- Watershed Managers





# Project Evolution and Challenges

## Influential Factors

- Intended to provide early planning guidance
- Guideline vs. Regulatory Requirement
- Ultimate objective to incentivize use of green infrastructure through funding
- Grant funded project
  - Project schedule
  - Project budget



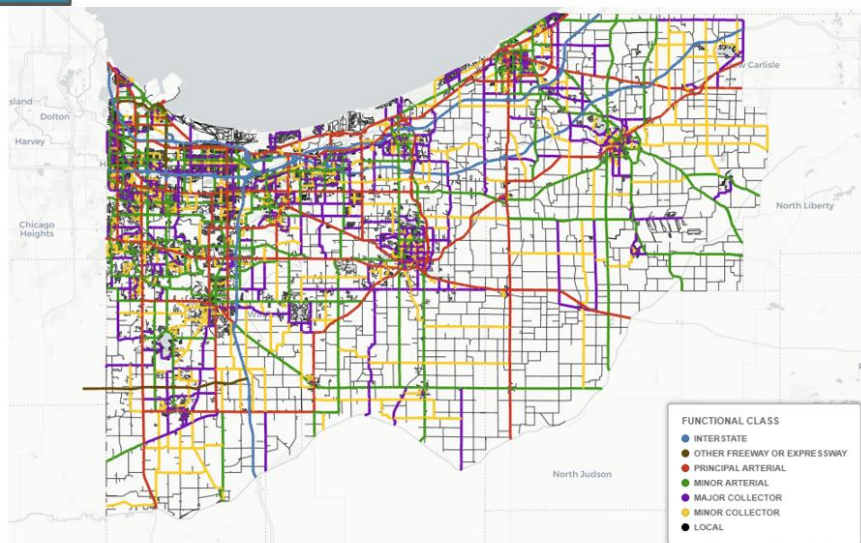


# Webtool Template

NIRPC

## Green Infrastructure Guidelines For Implementing NIRPC'S Living Streets Policy

GUIDE NAVIGATION ▾



### Roadway Classifications

- Principal (Primary Arterial)
- Minor (Secondary Arterial)
- Collector
- Local Streets
- Intersections + Roundabouts
- Parking Lanes

### Relevant Links:

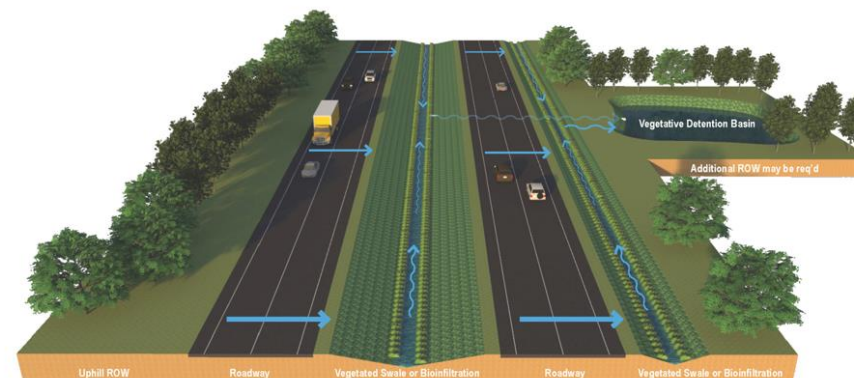
- Links other relevant local references.

