



**Grand Haven**  
Coast Guard City USA

# Green Infrastructure Development in Grand Haven

---






**Site Analysis and Policy Recommendations**

By Isaac Harter

M.S. in Urban Planning Student  
at Michigan State University

# Why Green Infrastructure?

## Introduction

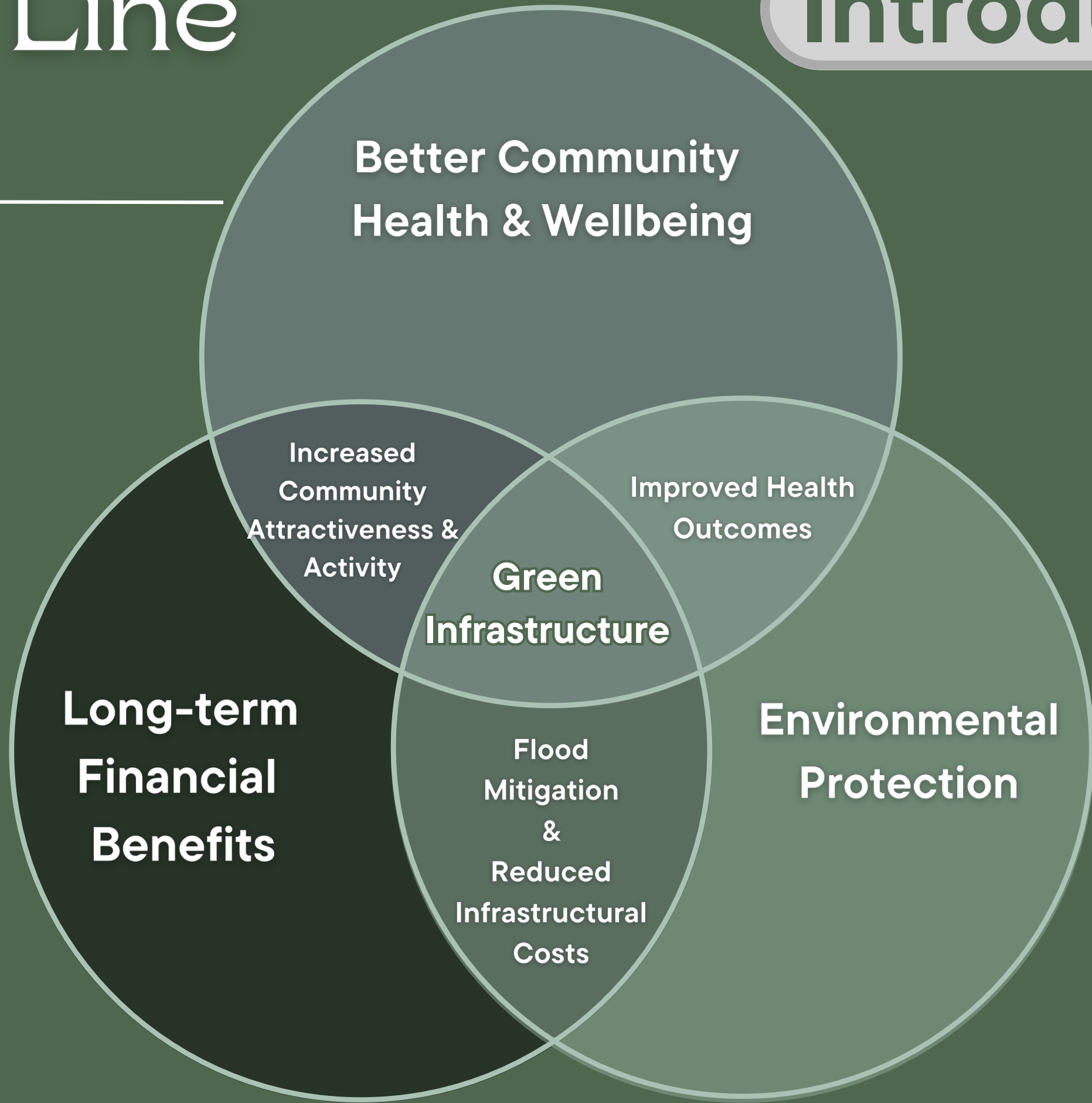
-  **Manages and purifies** stormwater runoff
-  **Expands** local recreation & open space
-  **Benefits** native species & ecosystems
-  **Improves** air & water quality
-  **Reduces** urban heat
-  **Increases** local aesthetic value



