DEVELOPING A SUCCESSFUL STORMWATER PROGRAM

URBAN FORESTRY AND STORMWATER MITIGATION

Presented by:
Matthew Lake, M.S., CMS4S - Executive Director
Reggie Korthals - IDEM MS4 Program Coordinator
TREES & STORMWATER
There are many references relating trees and stormwater management.
Trees Tame Stormwater

Rain refreshes water land and nourishes the green landscape. But as houses, stores, schools, roads, and parking lots spread and natural tree cover is lost, so is the absorbing effect of vegetation and soil. The surplus rain becomes costly stormwater runoff. Without the benefits of trees and vegetated infrastructure, waterways are polluted as oils, heavy metal particles, and other harmful substances are washed away. Fish and wildlife suffer, drinking water becomes expensive or impossible to reclaim, property values are reduced, and our living environment is degraded.

Trees make a difference and every tree matters. It’s never too late for municipalities, homeowners, businesses, and schools to plant abundant trees to retain more water on-site, reduce percolation into the soil, reduce the expense of pipes and treatment plants, and protect environmental quality. For more information, including an interactive version of these pages, please visit arborday.org/stormwater.

Few Trees

1. Parking lots are easily converted to stormwater runnel and are a source of flood that is not only uncomfortable but increases air pollution.
2. Streets with the community of social benefits and ecological services. Following storms, water soaks along the street.
3. Asphalt Playgrounds are a potential source of pollution to the community.
4. Erosion-prone rivers and adjacent properties are at risk of heavy rain.
5. Compacted lawns do not absorb rainwater, instead adding extra volume to runoffs.
6. Tree-lined streets reduce property values and increase energy costs of cooling and heating.
7. Stormwater Systems can lead to reduced sewage being wet into stormwater. Upgrades are expensive, adding to local tax burdens.

Abundant Trees

1. Well-landscaped Parking lots can be designed to slow storm runoffs and beautify the community. They cost less than emergency services and air pollution control.
2. Tree-lined streets reduce property values, encourage shopping and business, reduce air pollution, and lower noise levels.
3. Nature education classrooms at schools can be combined with new community gardens and natural areas to serve as neighborhood parks.
4. Shaded homes and tree-lined yards make outdoor living more pleasant and provide practical benefits such as cooler breezes, shade, and reduced energy costs.
5. Rain gardens absorb excess runoff, reducing pollution and providing moisture for tree roots and flower beds. They also filter chemicals draining from walks, driveways, and streets.
6. Manageable Stormwater runoff results from abundant trees, multi-use catch basins, and rain gardens, reduced impervious surfaces, and increased ground vegetation. The benefits are lower costs and a more livable, sustainable environment.
Natural VS Developed

40% evapotranspiration

10% runoff

25% shallow infiltration

25% deep infiltration

Natural Ground Cover

30% evapotranspiration

55% runoff

10% shallow infiltration

75%-100% Impervious Cover

5% deep infiltration
Right Tree Right Place?

- Trees can be a tremendous asset or liability
- Many communities have to deal with many years of poor planning
Functions for SW Management

- **Transpiration** - Large quantities of water are pulled from the soil and released through the leaves as vapor

- **Interception** - Above ground surfaces intercept and absorb rainfall (reduce volume of peak flows)

- **Infiltration** - Root system growth & decomposition creates soil porosity which increases infiltration

- **Phytoremediation** - Biological processes break down harmful chemicals (metals, organic compounds, fuels etc.)
Multiple SW Benefits

• Reduce runoff thus hydrological impacts on streams and stream banks & flooding
• Root systems create soils conditions that promote infiltration which increases groundwater recharge
• Reduce temperature of stormwater runoff
• Trees biological processes transform pollutants into less harmful substances
• Help achieve goals of the Clean Water Act!
Water Treatment Plant

- Trees process stormwater naturally through biological processes
- More cost effective to use natural treatment strategies
Engineered Tree Planting Areas

