

# Be Prepared, NCR: A Community Planning Approach to Green Infrastructure, Hazard Mitigation, & Flooding

Kara Salazar and Carrie McKillip will present a new program funded through the Extension Disaster Education Network (EDEN) which is designed to support community-based updates of hazard mitigation and resilience planning with an emphasis on green infrastructure. Ken Hellevang will present being prepared for flooding, which includes knowing your roles, having educational resources prepared, and following forecasts.

WEBINAR

**MARCH 7, 2023** 1:00 PM - 2:00 PM (ET)



**NORTH CENTRAL  
REGIONAL CENTER  
FOR RURAL DEVELOPMENT**



# Siting Clean Energy and Spent Nuclear Fuel Facilities: Rural Opportunities and Impacts

Processes for siting clean energy technologies and spent nuclear fuel management facilities can impact rural communities – creating new economic opportunities, inspiring cross-sectoral partnerships, altering regional land and resource use, and reshaping local perceptions of risk.

Dr. Vincent Ialenti, U.S. Dept. of Energy's Consent-Based Siting Team, will discuss federal efforts to make people and communities central to siting federal consolidated interim storage facilities. Dr. Sarah Mills, University of Michigan, will discuss the positive and negative impacts of wind and solar energy in rural communities and how to help rural communities proactively plan for renewables. The discussion to follow will explore differences between the various risks and benefits associated with siting different kinds of energy-related facilities.

WEBINAR

**APRIL 25, 2023 2:00 PM - 3:30 PM (ET)**



**NORTH CENTRAL  
REGIONAL CENTER**  
FOR RURAL DEVELOPMENT





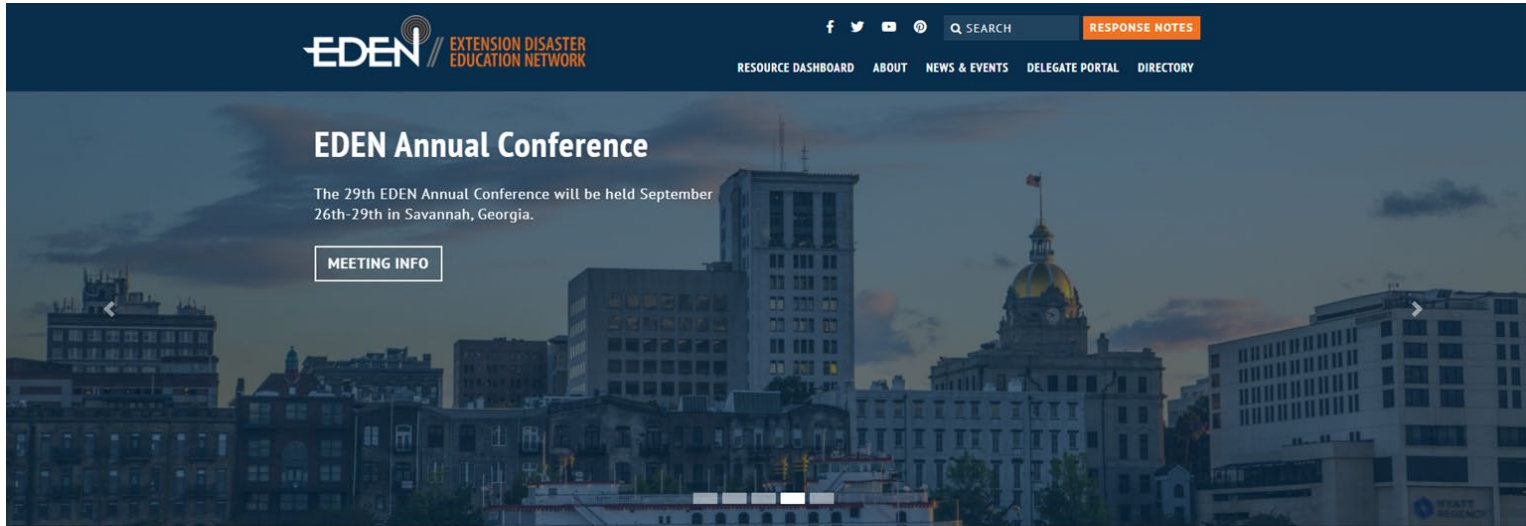
# **A community planning approach to green infrastructure and hazard mitigation**

**Kara Salazar**, Purdue Extension & IL-IN Sea Grant  
**Carrie McKillip**, University of Illinois Extension



# Extension Disaster Education Network

extensiondisaster.net



The screenshot shows the EDEN website homepage. At the top, there is a dark blue header with the EDEN logo (a stylized 'E' with a sun-like symbol) and the text 'EXTENSION DISASTER EDUCATION NETWORK'. To the right of the logo are social media icons for Facebook, Twitter, YouTube, and Pinterest, followed by a search bar and a 'RESPONSE NOTES' button. Below the header, a navigation menu includes 'RESOURCE DASHBOARD', 'ABOUT', 'NEWS & EVENTS', 'DELEGATE PORTAL', and 'DIRECTORY'. The main content area features a large background image of a city skyline at dusk. Overlaid on this image is the text 'EDEN Annual Conference' in a large, white, sans-serif font. Below this, in a smaller white font, it says 'The 29th EDEN Annual Conference will be held September 26th-29th in Savannah, Georgia.' A white button with the text 'MEETING INFO' is positioned below the text. Navigation arrows (left and right) are visible on the left and right sides of the main image area.