**Chinook Pier**

# Triple Bottom Line Framework

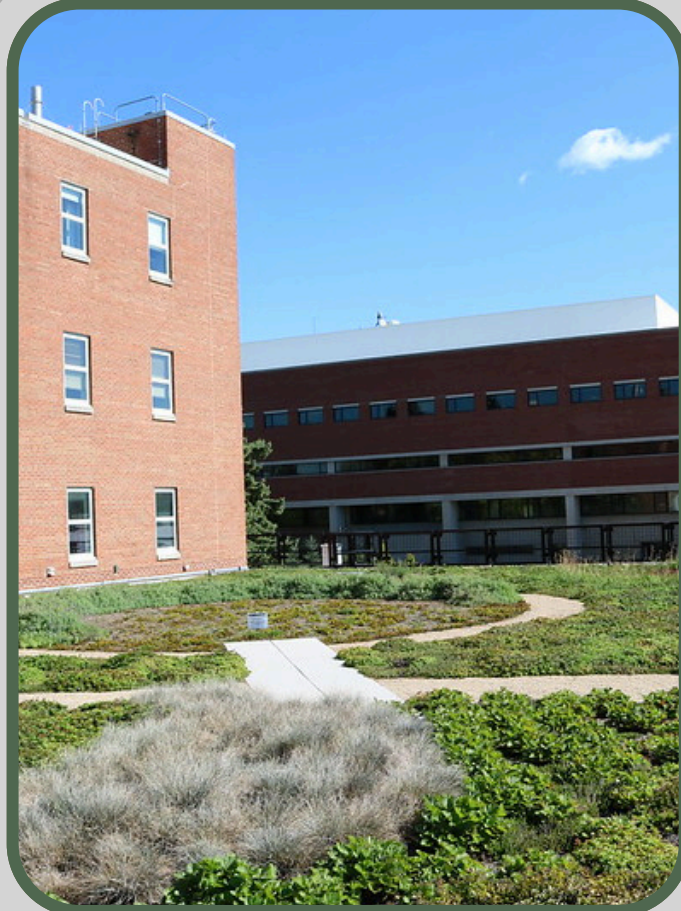
## Introduction



# Green Infrastructure In Practice

---

## Introduction



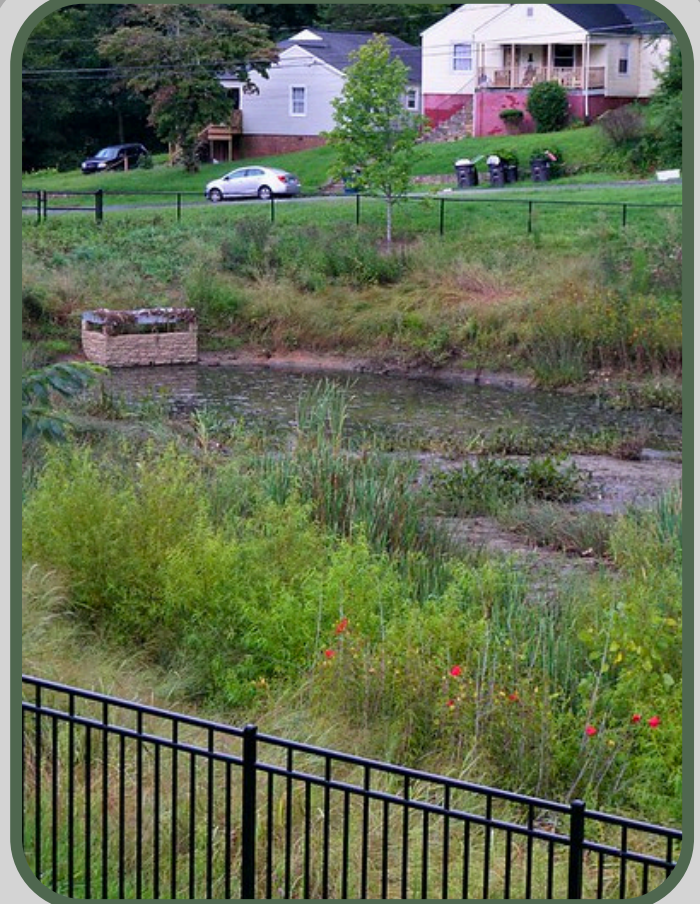
**Green Roofs**



**Rain Barrels**



**Raised Beds**



**Artificial Wetlands**

# Green Infrastructure In Practice

## Introduction



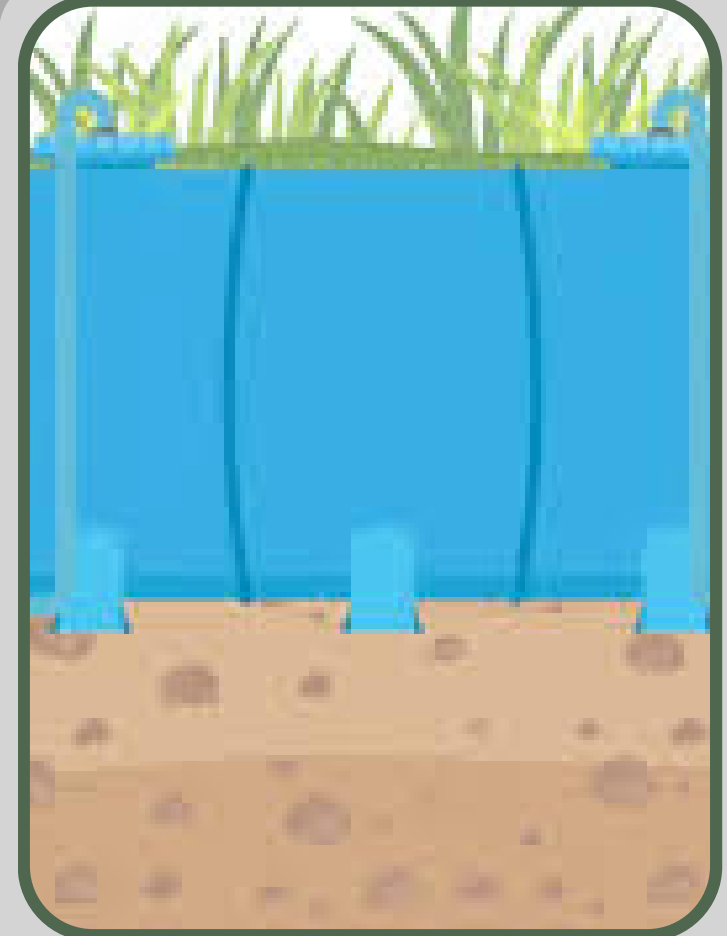
**Permeable  
Pavement**



**Rain Gardens &  
Bioswales**



**Downspout  
Disconnection**

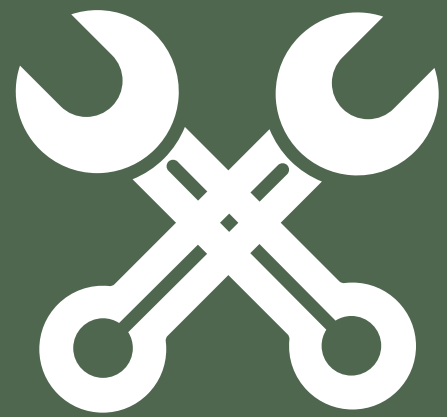


**Underground  
Cisterns**

# Barriers to Development

---

