# Gaining Consensus for Green Infrastructure
# Rain to Recreation

**May 2nd, 2017**

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# Rain to Recreation:
# Keys to Success/Presentation Outline

*Introduction to Lenexa*

*Gaining Concensus for Green Infrastructure:*

- Build on Popular Opinion
- Provide Appropriate Regulation
- Partner with Development
- Lead By Example
- Engage the Public

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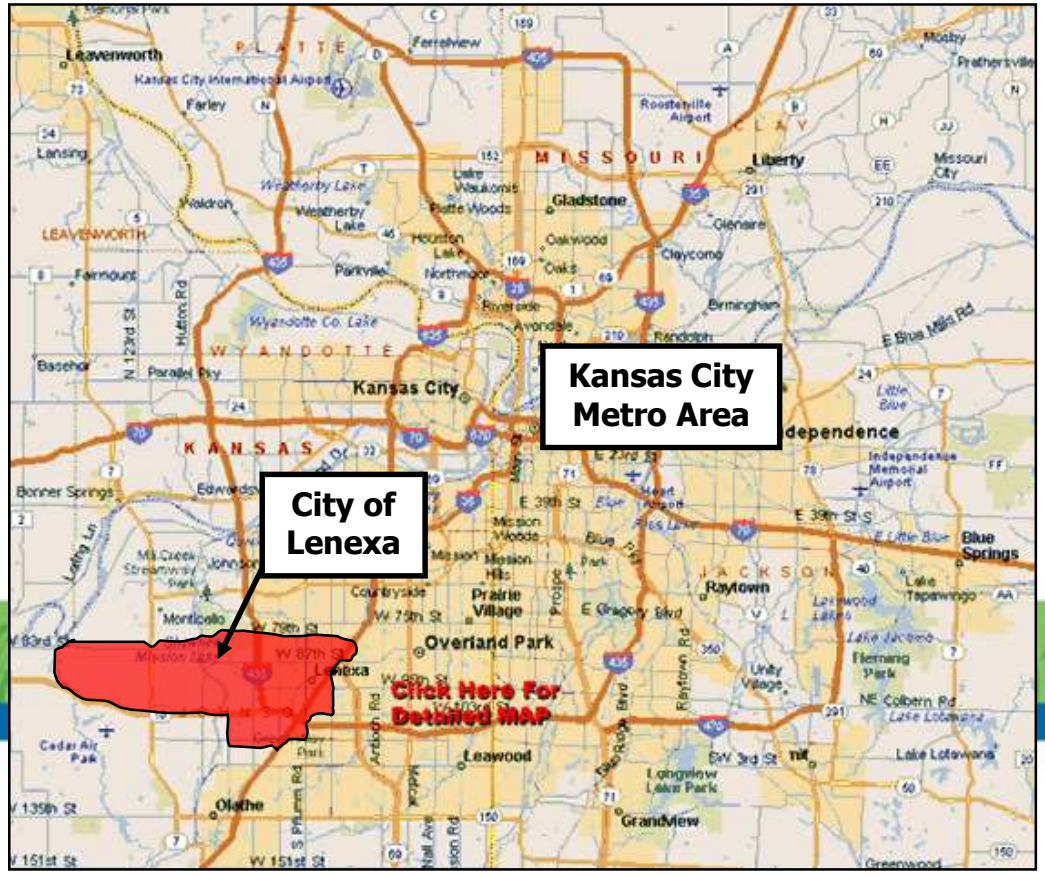
# Introduction to Lenexa

- Kansas City Metro Area population 2 million
- 52,000 residents
- 34 sq. miles

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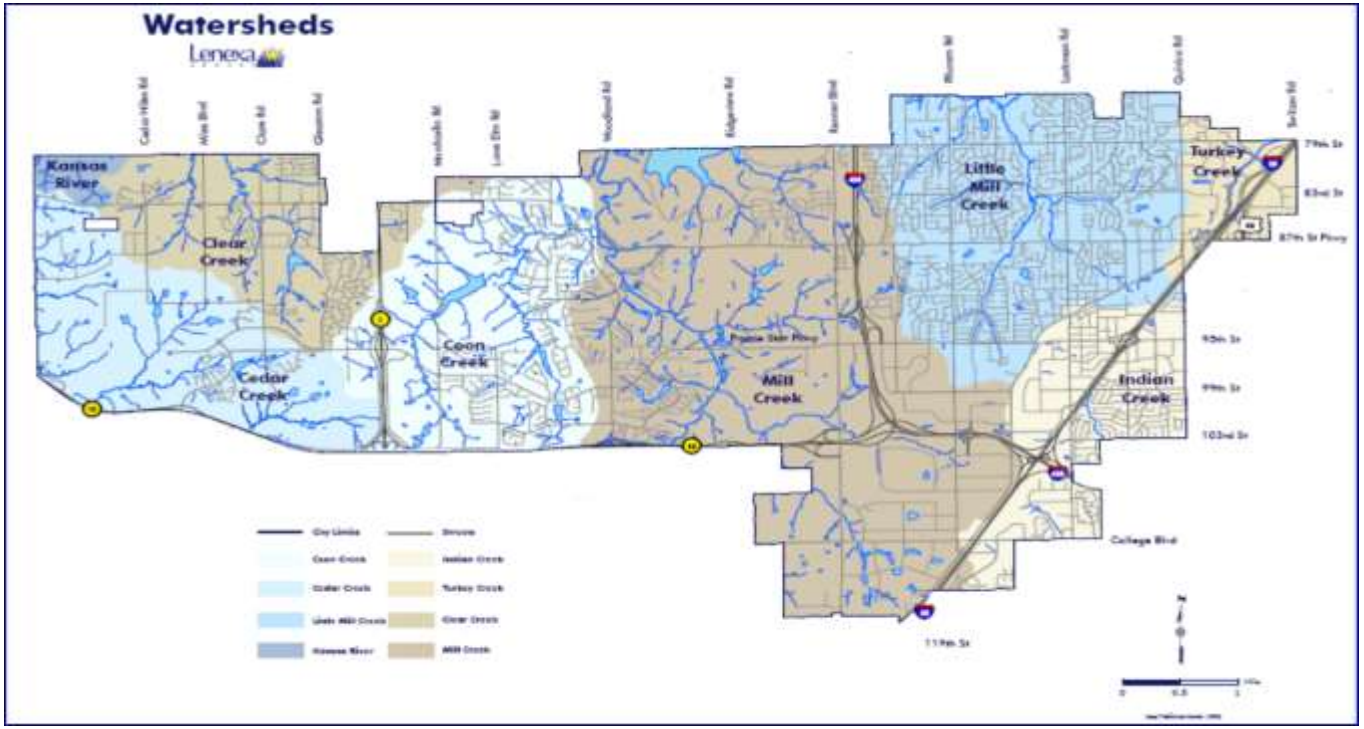
# Introduction to Lenexa