EARTHQUAKE RESOURCES



AVIAN INFLUENZA RESOURCES



WINTER WEATHER RESOURCES

# Project Team

Kara Salazar, Purdue Extension & Illinois-Indiana Sea Grant

C. Eliana Brown, University of Illinois Extension & Illinois-Indiana Sea Grant

Dr. Jingqiu Chen, Florida A&M University

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John Orick, Purdue Extension

Hans Schmitz, Purdue Extension

Daniel Walker, Purdue Extension & Illinois-Indiana Sea Grant

# Community Resilience

- ability to prepare for anticipated hazards
- adapt to changing conditions
- withstand and recover rapidly from disruptions

*Requires collaborative planning with broad stakeholder involvement*

National Institute of Standards and Technology (NIST) Community Resilience Planning Guide



# Hazard Mitigation

*Any sustainable action that reduces or eliminates long-term risk to people and property from future disasters*



## BUILDING COMMUNITY RESILIENCE WITH NATURE-BASED SOLUTIONS

A GUIDE FOR LOCAL COMMUNITIES



JUNE 2021

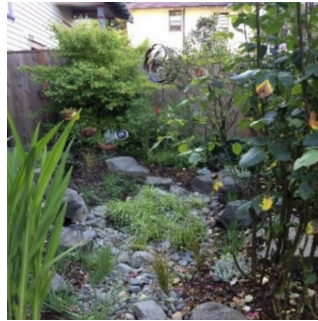
**RiskMAP**  
Increasing Resilience Together



# Green Infrastructure



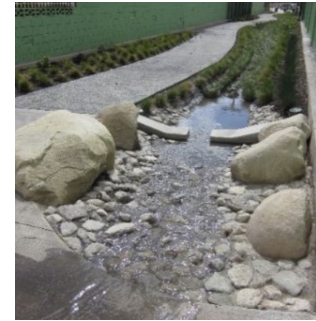
Downspout  
Disconnection



Rain Gardens and  
Bioswales



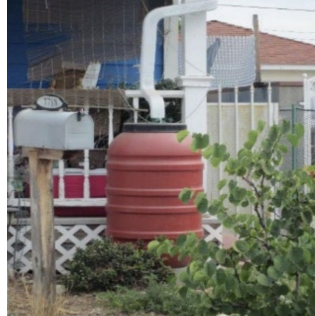
Green Roofs



Green Alleys and Streets



Land Conservation



Rainwater Harvesting



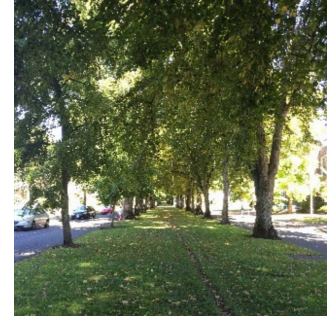
Planter Boxes



Permeable Pavements



Green Parking



Urban Tree Canopy



# Hazard Mitigation + Green Infrastructure + Climate

Harm reduction to urban/suburban populations through water infiltration directly, albedo and air quality increases indirectly



# Project Goals

## Background

- Communities are now facing complex climate-related natural hazard challenges
- USEPA and FEMA have recognized green infrastructure as a multi-benefit solution to local hazard mitigation and increased community resilience

***Support community resilience and multi-hazard mitigation plans that successfully integrate green infrastructure practices***

# **Project Objectives and Deliverables**

## **Community engagement**

- Identify needs, motivations, and barriers for hazard mitigation planning
- Understand perceptions of green infrastructure and strategies for natural hazard mitigation, particularly flooding

## **Green infrastructure hazard mitigation planning and ordinance development**

- Convene planning sessions in LaPorte, IN and Hancock County, IL
- Focus on and engage areas with high Social Vulnerability Index Values

## **Implementation support**

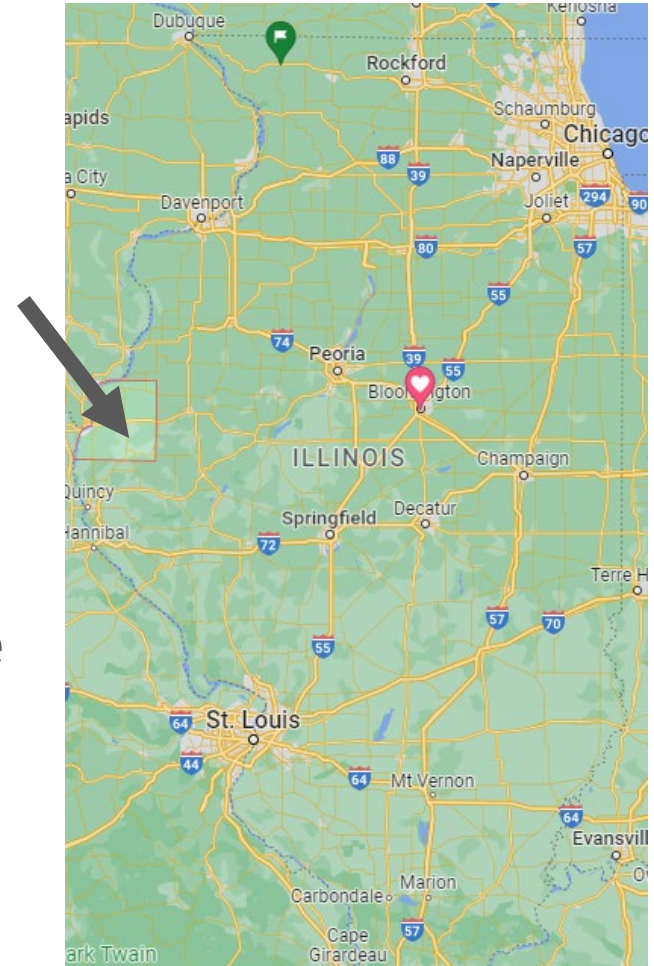
- Conduct the Purdue Extension Rainscaping Education Program in each community
- Develop an Extension Toolkit