## Introduction



**Unique Maintenance  
Needs**



**Awareness Gaps  
and Novelty**



**Significant  
Initial Cost**

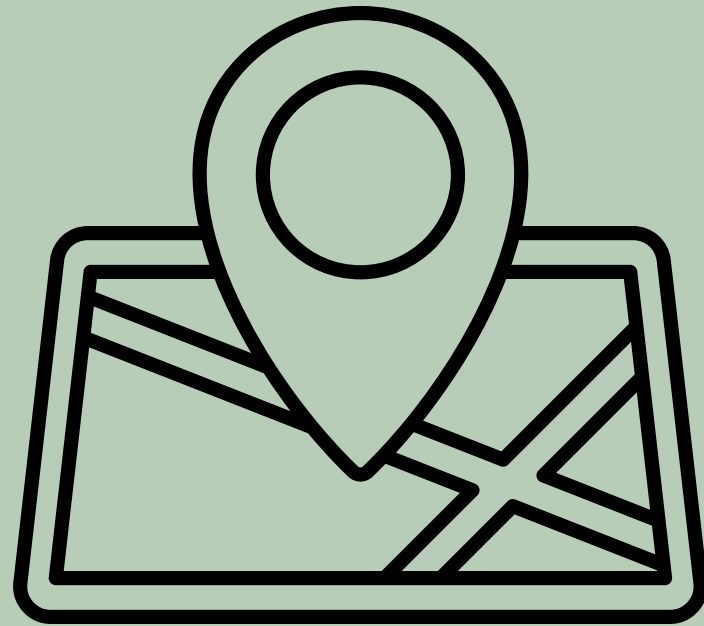


**Unclear or Restrictive  
Policies**

# Analysis of Chinook Pier

---

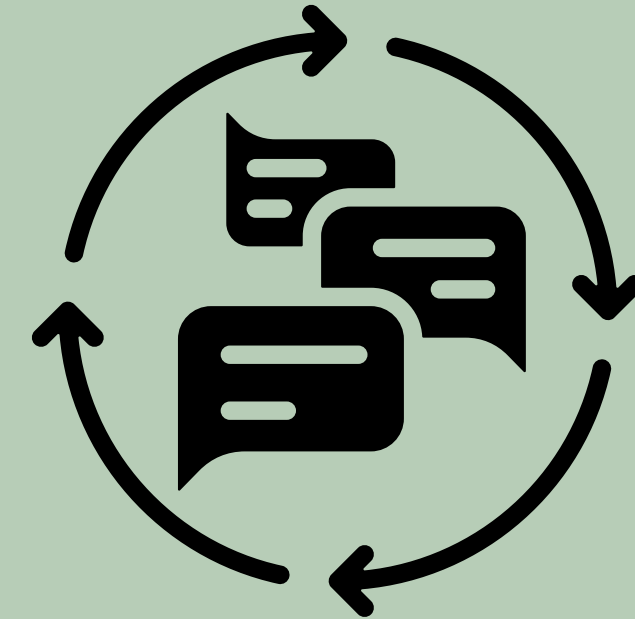
## Methods



**Site Factors &  
Context**



**Technical Requirements  
& Feasibility**



**Relevant Community  
Goals & Feedback**

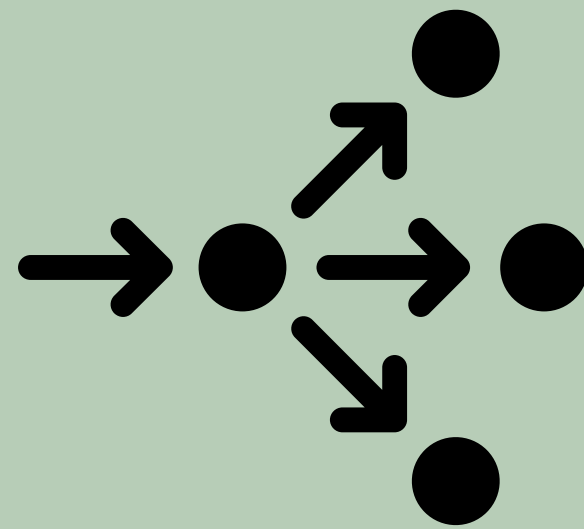
# Inventory of Current Policy

---

## Methods



**Strengths & Weaknesses  
of City Policy**



**Effects of Current  
Policies on Development**