Watersheds drain to the Kansas and Missouri Rivers

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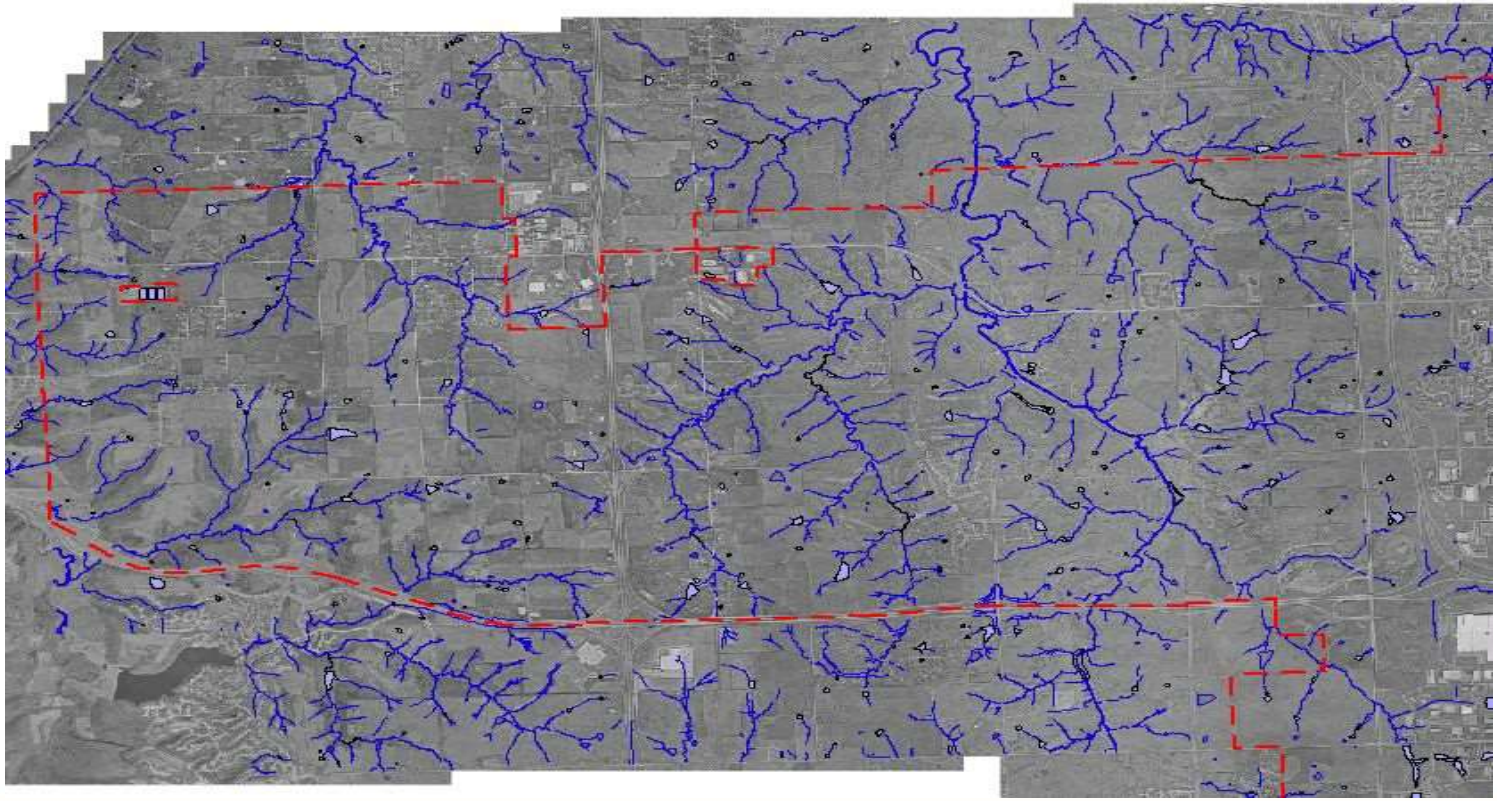
# Stream Inventory



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# rain to recreation

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**View Stormwater as an amenity not a liability**

# *Build on Popular Opinion:*
# Lenexa Vision 2020

- Maintain a balance between natural and manmade environments
- Utilize and preserve the natural vegetation
- Maintain ample public open space
- Develop a comprehensive strategy for water, wastewater, and stormwater
- Investigate regional facilities for stormwater management

Lenexa Vision 2020

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# *Build on Popular Opinion:*
# Recreation

- Regional Facilities

- All projects include recreation component
  - Water Quality
  - Flood Control
  - Recreation
  - Preserve Open Space and Natural Resources

# *Build on Popular Opinion:*
# Citizen Survey

- 15% had stormwater problems *(most reported were not structural flooding issues)*
- Nearly 80% believe water quality and open space are extremely important and are willing to pay for it