- **Silva Cell** Sites designed to provide sufficient rooting zone, soil permeability, adequate hydration and drainage
  - Engineered structural soils
  - Permeable hardscapes
  - Curb opening
  - Subsurface drainage system
  - Use of cultivars

Illustration by AECOM
Quantify Benefits

- **National Tree Benefit Calculator** - [http://www.treebenefits.com/calculator/](http://www.treebenefits.com/calculator/)
  - developed by [Casey Trees](http://www.caseytrees.com) and [Davey Tree Expert Co.](http://www.davey.com)
  - Quantify an estimated amount of stormwater interception
  - A 24 inch DBH Northern Hackberry will intercept 3,026 gallons of stormwater runoff/year
i-Tree Inventory Software

http://www.itreetools.org/

• **i-Tree** free software suite from the USDA Forest Service that provides urban forestry analysis and benefits assessment tools

• **i-Tree Streets** allows any community to conduct and analyze a street tree inventory. Baseline data can be used to effectively manage the resource, develop policy and set priorities. Using a sample or an existing inventory of street trees, this software allows managers to evaluate current benefits, costs, and management needs

• **i-Tree Storm** establishes a standard method to assess widespread damage immediately after a severe storm in a simple, credible, and efficient manner
Management Goals

- Maximize the potential to gain optimal function
- Minimize infrastructure conflicts and liability
- Reduce unnecessary maintenance
- Ensure sustainability
URBAN TREES
(A STORMWATER LOW IMPACT DEVELOPMENT BMP)
Grey vs Green SW Systems

**Grey**
- Curbs
- Inlets
- Pipes
- Vaults
- Basins
- Outfalls

**Green**
- Swales
- Rain gardens
- Vegetative Buffers
- Wetlands
- Trees?

***Trees are usually considered just landscaping. How can we maximize their full potential?***
Green infrastructure techniques utilize natural systems, or engineered systems that mimic natural landscapes, to capture, cleanse and reduce stormwater runoff using plants, soils and microbes.

~ U.S. EPA

Example green infrastructure pictures from Fort Wright, KY and Portland, OR.
BMP – Managing Wet Weather with

- Urban trees cannot be considered a BMP unless there is implementation of management including:
  - Supported financially
  - Inventory
  - Maintenance
  - Dedicated staffing/responsibilities
  - Planning
  - Re-forestation/replacement
  - Ordinance/enforcement
IDNR Publications

**Challenges**

There is a serious disconnect between urban foresters and development planners regarding the importance of trees and stormwater management.

- The stormwater mitigation benefits of trees exceed almost any other alternative.
- Stormwater regulations do not consider the use of trees as cost-effective, natural stormwater management tools.

**Solutions**

- Trees are considered a storm water quality BMP and should be a part of each Storm Water Quality Management Plans (SWQMP) to treat storm water to the maximum extent practicable.
- The most effective way to mitigate storm water pollution from urbanization is to implement trees as best management practices (BMPs) in order to provide shade and influence runoff before it can affect water bodies downstream.

**Urban Forest BMP**

Urban forests improve the quality of stormwater runoff considerably by decreasing the amount of stormwater runoff and pollutants that reach our local rivers. They reduce pollutants by taking up pollutants from soils, vegetation, and sediments before they enter the stormwater system.

**Best Management Practice**

**STORMWATER MANAGEMENT AND URBAN TREES**

Urban forests improve the quality of stormwater runoff considerably by decreasing the amount of stormwater runoff and pollutants that reach our local rivers. They reduce pollutants by taking up pollutants from soils, vegetation, and sediments before they enter the stormwater system.

**Benefits**

- Trees prevent sediment from entering watersheds by stabilizing the soil and dispersing runoff in beneficial ways.
- Trees reduce thermal pollution in waterways protecting aquatic life, animals, and wildlife.
- Trees reduce runoff from impervious surfaces, reducing the frequency and extent of flood events.