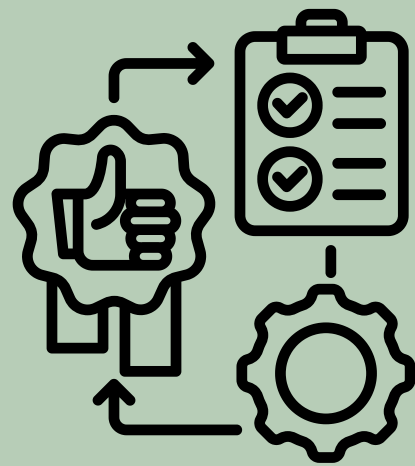


**Site-Specific  
Policy Requirements**

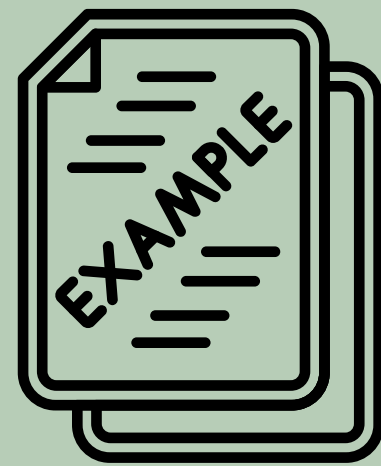
# Case Studies & Research

---

## Methods



**Green Infrastructure  
Best Practices**



**Example Policy  
Language**



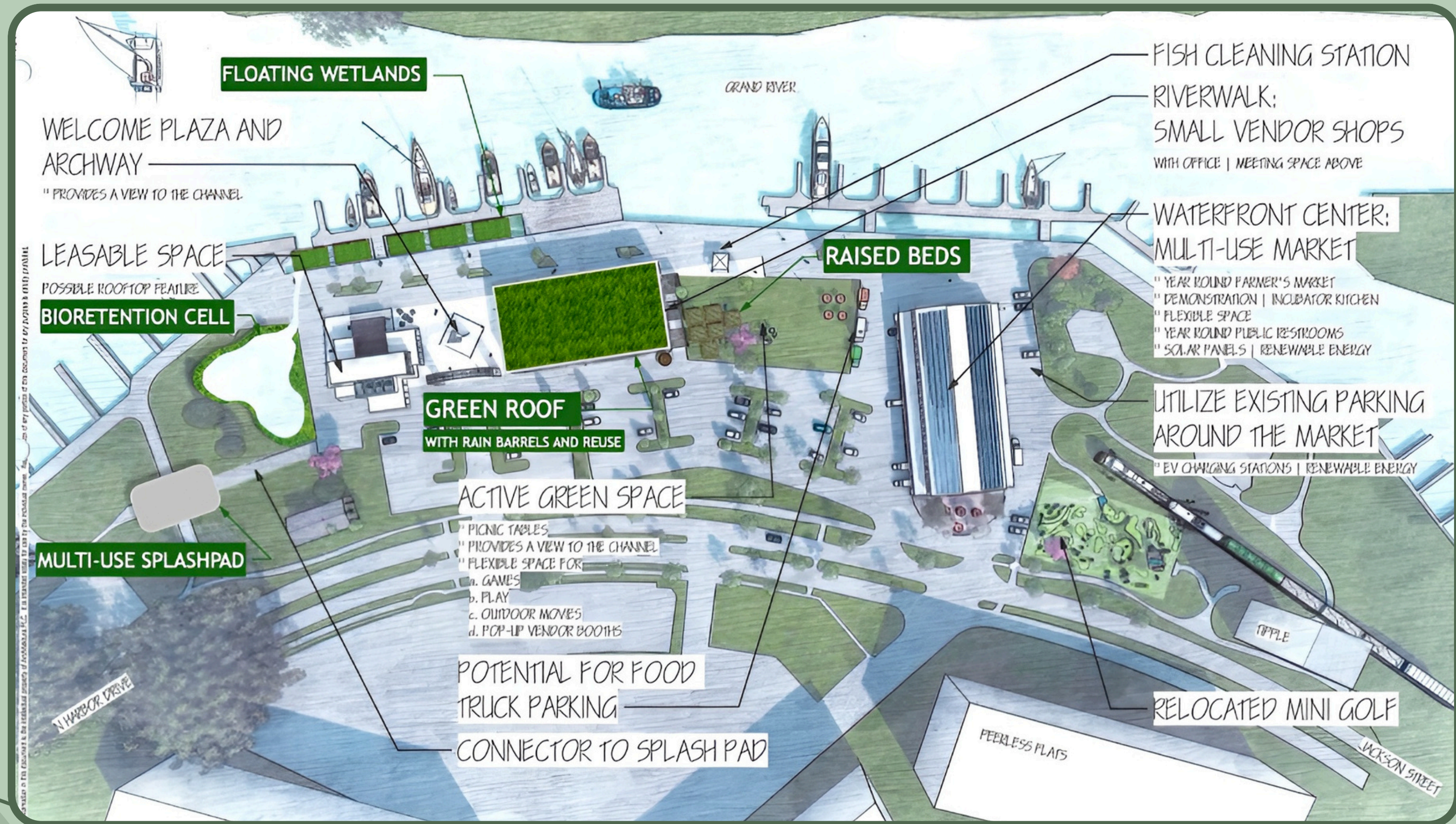
**Financial Assistance  
Mechanisms**



**Local Native Species  
Characteristics**

# Site Analysis Framework

# Results



# Policy Analysis & Recommendations

---

**Results**



# Financing & Native Species Applications

## Results

### Grand Haven Native Species Fact Sheet for Pollinator Gardens

**i Attributes**

**Wetland/Moist Soil**

Prefer wet meadows, marsh edges, or moist soils

See also: Swamp milkweed, Meadowsweet, & Early Figwort

**Meadow, Prairie, Upland**

Prefer drier meadows, prairies, or open uplands

See also: Tall Tickseed, Rough Cinquefoil, & Indian Hemp

**Versatile Generalists**

Tolerate a range of soil moisture, prefer rich soil

Found in both wet and upland areas

**Plant Choices**



Missouri Ironweed (*Vernonia missurica*)  
Ridell's Goldenrod (*Solidago riddellii*)  
Blue Lobelia (*Lobelia siphilitica*)