# Program Funding:

| **Annual Summary** | **2005** | **2015** |
|---|---|---|
| • Sales Tax – Local 1/8th Cent | $1,000,000 | N/A |
| • General Fund (property tax) | $ 700,000 | N/A |
| • Service Charges (Utility Fees) | $1,970,000 | $5,000,000 |
| • Grants (Fed., St., Co., Prvt.) | $ 300,000$ | 300,000 |
| • Permit Fees (Grading, site dev) | $ 115,000$ | 90,000 |
| • System Development Charge | $ 450,000$ | 300,000 |
| **TOTAL Revenues** | **$4,535,000** | **$5,690,000** |

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# *Regulate:*
# NPDES Phase II

- Public Education and Outreach
- Public Participation and Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Runoff Control
- Post-Construction Runoff Control
- Pollution Prevention/Good Housekeeping

# *Regulate:*
# Site Development Standards

- Stream Setback Ordinance
- BMP Maintenance Ordinance
- Updated Detention and Post construction BMP Regulations

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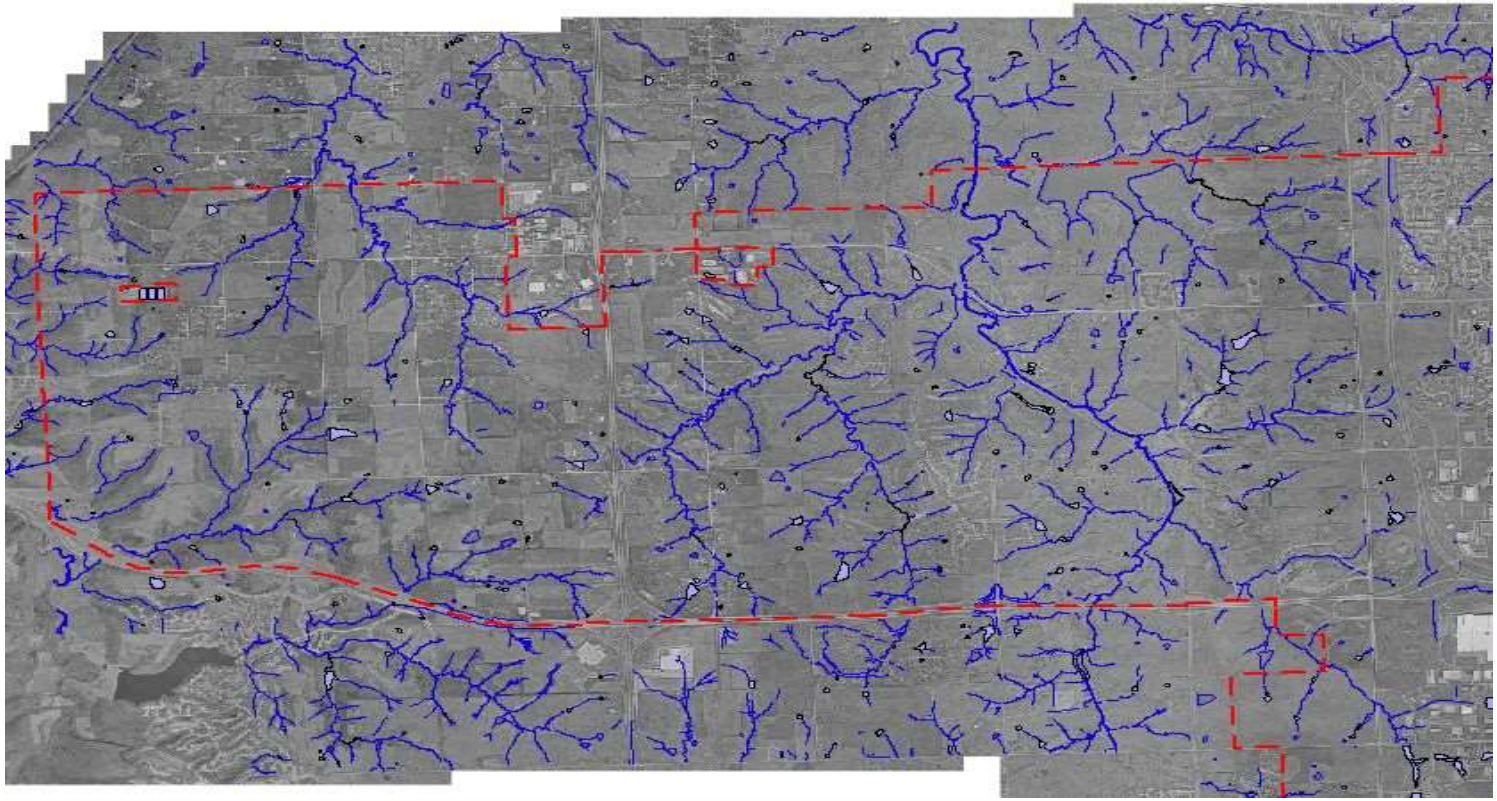
# Stream Inventory



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# *Regulate:*
# Detention and Post Construction BMP Requirements (BMP Manual)

- Green Infrastructure Requirement for all new development and redevelopment (BMP Manual)
  - Based on increase in runoff
  - Encourages preservation of open space
  - Encourages use of infiltration methods
- Full Spectrum Detention Requirements

# *Regulate:*
# MARC/APWA BMP Manual (Preserve Open Space)

**WORKSHEET 1: REQUIRED LEVEL OF SERVICE - UNDEVELOPED SITE**

*(Recalculated for BMP Option Package No. 3 with native grass lawns)*

Project: ***BMP Manual Example No. 2*** By: SAS Date: 11/20/07
Location: Smallville, Kansas Checked: Date:

**1. Runoff Curve Number**

**A. Predevelopment CN**

| Cover Description | Soil HSG | CN from Table 1 | Area (ac.) | Product of CN x Area |
|---|---|---|---|---|
| Pasture, good | B | 61 | 51.00 | 3111 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | Totals: | 51.00 | 3111 |

Area-Weighted CN = total product/total area = 61 (Round to integer)

**B. Postdevelopment CN**

| Cover Description | Soil HSG[1] | CN from Table 1 | Area (ac.) | Product of CN x Area |
|---|---|---|---|---|
| Buildings | NA | 98 | 10.00 | 980 |
| Parking | NA | 98 | 22.00 | 2156 |
| Native grass | *B* | *58* | 16.00 | 928 |
| Pond | NA | 98 | 3.00 | 294 |
| | | | | |
| | | | | |
| | | | | |
| | | Totals: | 51.00 | 4358 |

*Group B only if topsoil is preserved according to Appendix A.*

[1] Postdevelopment CN is one HSG higher for all cover types except preserved vegetation, absent documentation showing how postdevelopment soil structure will be preserved.