**Goals**

- Protect urban woodlands and edges from the impacts of land development.
- Enhance the health, condition, and functions of urban forests.
- Increase the overall watershed forest cover and increase forest connectivity.

**Implementation**

- Pennsylvania Stormwater Management Plan
- Urban Stormwater Management Plan
- Indiana Stormwater Management Plan

**Resources**

- Urban Trees: The Ultimate Stormwater Treatment Plant
- Stormwater Management Plan
- Urban Forest Management Plan
- Urban Forest BMP

**Urban Trees**

Urban forests improve the quality of stormwater runoff considerably by decreasing the amount of stormwater runoff and pollutants that reach our local rivers. They reduce pollutants by taking up pollutants from soils, vegetation, and sediments before they enter the stormwater system.
MS4 COMPLIANCE
IDEM Stormwater Rules

- **Rule 5** – Stormwater Discharge Associated with Construction Activity

- **Rule 6** – Stormwater Discharge Associated with Industrial Activity

- **Rule 13** – Municipal Separate Storm Sewer Systems
General permit rule 327 IAC 15-13, regulates Municipal Separate Storm Sewer Systems (MS4s).

The federal Clean Water Act requires storm water discharges from certain types of urbanized areas to be permitted under the National Pollutant Discharge Elimination System (NPDES) program.

Currently 185 MS4 entities must comply with their permit through documentation, implementation of stormwater quality BMPs to the maximum extent practicable (MEP).
IDEM Permit Compliance

- Stormwater regulations entail substantial documentation for the MS4 Coordinator.
- IDEM conducts permit compliance activities that include audits, inspections, Stormwater Quality Management Plan (SWQMP) reviews.
Minimum Control Measures

• MCM1: Public Education and Outreach
  – Arbor Day Event with educational seminars
  – Brochures/Literature

• MCM 2: Public Involvement & Participation
  – Tree Planting Event with volunteers
  – Public Concerns/Complaints

• MCM 4: Construction Site Run-off Controls
  – Plan reviews (SWP3, LID & Landscaping Requirements)
  – Riparian zone plantings, rain gardens

• MCM 5: Post-construction Management
  – Proper Tree maintenance

• MCM 6: Pollution Prevention & Good Housekeeping
  – Training (tree pruning/care/maintenance)
  – Public tree inventory & data analysis (GIS/Inventory Software)
  – Tree City USA Designation (National Arbor Day Foundation)
    • Ordinance
    • Tree Board
    • Arbor Day
    • $2/capita
Annual Reports

- Can include urban forestry activities as a benefit for MS4 program
- Sometimes included within a section for “Above and Beyond” or as part of the other MCMs
Federal Guidelines

- EPA is stressing LID and Urban Forestry is a key component
- More MS4 entities are forming Stormwater Utilities and establishing funding $
- Urban foresters can partner/network with the stormwater program managers and IDEM
- Need the renewable resources (trees/vegetation) to help enhance and protect the non-renewable resource (stormwater)
MERRILLVILLE PROGRAM IMPLEMENTATION
Merrillville Street Tree Inventory
2012 i-Tree Streets Software

Street Tree Inventory
Town of Merrillville

Legend
- Street Tree Inventory 6-18-12
- Town Limits
- Merrillville Roads
• Noticed a lack of diversity which can lead to more susceptibility to pest & disease
• About 47% Soft Maples = High Maintenance

Total of 7844 street trees
Species List for New Development

- To enhance biodiversity and proper species selection, the town created a Tree Species list.
- Provides guidance for landscape architects preparing plans.
# Annual Benefits