NIRPC

## Green Infrastructure Guidelines For Implementing NIRPC'S Living Streets Policy

GUIDE NAVIGATION ▾

Roadway Classification : Principal Arterial



### Recommended Green Infrastructure (selectable)

- ☐ Vegetated Swale
- ☐ Vegetative Detention Basin
- ☐ Bioinfiltration

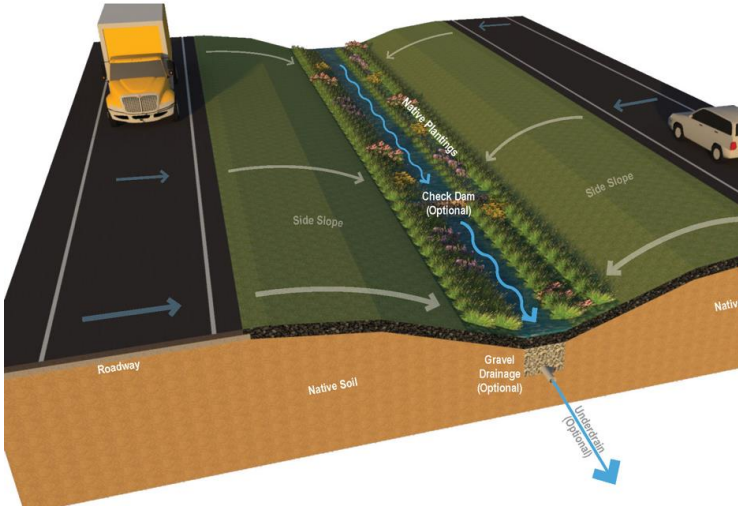
### Tree and Plant Lists

### Local References

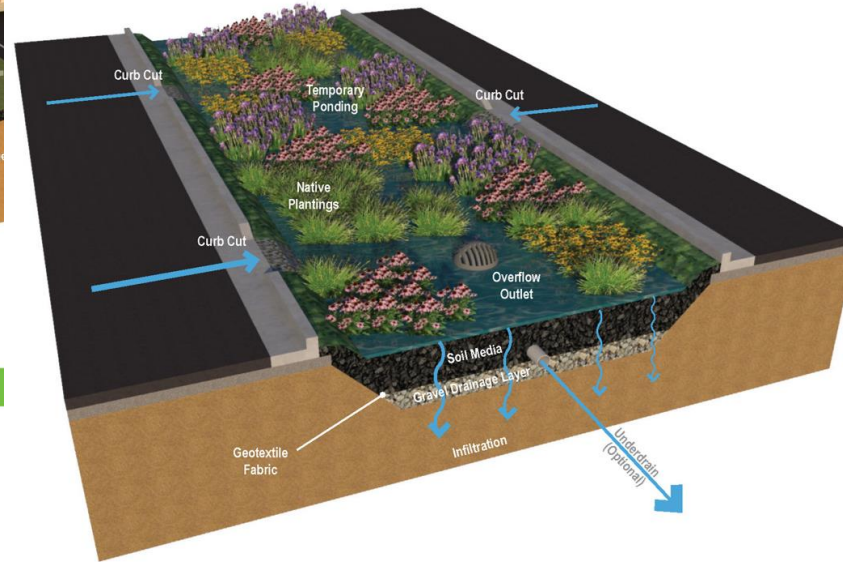


# Green Infrastructure Practices

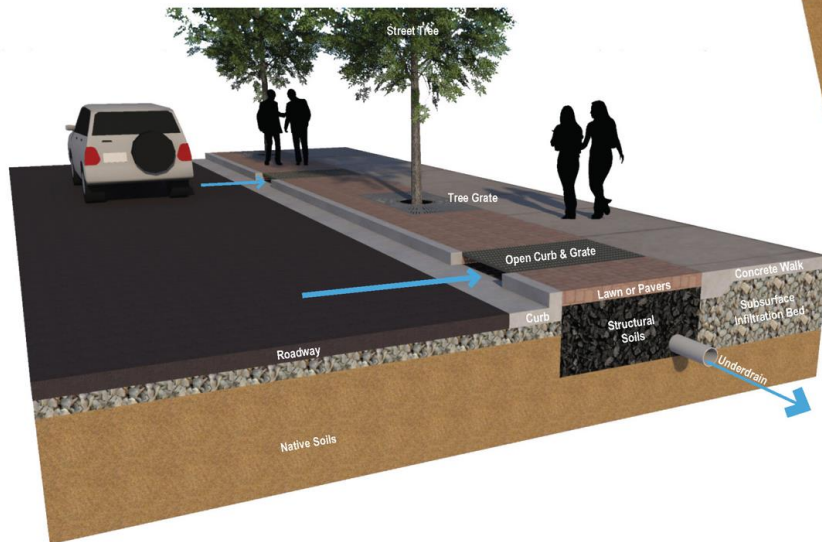
Vegetated Swale



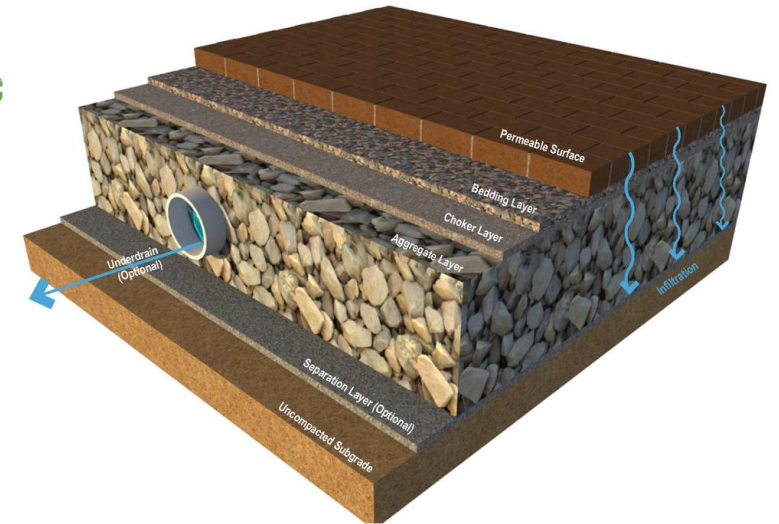