Area-Weighted CN = total product/total area = 85 (Round to integer)

**C. Level of Service (LS) Calculation**

| | | Change in CN | LS |
|---|---|---|---|
| Predevelopment CN: | 61 | 17+ | 8 |
| | | 7 to 16 | 7 |
| Postdevelopment CN: | *85* | 4 to 6 | 6 |
| | | 1 to 3 | 5 |
| Difference: | 24 | 0 | 4 |
| | | -7 to -1 | 3 |
| LS Required (see scale at right): | 8 | -8 to -17 | 2 |
| | | -18 to -21 | 1 |
| | | -22 - | 0 |

***Note: CN reduction from original plan not enough to reduce LS in this case.***



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# *Regulate:*
# MARC/APWA BMP Manual (Encourage Infiltration practices)

Table 4.4
Best Management Practice Value Ratings

| Cover Type or BMP | Median Expected Effluent EMC TSS (mg/L)[a] | Value Ratings: Water Quality Value | Volume Reduction | Temperature Reduction | Oils/ Floatables Reduction | Overall Value Rating |
|---|---|---|---|---|---|---|
| **Vegetation** | N/A | 5.25 | 2 | 1 | 1 | 9.25 |
| Native Vegetation preserved or established | | | | | | |
| **Rain Garden** | < 10 | 4 | 2 | 1 | 2 | 9.0 |
| A small residential depression planted with native vegetation designed to capture and infiltrate runoff | | | | | | |
| **Infiltration Practices** | < 10 | 4 | 2 | 1 | 2 | 9.0 |
| Infiltration Basin | | | | | | |
| Infiltration Trenches | | | | | | |
| **Bioretention** | < 10 | 4 | 1.5 | 1 | 2 | 8.5 |
| Small engineered and landscaped basins designed to filter runoff before release | | | | | | |
| **Pervious or Porous Pavement** | 10-20 | 3 | 1.5 | 1 | 2 | 7.5 |
| Pervious Concrete | | | | | | |
| Porous Asphalt | | | | | | |
| Modular Concrete Block | | | | | | |
| **Extended Detention Wetland** | < 10 | 4 | 2 | 0 | 1 | 7.0 |
| A land area that is permanently wet with hydric soils sized to detain the WQv for a minimum of 40 hours. | | | | | | |
| **Media Filtration Practices** | < 10 | 4 | 0 | 0 | 2 | 6.0 |
| Surface Sand Filter | | | | | | |
| Underground Sand Filter | | | | | | |
| Pocket Sand Filter | | | | | | |
| Perimeter Sand Filter | | | | | | |
| **Extended Wet Detention** | 10 - 20 | 3 | 2 | -1 | 1 | 5.0 |
| A basin intended to have a permanent pool and sized to detain the WQv for a minimum of 40 hours | | | | | | |
| **Vegetated Filter Strip** | 10 - 20 | 3 | 1 | 0 | 1 | 5.0 |
| Buffer strip with native vegetation treating sheet flow | | | | | | |
| **Native Vegetation Swale** | 10 - 20 | 3 | 1 | 0 | 0 | 4.0 |
| Native grasses and forbes planted in a swale to reduce velocity of runoff and promote infiltration | | | | | | |
| **Extended Dry Detention Basin** | 20 - 50 | 2 | 1 | 0 | 1 | 4.0 |
| A basin lined with native plant species designed to detain the WQv for a minimum of 40 hours with no permanent impoundment of water | | | | | | |
| **Other Systems** | 10 - 100 [b] | 1-3 [b] | 0 | 0 | 2 | 3.0-5.0 [b] |
| Proprietary Media Filtration Devices | | | | | | |
| Hydrodynamic Devices | | | | | | |
| Baffle Boxes | | | | | | |
| Catch Basin Inserts | | | | | | |
| **Signage** | N/A | N/A | N/A | N/A | N/A | BMP VR = 0.25 [a] |
| **Green Roofs –** No VR, Credit for Post Concrstrcution CN Reduction, See Design Section | | | | | | CN Credit See Design |

Notes:

TSS Total suspended solids

mg/L Milligrams per liter

a Expected median event mean concentrations of TSS is based on analysis of studies in International BMP Database www.bmpdatabase.org
Source: *Analysis of Treatment System Performance, International Stormwater Best Management Practices (BMP) Database* 1999-2005. Feb. 2006

b Jurisdiction will assign the score based on independent 3rd party field data showing expected event mean concentrations TSS in the effluent. However, if the proprietary BMP relies on sedimentation as the primary pollutant removal mechanism, then performance data over the range of

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# Regulations:
# Post Construction BMP Maintenance

- Full Time BMP Inspector
- Inspect at least every three years.