# Community Overview

## Hancock County, IL

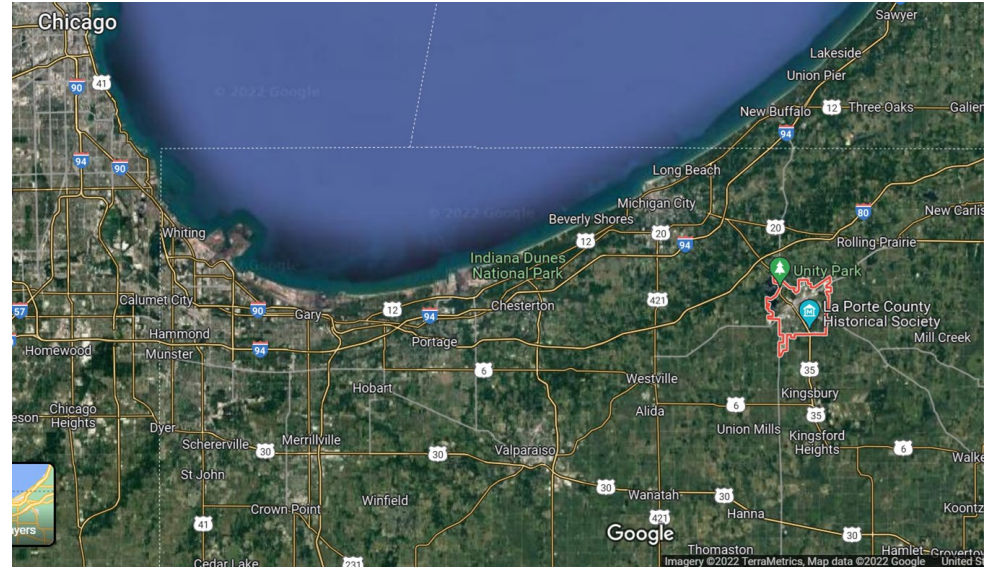
- Population 18,000
- Primarily rural, bedroom community for surrounding metro areas
- Carthage and Nauvoo are important tourist destinations
- Flooding and aging infrastructure are significant challenges
- Scheduled for an Multi-Jurisdictional Hazard Mitigation plan update in fall 2022-2023



# Community Overview

## LaPorte, IN

- Population 22,471
- LaPorte County seat
- Multiple lakes within municipality
- Focusing on community resilience planning
  - Updating stormwater management planning with city MS4 coordinator
  - Redevelopment corridor integrating green infrastructure



# Meeting Series and Program Toolkit Development

## Scoping & Introductory Community Meetings

### *Overview of community planning meetings*

- Introduce program purpose and sessions
- Discuss roles and responsibilities of local team and facilitation team
- Identify dates and locations for meeting sessions
- Discussion outreach and meeting recruitment

### *Introduce Rainscaping Education Program*

- Introduce program purpose, sessions
- Identify dates and locations for meeting sessions
- Discuss and identify rain garden location





# Program Participant Summary – Local Leadership

- Team of 3-5 individuals
  - Community planners
  - Extension and Sea Grant staff
  - Local government staff (engineering, stormwater, hazard planning, etc)
  - Others as identified by community contacts

# Program Participant Summary – Workshop Attendees

- agriculture (farmers, Farm Bureau, commodity groups, services/business)
- community planners (regional, county, local)
- drainage districts/boards
- economic development
- engineers
- floodplain managers
- health care
- human services
- K-12 education
- local political leadership
- members of boards and commissions
- natural resource management groups (SWCD, TNC, etc.)
- representatives of critical facilities
- residents
- stormwater officials
- street and highway department managers

# List of Potential Program Participants Mapped to the Community Capitals Framework

|  | DEFINITION  | EXAMPLES   |
|--|---|--|
| <br>Natural   | The quality and quantity of natural and environmental resources existing in a community.  | Parks; lakes; rivers; wildlife; forestland; farmland; mountains; other natural resource features.  |
| <br>Cultural  | The values, norms, beliefs, and traditions that people inherit from the family, school, and community. Also includes material goods produced at a specific time and place (such as paintings, books) that have historical or cultural significance.   | Cultural events/festivals; musical heritage; libraries; museums; multilingual populations; historical associations.  |
| <br>Human     | Attributes of individuals that provide them with the ability to earn a living, strengthen community, and otherwise contribute to community organizations, to their families, and to self-improvement (Flora et al., 2004). It includes access to education and knowledge development, training and skill-building activities, and efforts to build and expand local leadership. | Formal and informal educational institutions; workforce training programs; adult and youth leadership programs; lifelong learning activities.  |
| <br>Social    | Connections existing among people and organizations that help make things happen in the community. Includes close ties that build community cohesion (bonding) as well as weaker ties with local and outside people and organizations that help promote broad-based action on key matters (bridging).   | Activities that build trust among people and groups of different races and ethnic backgrounds; citizen involvement in community discussions and events; community celebrations or parades; involvement in civic and service groups; organizations that link diverse people and organizations together. |
| <br>Political | The ability to influence and enforce rules, regulations, and standards. Access to individuals and groups with the power to influence decisions. Participating in civic discourse on difficult public issues.  | Elected and appointed government officials; citizen participation in issue forums; Congressional representatives and staffers; political organization leaders; voting rates in local, state, and national elections.   |
| <br>Financial | The variety of financial resources available to invest in local projects or economic development initiatives. Efforts to build wealth to support community development activities.  | Community foundations; grants; microloan programs; revolving loan funds; community development financial institutions; banks.  |
| <br>Built    | Represents the infrastructure of the community—the basic set of facilities, services, and physical structures a community needs.  | Broadband and other information technologies; utilities; water/sewer systems; roads/bridges; business parks/incubator facilities; hospitals/health care buildings; main street buildings; housing stock.   |