Bioinfiltration



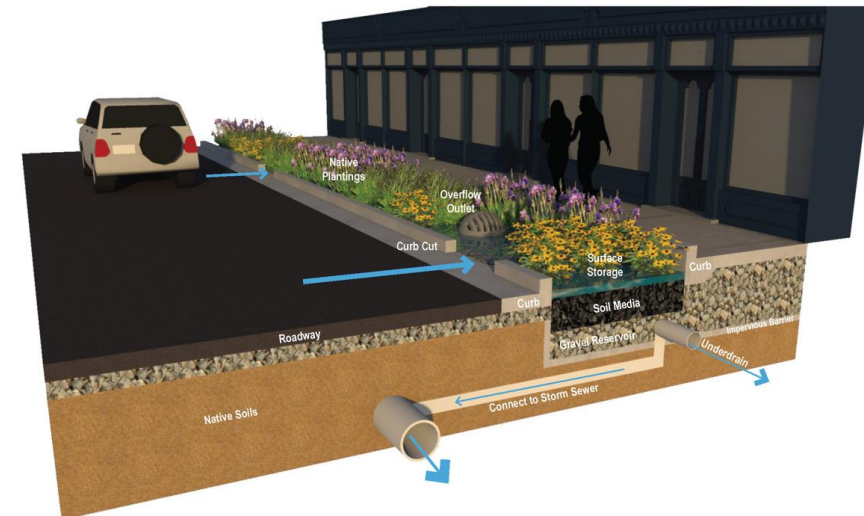
Urban Street Trees



Permeable Paving



Flow-Through Planter





# Typical GI Recommendations

## Roadway Classification : Collector (Urban)



### Recommended BMPs

Vegetated Swale

Bioinfiltration

Urban Street Trees

Hydrodynamic Separators

Flow-Through Planters

Permeable Paving

### Local Examples

35th Street (Gary)

Manor Ave (Munster)

Jackson Street (Michigan City)

### Characteristics

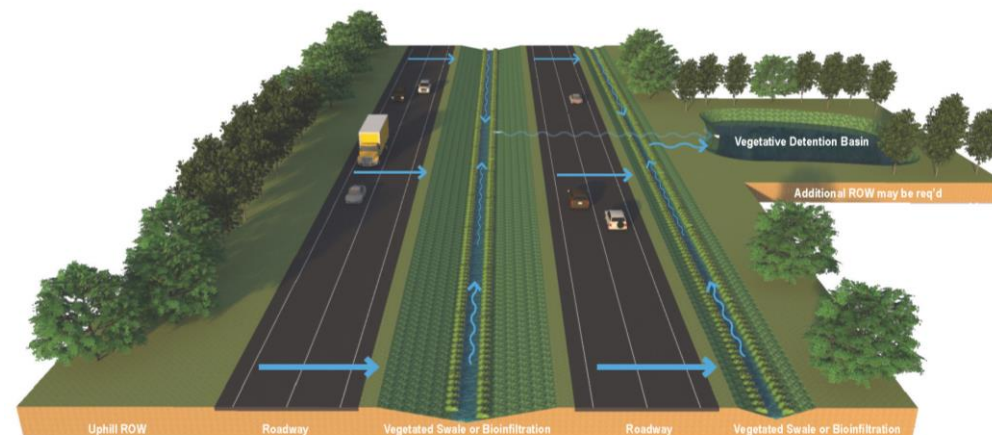
Moderate Traffic (Over 5,000 ADT)