# *Partner With Development:* Cottonwood Canyon

Impacted Stream

Project Area Prior to Restoration

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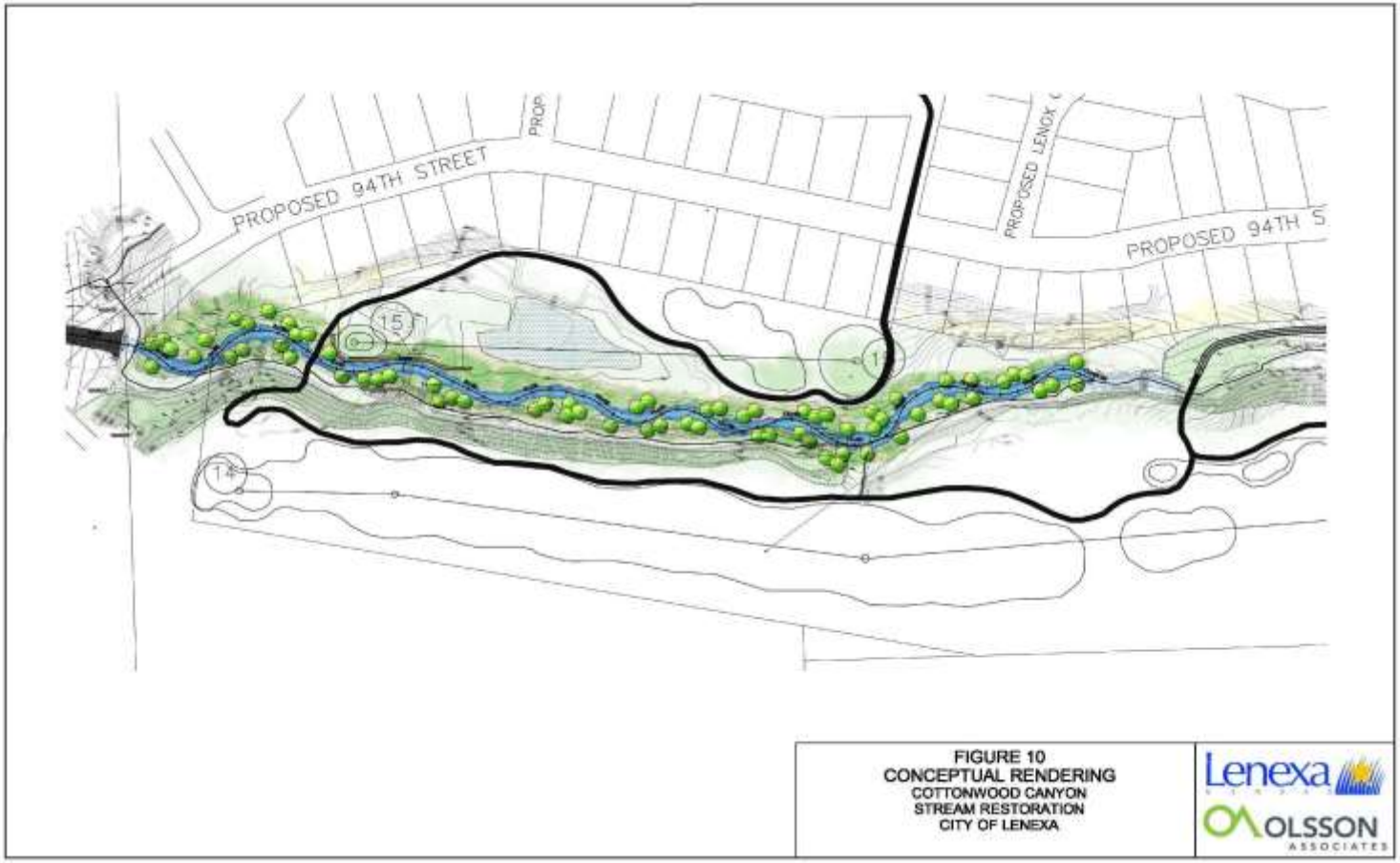
# *Partner With Development:*
# Cottonwood Canyon

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# *Partner With Development:*
# Cottonwood Canyon

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# *Lead By Example:*
# Regional Projects

- City Center
- Lake Lenexa
- Clear Creek Wetlands

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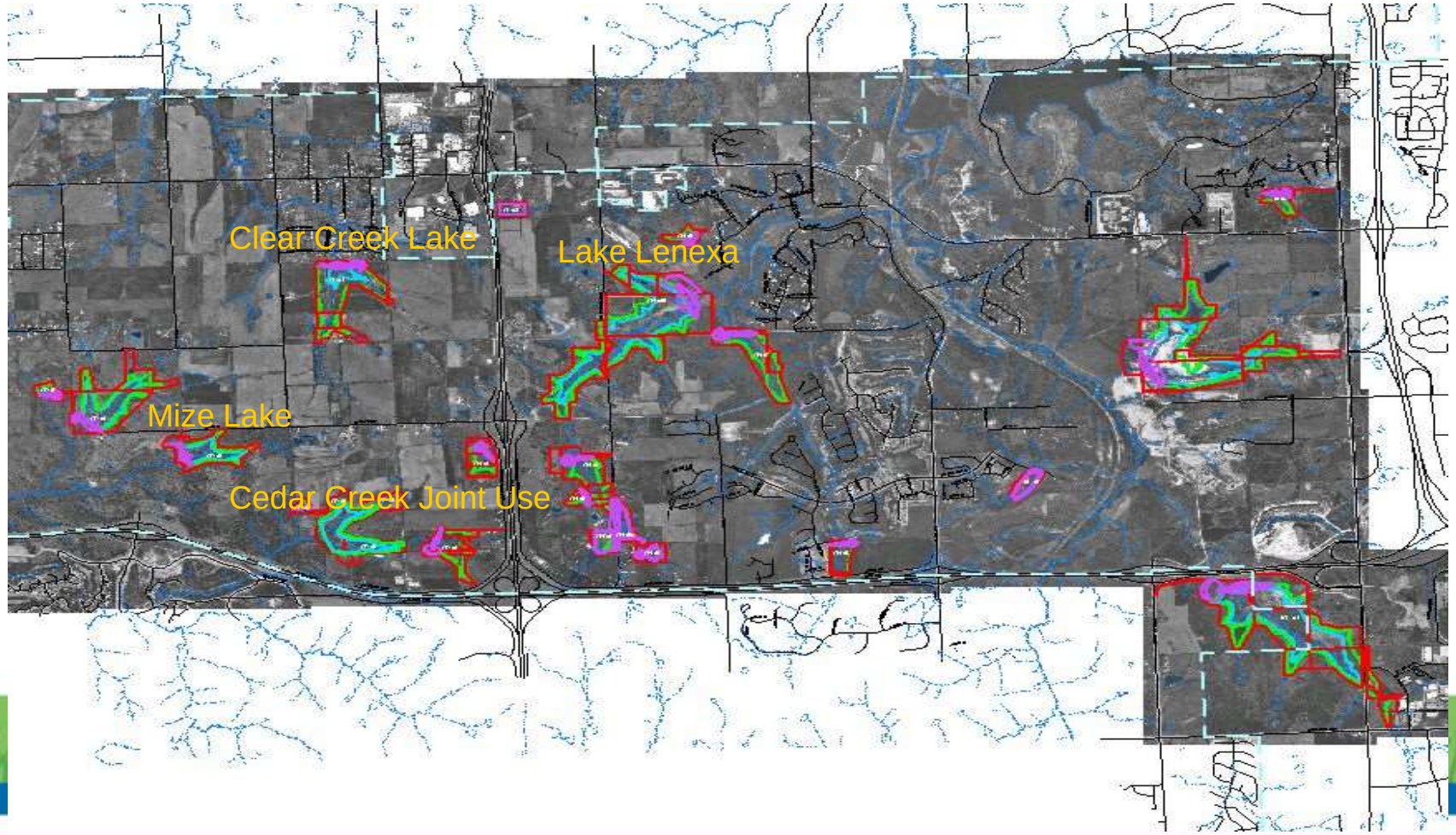
# Regional Retention & Detention