# Code and Policy Review – Plans and Ordinances

- Plans

- Comprehensive Plan
- Trails and Greenways Master Plan
- Gateway Corridor Realization Plan
- 5-Year Parks and Recreation Master Plan
- Healthy Living Plan
- Multi-Hazard Mitigation Plan

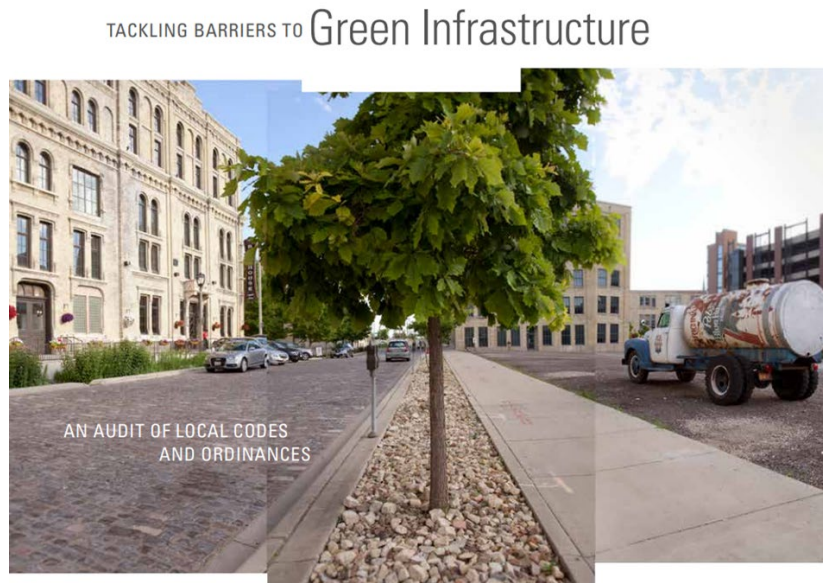
- Ordinances

- Joint Zoning Ordinance
- Municipal Code
- Subdivision Control Ordinance

# Code and Policy Review – Practice Areas

*Reference - WI Sea Grant Tackling Barriers to Green Infrastructure: An Audit of Local Codes and Ordinances*

- Architectural Design Standards
- Shorelines and Riparian Areas
- Community Outreach and Education
- Landscaping
- Parking
- Permeable Materials
- Purpose Statements and Community Plans
- Zoning
- Construction and post-construction management
- Pollutant reduction through site plan review
- Post-construction stormwater standards and long-term maintenance
- Public works standards
- Sanitary and storm water disconnections
- Stormwater management standards