Pale Sunflower (*Helianthus decapetalus*)  
Horse Mint (*Monarda punctata*)  
Yellow Coneflower (*Ratibida pinnata*)



New England Aster (*Symphotrichum novae-angliae*)  
Smooth Aster (*Symphotrichum laeve*)  
Yellow Giant Hyssop (*Agastache nepetoides*)

This material is based upon work supported by the Department of Energy and the Michigan Department of Environment, Great Lakes, and Energy (EGLE) under Award Number EE0008653. The views expressed herein do not necessarily reflect those of the Michigan Department of Environment, Great Lakes, and Energy.

### Grand Haven Native Species Fact Sheet for Green Roofs

**Types**

**Extensive** Lowest Cost & Maintenance

Used for basic stormwater management

Habitat for moss, grasses, herbs, succulents, and sedum

**Intensive** Higher Cost & Maintenance

Used for Recreational Space and for Larger Plants

Habitat for perennials, shrubs, grasses, and trees

**Semi-Intensive** Moderate Cost & Maintenance

Used for a greater variety of vegetation than extensive roofs

Habitat for grasses, shrubs, sedum, and herbs

**Plant Choices**



Nodding Wild Onion (*Allium cernuum*)  
Wild Columbine (*Aquilegia canadensis*)  
Lanceleaf Coreopsis (*Coreopsis lanceolata*)



Hoary Vervain (*Verbena stricta*)  
Awi-fruited Sedge (*Carex stipata*)  
Nodding Wild Onion (*Allium cernuum*)



Black-Eyed Susan (*Rudbeckia hirta*)  
Woodland Stonecrop (*Sedum ternatum*)  
Chives (*Allium schoenoprasum*)

This material is based upon work supported by the Department of Energy and the Michigan Department of Environment, Great Lakes, and Energy (EGLE) under Award Number EE0008653. The views expressed herein do not necessarily reflect those of the Michigan Department of Environment, Great Lakes, and Energy.

# Prioritizing Transferability

---

Results



Interactive Case Study Framework



Selection Tool for Best Practices



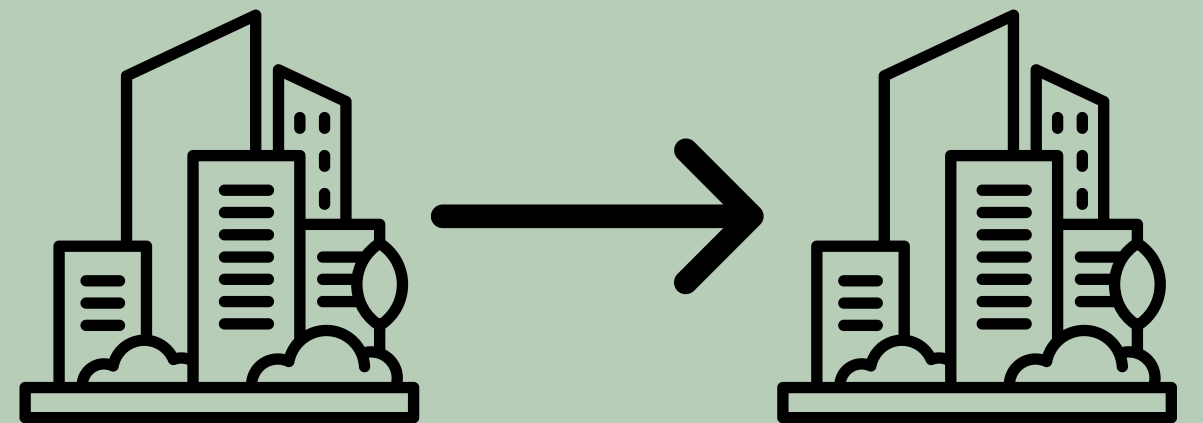
Financial Assistance Opportunities



Policy Identification & Recommendations



Resources & Native Species Information





GRAHAM SUSTAINABILITY INSTITUTE  
CENTER FOR EMPOWERING COMMUNITIES  
UNIVERSITY OF MICHIGAN



MICHIGAN DEPARTMENT OF  
ENVIRONMENT, GREAT LAKES, AND ENERGY

# Thank you!

Questions?

Access the Story  
Map Here!