Moderate Speed (25 to 35 MPH)

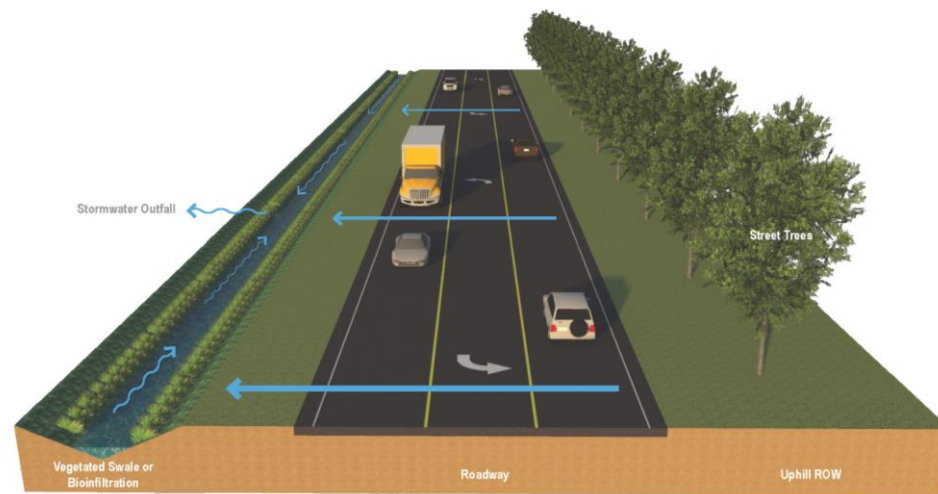
Ideally Spaced at 1/4- to 1- mile intervals

Collects Local Traffic

## Roadway Classification : Principal Arterial



## Roadway Classification : Minor Arterial





# Factsheets

Technical Green Infrastructure Guidelines  
For Implementing NIRPC's Living Streets Policy

## Vegetated Swale



- Applications**
- Roadway shoulder
  - Linear open space
  - Collector, and local
  - Open spaces
  - Pretreatment for other
- Advantages**
- Provides high pollutant and stormwater volume reduction
  - Combines stormwater with runoff conveyance
  - Relatively low maintenance
- Limitations**
- Higher maintenance than conventional curb and gutter
  - Not applicable for steep slopes

### DESCRIPTION

Vegetated swales are shallow, open conveyances with low-lying vegetation that collect and slowly convey runoff to downstream discharge points. Stormwater pollutants are filtered through vegetation and by allowing pollutants to settle due to the shallow flow depths and slow velocities in the swale. A swale that incorporates bioretention to promote both filtration and infiltration. Pollutant removal mechanisms include volume reduction through infiltration and evapotranspiration. Biochemical processes provide treatment of dissolved contaminants. An effective vegetated swale achieves uniform sheet flow through a densely vegetated channel. The vegetation in the swale including native vegetation can vary depending on desired aesthetic, maintenance requirements or maximum quality benefits. Use of native plant species are encouraged to maximize infiltration, removal, and vegetation survivability.

### CONDITIONS WHERE PRACTICE APPLIES

Vegetated swales or bioswales have a wide range of applications and can be adjacent to all roadway classifications including arterials and collectors. Vegetated

Green Infrastructure Fact Sheet



Vegetated

Technical Green Infrastructure Guidelines  
For Implementing NIRPC's Living Streets Policy

well suited to treat runoff from impervious surfaces and act as a natural buffer between impervious areas and natural areas. Vegetated swales are typically intended as a pre-treatment to decrease runoff velocity, filter out sediment and infiltration into underlying soils. Vegetated swales handle stormwater flows that can replace curbs, gutters, and be lined or avoided in areas where soils might be compacted if there is limited infiltration capacity of underlying soils. Underdrains can improve the health of the vegetated swales from becoming soggy. Underdrains (mosquito) concerns related to the formation of stagnant water.