# Meeting Series and Program Toolkit Development

## Session 1: Community Hazard Planning and GI Infrastructure Mitigation Opportunities

### *Welcome / Introductions / Overview*

- Purpose of planning effort

### *Activity I: Community Discussion*

- Community hazard identification through maps, worksheets, and group discussion

### *Activity II: Existing Plan and Ordinance Review*





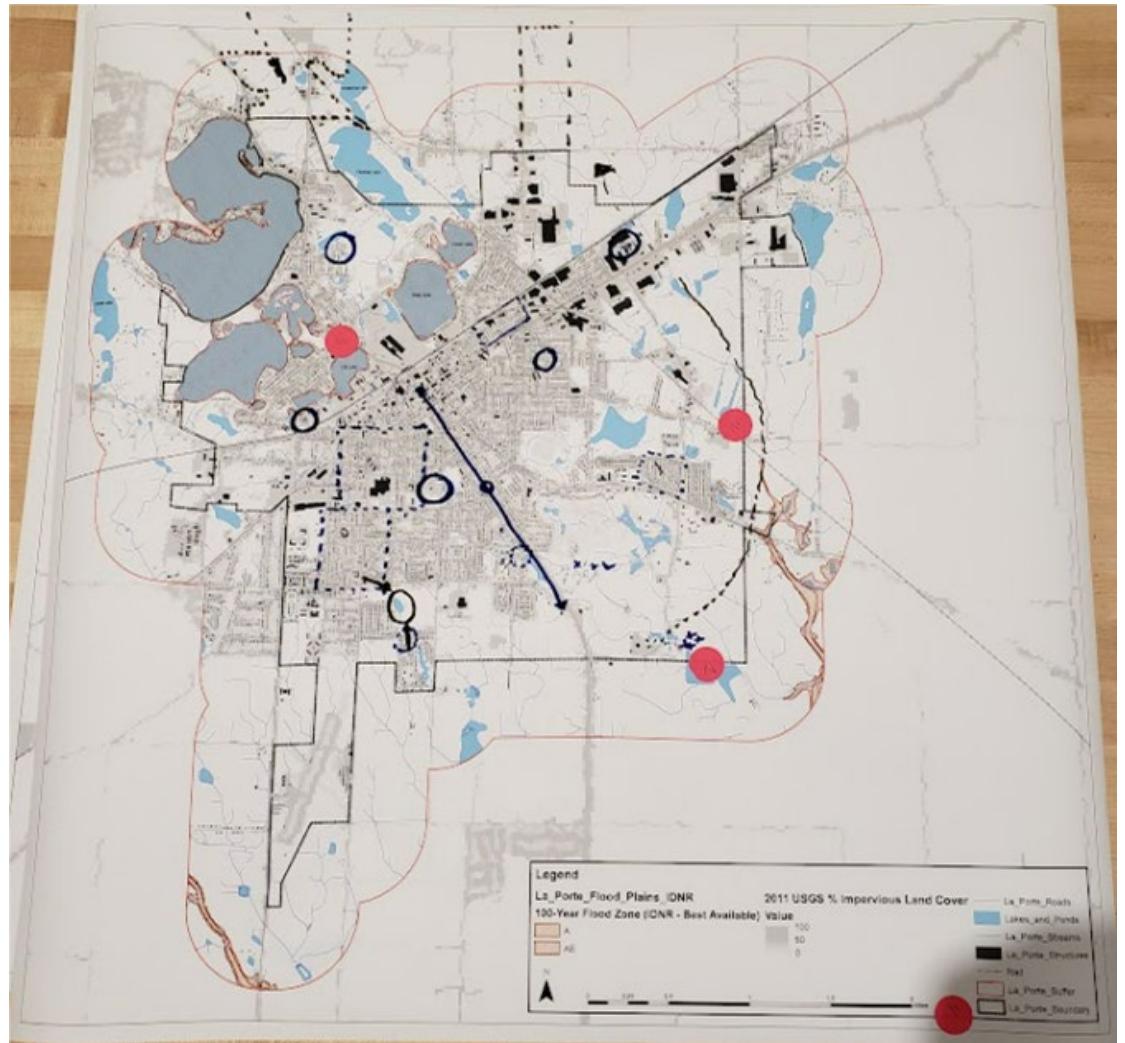
# Hazard Identification

Riverine Flooding (red dot/marker)

Storm Water/Drainage Flooding (blue dot/marker)

Projected issues (i.e. Erosion / channelization) (black hatch marks, etc)

Identify additional hazards as needed



# Community Discussion Worksheet

Group Names: \_\_\_\_\_

Date: \_\_\_\_\_

| Natural Hazard                         | Part I:<br>Which of the following hazards have impacted personal, business, nonprofit, and/or government properties in the community within the past five years?<br><br>What was the response? Who led it? Was it effective? | Part II:<br>How could the community address the following future hazards more effectively? |
|--|--|--|
| Severe Storms<br>(thunder, wind, hail) |  |  |
| Floods                                 |  |  |
| Flash Floods                           |  |  |
| Drought                                |  |  |

# Code and Policy Review for Enhancing Resilience

Referenced WI Sea Grant  
Tackling Barriers to Green  
Infrastructure: An Audit of  
Local Codes and  
Ordinances

| Code and Policy Review for Enhancing Resilience |  |  |  |
|---|--|--|--|
| Resilience and Green Infrastructure Practices   | Plan/Ordinance<br>Which community policies or plans can further enhance resilience?  | Notes, Ideas, and Strategies<br>Are there key agencies, people, or funding sources that need to be involved to increase implementation?  | Barrier(s)<br>Are existing ordinances or policies impacting implementation?  |
| Landscaping                                     | <div>LID</div> <div> <input checked="" type="checkbox"/> County Comprehensive Plan<br/> <input checked="" type="checkbox"/> Joint Zoning Ord.<br/> <input type="checkbox"/> Municipal Code<br/> <input type="checkbox"/> City Trails &amp; Greenway Master Plan<br/> <input type="checkbox"/> 5-Year Parks &amp; Rec. Master Plan<br/> <input type="checkbox"/> Multi-Hazard Mitigation Plan<br/> <input type="checkbox"/> Subdivision Control Ord.<br/> <input type="checkbox"/> Healthy Living Plan<br/> <input type="checkbox"/> La Porte Gateway Corridor Revitalization Plan<br/> <input type="checkbox"/> La Porte County Thoroughfare Plan<br/> <input type="checkbox"/> Other                 </div> | <p>→ Update &amp; add City of LP</p> <p>→ Add more LID language &amp; specify tree preservation language; more planting required</p> <p>→ Simplified street tree updates; include space/vegetation ordinance; parking lot landscaping</p> <p>→ tree by ordinances</p> <p>→ Landscaping std: low maintenance</p> <p>→ Involve experts; hazard tree reduction &amp; management; reforestation = less area to mow (no mow)</p> <p>→ Low maintenance plantings; management capacity building</p> <p>→ update ord to include existing common area &amp; parking landscaping</p> <p>ALL: water management</p>  | <p>→ \$</p> <p>- capacity</p> <p>- education &amp; outreach (all ages)</p> <p>- maintenance planning</p> <p>- public perception</p>  |
| Parking   | <div> <input type="checkbox"/> County Comprehensive Plan<br/> <input type="checkbox"/> Joint Zoning Ord.<br/> <input type="checkbox"/> Municipal Code<br/> <input type="checkbox"/> City Trails &amp; Greenway Master Plan<br/> <input type="checkbox"/> 5-Year Parks &amp; Rec. Master Plan<br/> <input type="checkbox"/> Multi-Hazard Mitigation Plan<br/> <input type="checkbox"/> Subdivision Control Ord.<br/> <input type="checkbox"/> Healthy Living Plan<br/> <input type="checkbox"/> La Porte Gateway Corridor Revitalization Plan<br/> <input type="checkbox"/> La Porte County Thoroughfare Plan<br/> <input type="checkbox"/> Other                 </div>                                      | <p>→ currently minimum 500 ft</p> <p>→ LID/Storm water &amp; BMPs; impervious ratios; max parking qty; collective &amp; shared parking</p> <p>→ include LID/GI where possible; green space parking - discourage w/ curbs, consistent across streets/neighborhood</p> <p>→ parking along roads - curbs/design; more trailheads; encourage event parking (for parks)</p> <p>→ landscaping</p> <p>→ design/maintenance space parking not addressed; recreational areas</p> <p>→ Street/neighborhood</p> <p>→ not by unmaintained maps/solutions</p> <p>→ DOWNSTOWN</p> <p>- public transportation options as alternative to add parking/shuttles - especially for events</p> <p>- incentive-based tools</p> | <p>- developer convenience</p> <p>- space</p> <p>- public perception</p> <p>- capacity</p> <p>- enforcement</p> <p>- \$</p> <p>- data (parking study) through plan has two sub</p> |
| Permeable Materials                             | <div> <input type="checkbox"/> County Comprehensive Plan<br/> <input type="checkbox"/> Joint Zoning Ord.<br/> <input type="checkbox"/> Municipal Code<br/> <input type="checkbox"/> City Trails &amp; Greenway Master Plan<br/> <input type="checkbox"/> 5-Year Parks &amp; Rec. Master Plan<br/> <input type="checkbox"/> Multi-Hazard Mitigation Plan<br/> <input type="checkbox"/> Subdivision Control Ord.<br/> <input type="checkbox"/> Healthy Living Plan<br/> <input type="checkbox"/> La Porte Gateway Corridor Revitalization Plan<br/> <input type="checkbox"/> La Porte County Thoroughfare Plan<br/> <input type="checkbox"/> Other                 </div>                                      | <p>→ LID/Storm water &amp; BMPs</p> <p>→ maintenance plan for installed GI BMPs in plans</p> <p>ALL: LID</p>   | <p>→ \$</p> <p>- maintenance planning lacking after install</p>  |