Monetary ($) value per year

## Merrillville

### Total Annual Benefits of Public Trees by Species ($)

<table>
<thead>
<tr>
<th>Species</th>
<th>Energy</th>
<th>CO₂</th>
<th>Air Quality</th>
<th>Stormwater</th>
<th>Aesthetic/Other</th>
<th>Total ($)</th>
<th>Standard Error</th>
<th>% of Total $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver maple</td>
<td>133,510</td>
<td>21,726</td>
<td>21,797</td>
<td>165,964</td>
<td>183,971</td>
<td>526,967</td>
<td>0.0</td>
<td>60.7</td>
</tr>
<tr>
<td>Honeylocust</td>
<td>20,039</td>
<td>2,339</td>
<td>3,041</td>
<td>13,803</td>
<td>29,968</td>
<td>69,190</td>
<td>0.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Red maple</td>
<td>7,597</td>
<td>853</td>
<td>1,189</td>
<td>5,459</td>
<td>8,984</td>
<td>24,082</td>
<td>0.0</td>
<td>2.8</td>
</tr>
<tr>
<td>Callery pear</td>
<td>3,318</td>
<td>402</td>
<td>468</td>
<td>1,951</td>
<td>4,290</td>
<td>10,429</td>
<td>0.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Apple</td>
<td>3,749</td>
<td>372</td>
<td>516</td>
<td>1,407</td>
<td>1,352</td>
<td>7,396</td>
<td>0.0</td>
<td>0.9</td>
</tr>
<tr>
<td>American basswood</td>
<td>8,661</td>
<td>931</td>
<td>1,222</td>
<td>6,210</td>
<td>6,010</td>
<td>23,035</td>
<td>0.0</td>
<td>2.7</td>
</tr>
<tr>
<td>Green ash</td>
<td>11,876</td>
<td>1,614</td>
<td>1,867</td>
<td>11,024</td>
<td>14,411</td>
<td>40,792</td>
<td>0.0</td>
<td>4.7</td>
</tr>
<tr>
<td>Norway maple</td>
<td>8,249</td>
<td>998</td>
<td>1,278</td>
<td>6,163</td>
<td>8,106</td>
<td>24,794</td>
<td>0.0</td>
<td>2.9</td>
</tr>
<tr>
<td>American elm</td>
<td>9,962</td>
<td>984</td>
<td>1,651</td>
<td>10,223</td>
<td>8,265</td>
<td>31,085</td>
<td>0.0</td>
<td>3.6</td>
</tr>
<tr>
<td>Spruce</td>
<td>2,846</td>
<td>203</td>
<td>255</td>
<td>3,257</td>
<td>2,914</td>
<td>8,976</td>
<td>0.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Sugar maple</td>
<td>4,322</td>
<td>507</td>
<td>667</td>
<td>3,835</td>
<td>4,107</td>
<td>13,438</td>
<td>0.0</td>
<td>1.5</td>
</tr>
<tr>
<td>White ash</td>
<td>3,312</td>
<td>460</td>
<td>536</td>
<td>3,364</td>
<td>5,068</td>
<td>12,739</td>
<td>0.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Siberian elm</td>
<td>3,746</td>
<td>441</td>
<td>625</td>
<td>3,857</td>
<td>2,792</td>
<td>11,462</td>
<td>0.0</td>
<td>1.3</td>
</tr>
<tr>
<td>OTHER STREET TRI</td>
<td>19,454</td>
<td>2,373</td>
<td>3,081</td>
<td>19,721</td>
<td>18,799</td>
<td>63,427</td>
<td>0.0</td>
<td>7.3</td>
</tr>
<tr>
<td><strong>Citywide Total</strong></td>
<td>240,140</td>
<td>34,204</td>
<td>38,195</td>
<td><strong>256,237</strong></td>
<td>299,035</td>
<td><strong>867,811</strong></td>
<td><strong>0.0</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>
# Stormwater Benefits