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# City Center

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*Adopted*
*April, 2007*

**Lenexa City Center Neighborhood**
**Design Standards & Guidelines**

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# City Center



## Stormwater Management

**Intent:**
To manage stormwater quantity and improve water quality by capturing and cleaning stormwater nearest the source from which it is generated, as it pertains to the particular location and site characteristics of the City Center neighborhood.

**Standards & Guidelines:**

1. All stormwater facilities shall comply with the City of Lenexa standards, specifications and details, unless otherwise approved by the City Engineer.
2. American Public Works Association (APWA) Design Criteria Section 5600, as amended, shall govern all drainage design.
3. All developments shall comply with the City of Lenexa stream setback requirements, Lenexa City Center Watershed and Stormwater BMP Study (URS 2004), and Stormwater Management Study Report for the Lenexa City Center North Subshed (URS 2006).
4. All developments shall capture and manage, with on-site Best Management Practices (BMPs), the (1.37 inch) stormwater quality volume. Release of this volume shall occur over no less than a 24 hour period.
5. BMPs shall be selected to address the amounts and types of pollutants mobilized and transported from specific site features as close to the source as possible. A "treatment train" approach will be the preferred approach to treatment as demonstrated in the APWA Manual of BMPs for Stormwater Quality Management. The Lenexa City Center Watershed and Stormwater BMP Study (URS 2004) defines urban pollutants of concern and their sources in addition to other pollutants such as herbicides, insecticides, chloride and other metals.
6. In addition to plans and graphic information, at time of preliminary and final plan approval, a written explanation of stormwater management facilities and practices shall be submitted for each development project. At time of preliminary plan, the manner, location and distributed proportion of stormwater treatment for the 1.37" water quality volume, that will be accommodated in the stormwater facilities utilizing the treatment train approach, shall be determined and incorporated into the preliminary plan approval.
7. Non-structural BMPs play an important role in the management of stormwater quality and should be employed as good operating practice. Examples are street and parking lot sweeping, appropriate lawn fertilizing and associated soils testing, pet waste and other solid waste cleanup (litter, trash and debris) and appropriate management and operation of structural stormwater BMPs.

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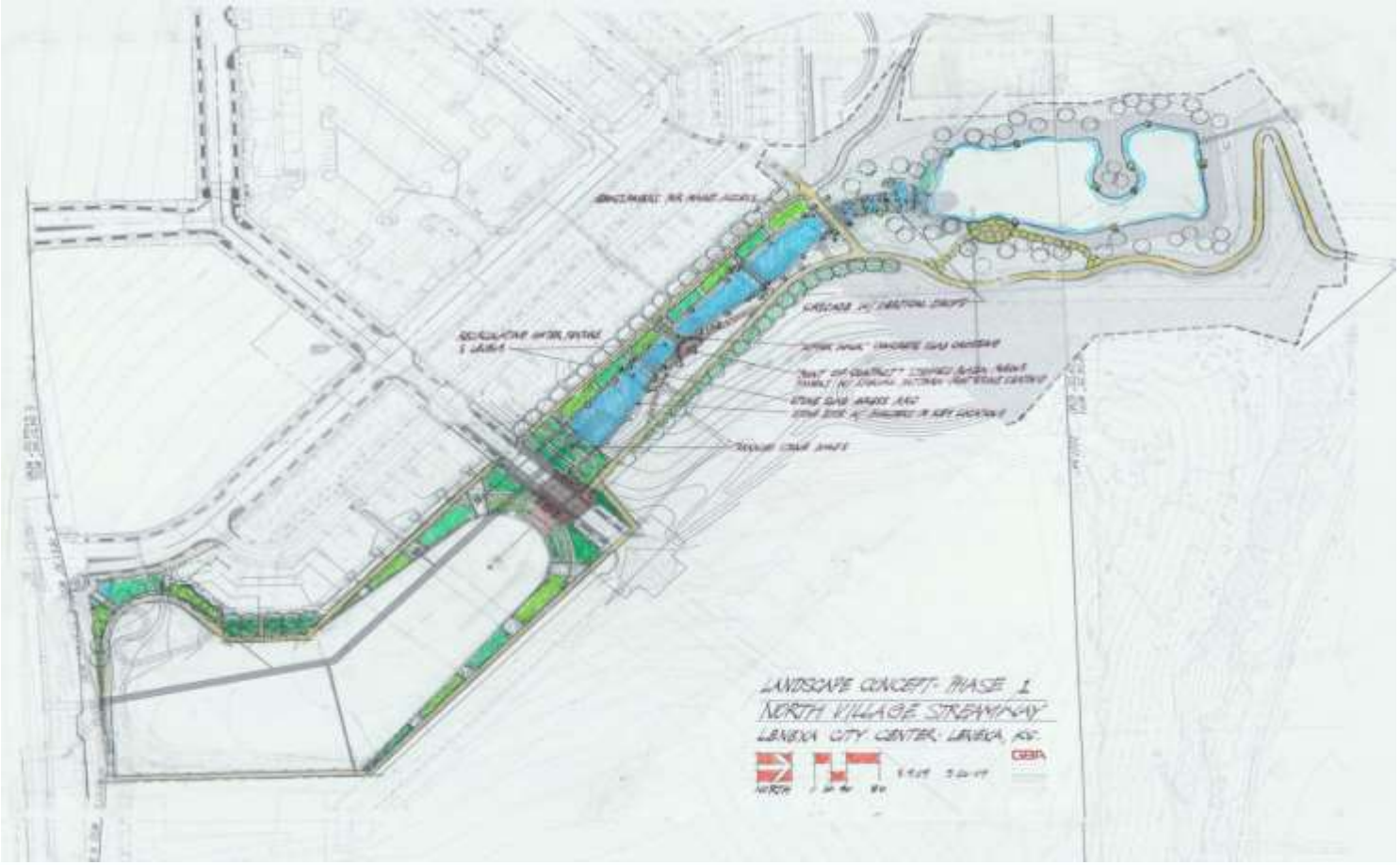
# City Center Central Green