# Meeting Series and Program Toolkit Development

## Session 2: Developing Green infrastructure Mitigation Strategies

*Welcome / Introductions / Overview*

- Introduction to green infrastructure examples

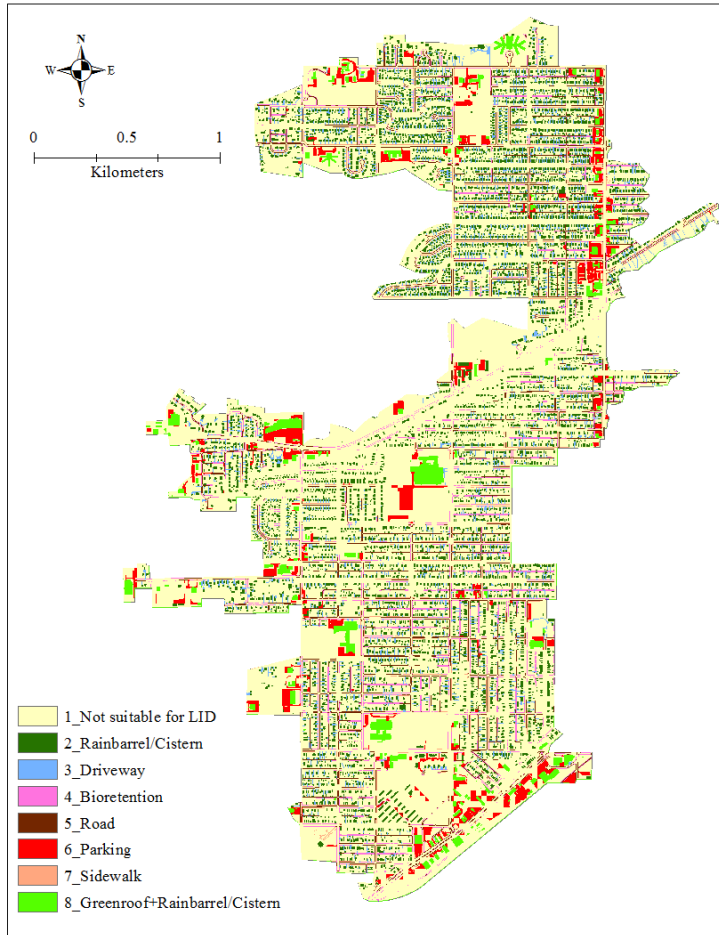
*Activity I: Identify green infrastructure strategies using decision support tool*

*Activity II: Prioritize strategies, GI Location recommendations, and next steps*

*Next steps & Conclusion*



# GIS Analysis + Hydrologic Modeling + Cost-Effectiveness Analysis



❑ Combined implementation of GI practices achieved more reductions than applying individual practices alone.

❑ Adding more GI practices did not necessarily mean that substantial runoff and pollutant reductions would be achieved based on site characteristics.

❑ The most cost-effective scenario can be determined.

❑ Adoption of GI practices on all possible areas could potentially achieve the greatest runoff and pollutant load reductions but would not be the most cost-effective option.

(Chen et al., 2019)