Gallons of Rainfall Interception/Year

---

**Merrillville**

### Annual Stormwater Benefits of Public Trees by Species

<table>
<thead>
<tr>
<th>Species</th>
<th>Total rainfall interception (Gal)</th>
<th>Total ($)</th>
<th>Standard Error (N/A)</th>
<th>% of Total Trees</th>
<th>% of Total $</th>
<th>Avg. $/tree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver maple</td>
<td>6,123,705</td>
<td>165,964</td>
<td>(N/A)</td>
<td>39.7</td>
<td>64.8</td>
<td>53.33</td>
</tr>
<tr>
<td>Honeylocust</td>
<td>509,295</td>
<td>13,803</td>
<td>(N/A)</td>
<td>8.0</td>
<td>5.4</td>
<td>21.91</td>
</tr>
<tr>
<td>Red maple</td>
<td>201,423</td>
<td>5,459</td>
<td>(N/A)</td>
<td>6.5</td>
<td>2.1</td>
<td>10.70</td>
</tr>
<tr>
<td>Callery pear</td>
<td>71,983</td>
<td>1,951</td>
<td>(N/A)</td>
<td>5.9</td>
<td>0.8</td>
<td>4.25</td>
</tr>
<tr>
<td>Apple</td>
<td>51,920</td>
<td>1,407</td>
<td>(N/A)</td>
<td>5.8</td>
<td>0.6</td>
<td>3.09</td>
</tr>
<tr>
<td>American basswood</td>
<td>229,138</td>
<td>6,210</td>
<td>(N/A)</td>
<td>5.7</td>
<td>2.4</td>
<td>14.02</td>
</tr>
<tr>
<td>Green ash</td>
<td>406,743</td>
<td>11,024</td>
<td>(N/A)</td>
<td>5.6</td>
<td>4.3</td>
<td>25.28</td>
</tr>
<tr>
<td>Norway maple</td>
<td>227,396</td>
<td>6,163</td>
<td>(N/A)</td>
<td>4.3</td>
<td>2.4</td>
<td>18.34</td>
</tr>
<tr>
<td>American elm</td>
<td>377,201</td>
<td>10,223</td>
<td>(N/A)</td>
<td>2.8</td>
<td>4.0</td>
<td>47.33</td>
</tr>
<tr>
<td>Spruce</td>
<td>120,186</td>
<td>3,257</td>
<td>(N/A)</td>
<td>2.3</td>
<td>1.3</td>
<td>18.10</td>
</tr>
<tr>
<td>Sugar maple</td>
<td>141,489</td>
<td>3,835</td>
<td>(N/A)</td>
<td>1.9</td>
<td>1.5</td>
<td>26.45</td>
</tr>
<tr>
<td>White ash</td>
<td>124,111</td>
<td>3,364</td>
<td>(N/A)</td>
<td>1.5</td>
<td>1.3</td>
<td>29.25</td>
</tr>
<tr>
<td>Siberian elm</td>
<td>142,333</td>
<td>3,857</td>
<td>(N/A)</td>
<td>1.1</td>
<td>1.5</td>
<td>45.92</td>
</tr>
<tr>
<td>OTHER STREET TREES</td>
<td>727,650</td>
<td>19,721</td>
<td>(N/A)</td>
<td>9.2</td>
<td>7.7</td>
<td>27.31</td>
</tr>
<tr>
<td><strong>Citywide total</strong></td>
<td><strong>9,454,571</strong></td>
<td><strong>256,237</strong></td>
<td>(N/A)</td>
<td><strong>100.0</strong></td>
<td><strong>100.0</strong></td>
<td><strong>32.67</strong></td>
</tr>
</tbody>
</table>

---

29 ACRE-FEET/YEAR
In 2010 we revised the ordinance and included for more stormwater treatment requirements

Allow for flexibility for LID strategies

Introduced a simple procedure to comply with LID standards
LID Worksheet (points system)

- Applicant calculates the total amount of disturbed acreage X 100 to assess points needed.
- The quantity of BMP is calculated along with total points for each BMP.
- Any new emerging practices or technologies will be considered.
- Any trees planted in addition to what’s required by the Landscape Standards are valued a 5pts. each.
- Each BMP has a point value based on quantity.
- A score of 100 LID Points must be achieved for every acre of land disturbance.