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# City Center Central Green

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# Lake Lenexa & Blackhoof Park

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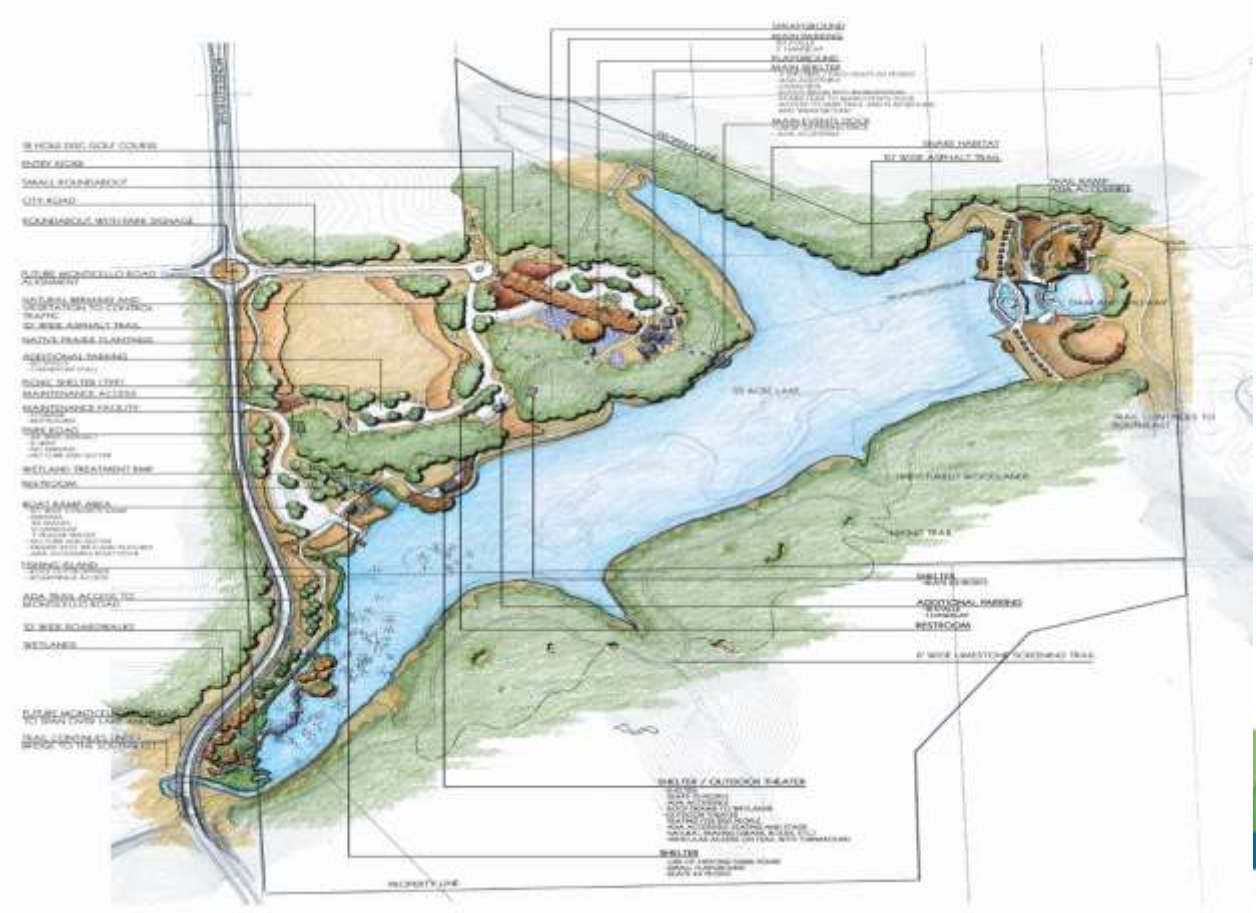
# Black Hoof Park & Lake Lenexa

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# Black Hoof Park & Lake Lenexa

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# Black Hoof Park & Lake Lenexa