Predominate Land Cover

Urban

Target Goal

Runoff

Reduction Goal

5%

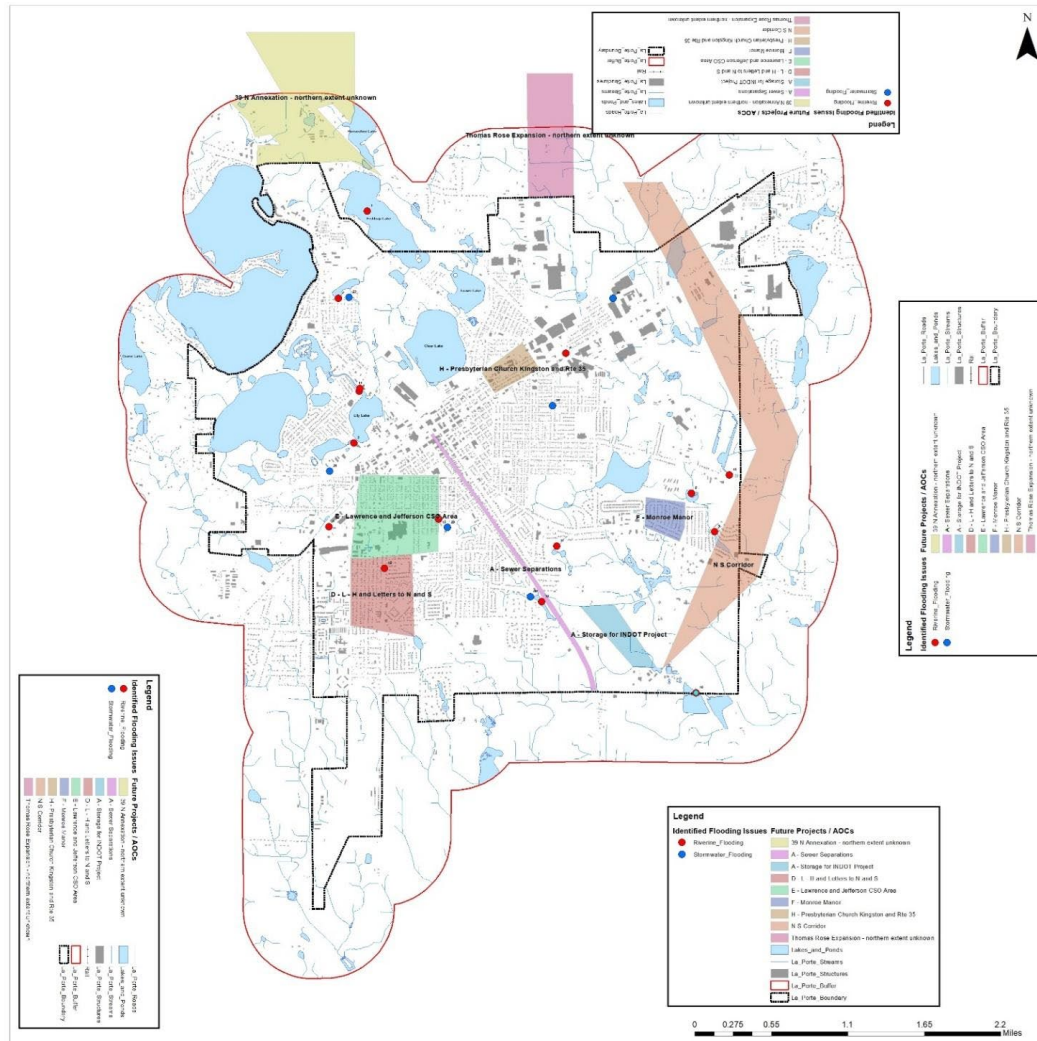
## FACT SHEETS AND USER GUIDE FOR THE LID/BMP MODULE

Attribution: Dr. Yaoze Liu, Dr. Jingqiu Chen, Purdue University

Overview:  
Urban low-impact development (LID) strategies and agricultural best management practices can reduce runoff volume and nutrient loading. These strategies vary in cost, expected reduction, and are constrained by site suitability/availability within the watershed. The data presented in this module is derived from L-THIA-LID. Click [here](#) for definitions of the LIDs, and [here](#) for definitions of the BMPs shown in this module. Note that combinations of practices are used in some cases, and that percentage reductions depend upon

| LID applied in Suitable Areas ↕   | Runoff ↕ | Annual cost per m <sup>3</sup> reduction ↕ | Phosphorus % ↕ | Nitrogen % ↕ | TSS % ↕ | Include in your Action Plan? |
|---|----------|--|----------------|--------------|---------|------------------------------|
| 100% of practices applied to all suitable areas   | -23.50%  | \$20.38                                    | -28.10%        | -27.90%      | -30.80% | <input type="checkbox"/>     |
| 100% Bioretention, 100% Porous Roads, 50% Porous Parking Lot, 50% Porous Sidewalks, 50% Porous Driveways, 50% Rain Barrels, and 50% Green Roofs | -13.10%  | \$19.53                                    | -17.00%        | -16.80%      | -18.90% | <input type="checkbox"/>     |
| 100% Bioretention, 100% Porous Roads, 50% Porous Parking Lot, 50% Porous Sidewalks, 50% Porous Driveways, and 50% Rain Barrels                  | -12.10%  | \$9.21                                     | -16.60%        | -16.00%      | -17.80% | <input type="checkbox"/>     |
| 100% Bioretention, 100% Porous Roads, 50% Porous Parking Lot, 50% Porous Sidewalks, and 50% Porous Driveways                                    | -4.30%   | \$19.39                                    | -8.90%         | -8.30%       | -10.00% | <input type="checkbox"/>     |
| 100% Bioretention, 100% Porous Roads, 50% Porous Parking Lot, and 50% Porous Sidewalks  | -3.80%   | \$19.44                                    | -7.80%         | -7.40%       | -9.00%  | <input type="checkbox"/>     |
| 100% Porous Roads, 50% Porous Parking Lot, and 50% Porous Sidewalks   | -3.40%   | \$20.15                                    | -7.40%         | -7.00%       | -8.60%  | <input type="checkbox"/>     |