![LID Worksheet Image]
Low Impact Development Factsheets

- Revised SW Technical Standards Manual to include Low Impact Development factsheets.

- One factsheet contains specifications for tree selection, installation and maintenance.
Tree Ordinance

- Established **Environmental Resource Committee** as a 5 member advisory review board (volunteers)
- Requires submittal of a Landscaping Plan
- Conservation of Trees During Development Standards
- Restrictions on Tree Planting, Pruning, Maintenance, Vandalism etc.. for Public Trees
- Enforcement

**EXHIBIT A**

**ORDINANCE NO. 10-23**

**TOWN OF MERRILLVILLE TREE ORDINANCE AND LANDSCAPE PLAN REQUIREMENTS**

**Purpose**

The intent of this document is to promote the public health, safety and welfare by establishing minimum requirements for the design, installation, and maintenance of woody vegetation and landscaping. These regulations are intended to achieve a number of functional and environment objectives to sustain Town-wide green infrastructure such as:

- Conserve existing woody vegetation.
- Require standards for landscape planning.
- Avoid conflicts with overhead and underground utilities.
- Protect trees from unnecessary damage during construction.
- Require sufficient mitigation of tree loss.
- Require proper tree planting, pruning and other related maintenance.
- Allow for early detection of pest and disease.
- Minimize soil compaction and control grade changes to protect root systems.
- Promote treatment of storm water runoff through vegetative buffers and trees.

**Establishment of an Environmental Resource Committee**

There shall be a committee that serves solely in an advisory capacity to the Town of Merrillville that shall be known as the Environmental Resource Committee composed of five (5) members who reside or work within Merrillville. Two (2) members are appointed by the Town Council, and three (3) members are appointed by the Town Manager/Administrator. The term of office for the members shall be one (1) year. Current members will be eligible to serve successive terms. The Town Council has the authority to remove any member at any time for any reason deemed sufficient. Vacancies will be filled by appointment for the remainder of the term.

**Environmental Committee Organization**

- The Environmental Committee shall elect from its membership a President and Vice-President whose respective terms shall be for one (1) year.
- The Environmental Committee shall have regularly scheduled meetings and may adopt written rules and procedures as necessary to carry out its stated duties and responsibilities.
- A majority of the members shall constitute a quorum for the transaction of business.
- The Town of Merrillville Public Works Director shall serve as the administrator for the Environmental Committee.

**Environmental Committee Duties and Responsibilities**

- The Environmental Committee shall serve in an advisory capacity to the Town of Merrillville and may provide guidance in the following areas:
  - Assist with technical standards concerning tree/shrub care, preservation, selection, installation, pest abatement, maintenance and removal located on Town-owned property.
  - Making recommendations to the Town of Merrillville Planning Commission on submitted landscaping plans prior to approval.
  - Participate in annual Arbor Day event and ensure reading of proclamation.
Landscape Standards

- Established requirements to get an approved landscaping plan
- Applicants submit plans which are reviewed by the Environmental Committee (ERC)
- ERC provides recommendations to the Plan Commission
Plan Review Checklist

- Applicant submits set of plans and completed checklist

- The Environmental Committee will review plans and make a recommendation to the Plan Commission.

- The Committee will hold meetings 1-2 weeks prior to the Plan Commission Meeting.
 ERC meets monthly and review landscape plans for new and re-development projects.

Recommendations from ERC are sent to Plan Commission for final approval.
Tree City USA & Arbor Day

- Have been a designated Tree City USA for 4 years which is good PR
- Arbor Day event provides opportunities for education and outreach activities that emphasize trees & stormwater
Urban Waters Initiative: Merrillville, Indiana

Overarching Project

Trees in Indiana’s urban areas have been proven to have specific monetary and ecological benefits. The focus of this project was to implement strategic urban forest plantings to maximize the functional benefits of trees to enhance our land, air, and water resources within the Great Lakes Basin. Many of the tributaries in Northwest Indiana are impaired water bodies that ultimately drain into Lake Michigan. Hoosiers get their water supplies from ground and surface waters, which can become significantly polluted from point and non-point sources (stormwater runoff).