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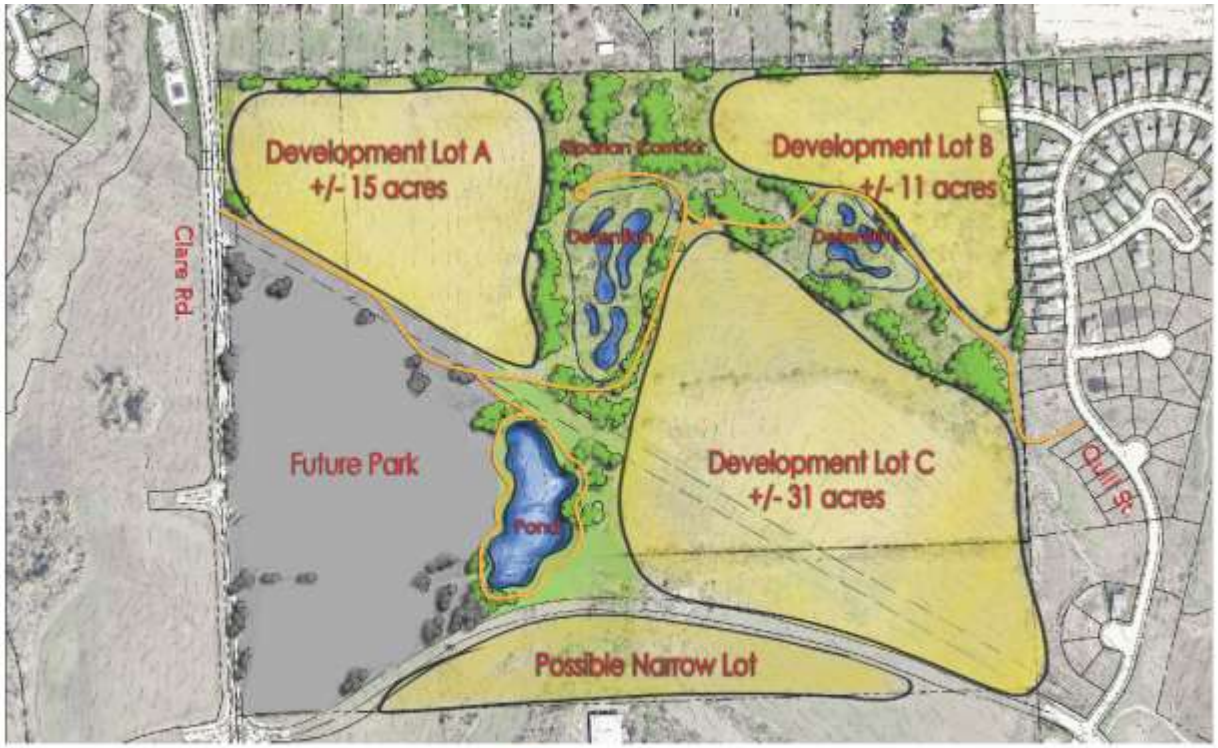
# Clear Creek Wetlands




Clear Creek Regional Stormwater Facility
Lenexa, Kansas

OCHSNER HARE & HARE
OLSSON ASSOCIATES
not to scale

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# Clear Creek Wetlands

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# *Lead By Example:*
# Good Maintenance Practices

- Two Full Time Crews
- 330 Acres of Riparian Zone
- 110 Native Planting Areas/BMP's

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# *Lead By Example:*
# Good Maintenance Practices - Have a Purpose

To engage the community and gain their acceptance it is important to have a purpose that you can easily communicate to them.

- Storm water quality improvement

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# *Lead By Example:*
# Good Maintenance Practices - Have a Purpose

To engage the community and gain their acceptance it is important to have a purpose that you can easily communicate to them.

- Storm water quality improvement
- Wildlife habitat

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# *Lead By Example:*
# Good Maintenance Practices - Have a Purpose

To engage the community and gain their acceptance it is important to have a purpose that you can easily communicate to them.

- Storm water quality improvement
- Wildlife habitat
- Money saving

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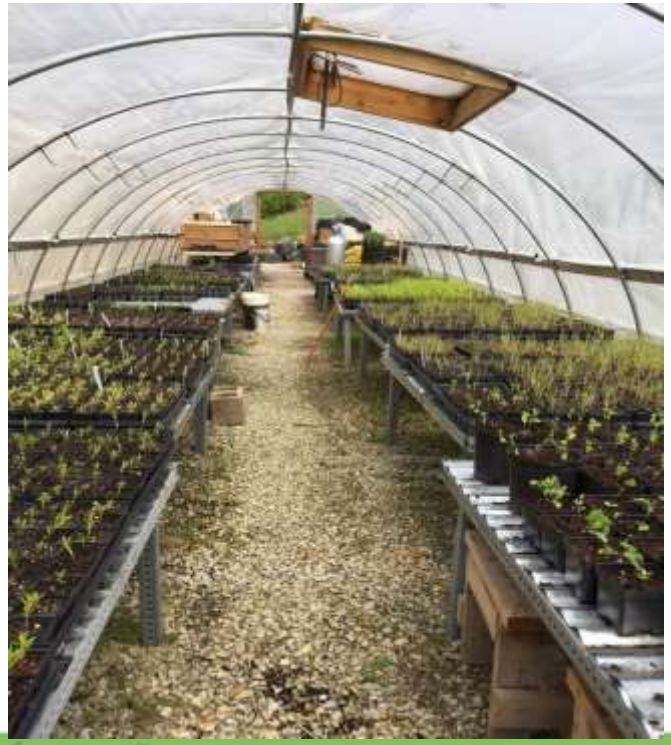
# *Lead By Example:*
# Communication

Having a way to communicate the purpose of a green infrastructure is a necessity.

- Bi-weekly e-mail to residents
- Quarterly mailers
- Social media

# *Engage the Public:*
# Volunteer Opportunities

- Honeysuckle removal
- Seed collection
- Stream Cleanup
- Planting
- Plant Propagation



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# *Engage the Public:*
# Special Events

- Healthy Yards Exposition
- STEAM Camp
- Learning About Lenexa

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# *Engage the Public:*
# Do It Yourself

- BMP Cost Share Program
- Rain Barrel Workshops
- Monarch Habitat Classes

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# Rain to Recreation:
# Keys to Success/Summary

*Gaining Concensus for Green Infrastructure:*

- Build on Popular Opinion
- Provide Appropriate Regulation
- Partner with Development
- Lead By Example
- Engage the Public

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# Contact Information:

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