# Green Infrastructure Location Identification



# Prioritize Action Strategies

|    |  |                            |                             |                           |                        |                            |                                      |              |
|----|--|----------------------------|-----------------------------|---------------------------|------------------------|----------------------------|--------------------------------------|--------------|
| 4  | <b>Resilience and Green Infrastructure Areas of Focus and Strategies</b> |                            |                             |                           |                        |                            |                                      |              |
| 5  | <b>Architectural Design Standards - Strategies</b>                       | <b>Plan / Policy Focus</b> | <b>Short (up to 1 year)</b> | <b>Medium (2-4 years)</b> | <b>Long (5+ years)</b> | <b>Responsible Parties</b> | <b>Action Items Needed / Funding</b> | <b>Notes</b> |
| 6  |  |                            |                             |                           |                        |                            |                                      |              |
| 7  |  |                            |                             |                           |                        |                            |                                      |              |
| 8  | <b>Shorelines and Riparian Areas - Strategies</b>                        | <b>Plan / Policy Focus</b> | <b>Short (up to 1 year)</b> | <b>Medium (2-4 years)</b> | <b>Long (5+ years)</b> | <b>Responsible Parties</b> | <b>Action Items Needed / Funding</b> | <b>Notes</b> |
| 9  |  |                            |                             |                           |                        |                            |                                      |              |
| 10 |  |                            |                             |                           |                        |                            |                                      |              |
| 11 | <b>Community Outreach and Education - Strategies</b>                     | <b>Plan / Policy Focus</b> | <b>Short (up to 1 year)</b> | <b>Medium (2-4 years)</b> | <b>Long (5+ years)</b> | <b>Responsible Parties</b> | <b>Action Items Needed / Funding</b> | <b>Notes</b> |
| 12 |  |                            |                             |                           |                        |                            |                                      |              |
| 13 |  |                            |                             |                           |                        |                            |                                      |              |
| 14 | <b>Purpose Statements and Community Plans - Strategies</b>               | <b>Plan / Policy Focus</b> | <b>Short (up to 1 year)</b> | <b>Medium (2-4 years)</b> | <b>Long (5+ years)</b> | <b>Responsible Parties</b> | <b>Action Items Needed / Funding</b> | <b>Notes</b> |
| 15 |  |                            |                             |                           |                        |                            |                                      |              |
| 16 |  |                            |                             |                           |                        |                            |                                      |              |
| 17 | <b>Zoning Updates - Strategies</b>                                       | <b>Plan / Policy Focus</b> | <b>Short (up to 1 year)</b> | <b>Medium (2-4 years)</b> | <b>Long (5+ years)</b> | <b>Responsible Parties</b> | <b>Action Items Needed / Funding</b> | <b>Notes</b> |
| 18 |  |                            |                             |                           |                        |                            |                                      |              |



# Summary Report Template - *Community Hazard Planning and Green Infrastructure Mitigation Opportunities*

Introduction and Purpose

Community Background Assessment

Hazard Discussions

Plan, Policy, and Code Audit

Green Infrastructure Implementation

Community Mapping of Stormwater and Green Infrastructure Opportunities

Rain garden Workshop Summary





# Climate Adaptation, Hazard Mitigation, and Community Resilience Planning Resources

- [Climate Adaptation Knowledge Exchange](#)
- [Community Resilience | NIST](#)
- [Climate Mapping for Resilience and Adaptation](#)
- [Hazard Mitigation Planning | FEMA.gov](#)
- [Hazard Mitigation Assistance Mitigation Action Portfolio | FEMA](#)
- [International Guidelines on Natural and Nature-Based Features for Flood Risk Management](#)
- [Nature-Based Solutions | FEMA.gov](#)
- [Storm Smart Cities: Integrating Green Infrastructure into Local Hazard Mitigation Plans | US EPA](#)
- [U.S. Climate Resilience Toolkit](#)

# Rainscaping Education Program

- Provide training and support to plan, install, and manage future successful bioretention projects
  - Education includes rain garden siting, sizing, design, installation, maintenance
- Engage community in rain garden efforts
  - Conduct community site tours
  - Install public space demonstration rain garden



# Rainscaping Demonstration Projects



News Weather



## Local University of Illinois extension teaches rain scaping



WGEM News at Five

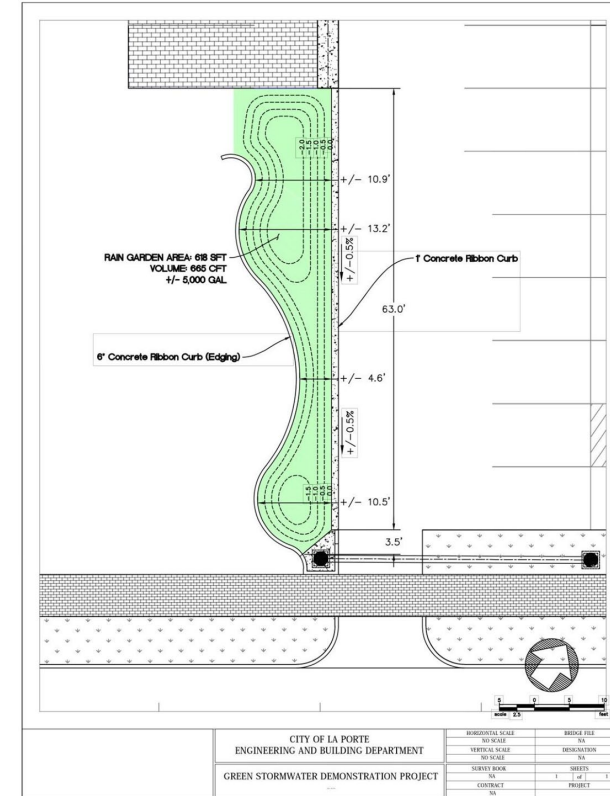
By [Victoria Bordenga](#)

Published: Sep. 19, 2022 at 6:25 PM EDT



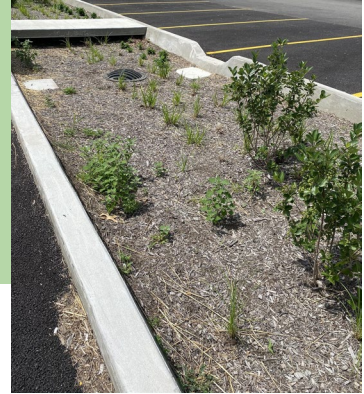
NAUVOO, IL. (WGEM) - The University of Illinois extension site in Nauvoo is helping people in the community learn to reduce pollution from runoff.

A \$4,000 grant came from the Extension Disaster Education Network to make this program happen.



# Hancock County Projects: Nature Based Solutions included in 2023 Natural Hazard Mitigation Plan

1. Two Jurisdictions including Rain Gardens as projects
1. One Jurisdiction “stacking” nature based solutions for stormwater management on infill lots in downtown area
1. One Jurisdiction including nature based solutions in codes and ordinances for potential new development





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**Carrie McKillip, [mckillip@illinois.edu](mailto:mckillip@illinois.edu)**