Trees provide significant stormwater quality and flood management benefits. They absorb and remediate pollutants that impact our waterways, slow down, and store, large volumes of stormwater and stabilize soils to reduce erosion.

The Indiana Department of Natural Resources (IDNR), Community & Urban Forestry (CUF) Program allocated $75,000 in GLEIT grant funds to focus on three (3) significant projects in Northwest Indiana that would demonstrate practices on the ground to enhance impaired tributaries that flow into Lake Michigan.

On-the-ground Progress

The Town of Merrillville received one of the Urban Waters Initiative grants from the Indiana Department of Natural Resources Division of Forestry, CUF Program to address non-point source pollution and demonstrate how riparian tree plantings can enhance stormwater runoff within an urbanized watershed.

The project area was initially surveyed and select damaged/dead trees were removed. Additional clearing and snagging operations were conducted within the stream and along the banks to remove dead and/or displaced woody and non-woody debris.

This riparian planting site was previously a parking lot that was converted to green space by removing existing asphalt and concrete to convert this hardscape into a suitable planting site. This site is located along an unnamed tributary that drains into Turkey Creek which is also adjacent to a stormwater detention pond.

This fact sheet is part of a larger project that included regional targeted tree planting in three communities within Lake and Porter Counties. For more information please contact the IDNR Community and Urban Forestry Coordinator at (219) 234-4306 or urbanforestry@dnr.in.gov.

Project Breakdown

Grantee: Merrillville Stormwater Utility
Grant Award Amount: $35,000
Grant Match Amount: $11,729.72
Total Project Amount: $46,729.72
No. of Trees Planted: 50
No. of Trees Removed: 20

Over the next 20 years, this planting will provide Average Total Annual Benefits:

<table>
<thead>
<tr>
<th>Stormwater (gallons) sequestered</th>
<th>Stormwater benefits saved ($)</th>
<th>Air Quality improvement ($)</th>
<th>Pounds of CO₂ sequestered</th>
</tr>
</thead>
<tbody>
<tr>
<td>41,834</td>
<td>$1,133.64</td>
<td>$305.67</td>
<td>21,542 lbs</td>
</tr>
</tbody>
</table>

Total Average Annual Benefits Over 20 Years: $4,336

* Due to delayed construction of the Merrillville Stormwater Resource Center, an extended harvest water, and exceptionally wet spring, Merrillville scaled back their project only utilizing $35,000 in grant funds.

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, or where applicable, political beliefs, marital status, familial or parental status, sexual orientation, or all or part of an individual's income is derived from any public assistance program, or protected genetic information in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases will apply to all programs and/or employment activities.)
Rain Garden Project – IDNR Coastal Grant

- Installed 8000 ft$^2$ rain garden that included trees
- Other features included roadway redesign, thousands of native plants, signage and seating area with recycled benches
Volunteers help install the trees during Arbor Day (Public Participation MCM 2)

Solicited donations from local landscape companies to donate trees annually

Different species are planted each year with signage

**TULIP POPLAR**
*Liriodendron tulipifera*

Height: 70’-90’ Spread: 35’-50’
Zone: 4-9
Native to Eastern & Southeastern U.S.
Donated by Hubinger’s Landscaping
Training

- Partnered with Purdue University to host tree care workshop
- Invited surrounding communities and included risk tree assessment training
- Developed several brochures including LID, EAB & Proper Tree Pruning
EAB Treatment Pilot Test

- Investigated options for EAB management
Healthy trees mean....cleaner water

- Trees are the new technology to retain water

- A typical “community forest” of 10,000 trees will retain approximately 10 million gallons of rain water per year.
QUESTIONS?