Green Infrastructure Fact Sheet



Technical Green Infrastructure Guidelines  
For Implementing NIRPC's Living Streets Policy

### Site Suitability Considerations for

Tributary Area	< 5 acres
BMP Area Typically Required as Percentage of Tributary Area (%)	< 5%
Site Slope (%)	2 to 10
Hydrologic Soil Group	Any

- 1) Tributary area is the area of the site draining to the vegetated swale as a general guideline only. Tributary areas can be larger or smaller.
- 2) If the longitudinal slope of the swale exceeds 4%, check dams should be installed.
- 3) If the vegetated swale has a longitudinal slope less than 1.5% ("C" or "D"), underdrains should be incorporated.

Note: The water quality design flow rate is the maximum flow rate within the swale should have a flow depth of less than 4 inches. The designer can vary the swale width, slope, and Manning's n to add the water quality design flow can be routed through the swale, effectively treated.

### VARIATIONS AND ENHANCEMENTS

Vegetated swales can be designed to maximize conveyance of pollutants, or assist with volume reduction depending on the enhancements that can increase performance in vegetated swales.

- Check dams are recommended where longitudinal slope is steep and dissipate erosive forces. Check dams slow stormwater to pond allowing coarse sediment to settle.
- Amended soils provide sorption sites for pollutants and help support for plant growth. Increased evapotranspiration and infiltration by increasing the underlying native soils time for degradation.
- Vegetated swales function best under conditions that distribute flow evenly across the swale. Flow spreaders should be placed at the outlet of a storm sewer, enter the swale.
- Flow dividers are recommended for vegetated swales. Flow dividers encourage sheet flow across the width of the swale.

### SIZING AND DESIGN CONSIDERATIONS

The following are recommended sizing and design considerations that should be based on site-specific considerations.

Green Infrastructure Fact Sheet



Technical Green Infrastructure Guidelines  
For Implementing NIRPC's Living Streets Policy

2022

- The vegetated swale should be sized based on the target percent capture and estimated time of concentration.
- The design flow velocity through the swale should not exceed 1ft/sec to keep the vegetation in the swale upright.
- Size width and side-slopes to handle the design flow rate such that flow depths in the vegetated swale do not exceed a recommended depth of 4 inches. Typically flows should be at least 2 inches less than grass height.
- The recommended minimum bottom width of the vegetated swale is 2 feet and maximum bottom width is 10 feet.
- The recommended swale length is the length required to achieve a minimum hydraulic residence time of 10 minutes. The recommended minimum swale length is 100 feet.
- The recommended side slope of the swale is flat with 3:1 max slopes.
- The vegetated swale should be planted with wetland vegetation if the swale is designed to be persistently wet.
- See Plant Lists for recommendations of vegetation for Northwest Indiana.

### INSPECTION AND MAINTENANCE

#### Routine Maintenance

Routine maintenance activities in vegetative swales should include:

- Maintain vegetation as needed to preserve aesthetics and proper function. Maintenance of vegetation could include mowing, trimming, and removal of invasive species. Mowing should only be completed if swale is completely dry to avoid causing low spots.
- Remove trash and debris and visible floatables such as oil and grease.
- Remove minor sediment accumulations near inlet and outlet structures.
- Stabilize and repair eroded banks as needed. Reseed areas where soil is exposed.

#### Major Maintenance

Major maintenance activities in vegetated swales should include:

- Re-grade swale bottom to restore design longitudinal slope as needed.
- Aerate or scarify compacted areas to restore infiltration capacity.

Green Infrastructure Fact Sheet



Vegetated Swale Guide





# Thank You

**Becky Helfrich, P.E.**

(312) 668-1065  
RHelfrich@geosyntec.com

**Matthew Bardol, P.E., CFM, CPESC, D.WRE.**

(630) 432-5675  
MBardol@Geosyntec.com

[geosyntec.com](https://www.geosyntec.com)

