

# KDHE Clean Water Neighbor Program Sunset Zoo Bio-Retention Area Gardens (K-State Demonstration Project)

The Kansas Department of Health and Environment (KDHE) has provided financial assistance to this project through USEPA Section 319 Nonpoint Source Pollution Control Grant #C9007405 14 (KDHE Funding Codes 3889 2649598).

## Project Description:

This project shows how stormwater can be slowed and captured in a plant-and-soil system while highlighting aesthetic qualities of herbaceous grasses and forbs native to the Flint Hills Eco-Region.

This garden includes five vegetated pools or shallow basins to collect and infiltrate a portion of the stormwater running off of roadways, sidewalks, and other parts of the zoo above the bio-retention area. Installation was initiated during Fall 2011 by Manhattan City and Sunset Zoo personnel, working with K-State faculty, staff and students. After City and Zoo staff removed, underutilized asphalt and several loads of topsoil were added and concrete pools and terraces created. The bio-retention area garden was planted with native prairie species in October 2011 and is being maintained by Sunset Zoo staff, Lee Skabelund, and community volunteers.

## Fall 2011 Construction Photos:



Photos by Lee R. Skabelund (left) & Dede Brokesh (right) – September 23, 2011 and October 2, 8 & 22, 2011 (L to R / T to B).

# KDHE Clean Water Neighbor Program

## Sunset Zoo Bio-Retention Area Gardens – Manhattan, Kansas



Frank's Sedge



Little Bluestem



Purple Prairie Clover



Spiderwort



Coreopsis

### Prairie Species supplied by Applied Ecological Services:

#### Grasses and Sedges

- Andropogon gerardii* Big Bluestem – 16 @ 1.53 = \$24.48  
*Buchloe dactyloides* Buffalo Grass – 144 @ 1.53 = \$220.32  
*Bouteloua curtipendula* Sideoats Grama – 64 @ 1.53 = \$97.92  
*Carex frankii* Frank's Sedge – 96 @ 1.53 = \$146.88  
*Carex stricta* Upright Sedge – 64 @ 1.53 = \$97.92  
*Panicum virgatum* Switchgrass – 16 @ 1.53 = \$24.48  
*Schizachyrium scoparium* Little Bluestem – 160 @ 1.53 = \$244.80

#### Forbs (Wildflowers)

- Asclepias incarnata* Swamp Milkweed – 16 @ 1.53 = \$24.48  
*Coreopsis lanceolata* Lance-leaf Coreopsis – 32 @ 1.53 = \$48.96  
*Eupatorium perfoliatum* Common Boneset – 16 @ 1.53 = \$24.48  
*Tradescantia ohiensis* Common Spiderwort – 64 @ 1.53 = \$97.92

### Prairie Species supplied by Bluebird Nursery:

#### Grasses

- Bouteloua gracilis* Blue Grama - 32 @ 1.20 = \$38.40  
*Sporobolus heterolepis* Prairie Dropseed – 64 @ 1.50 = \$96.00

#### Forbs (Wildflowers)

- Amorpha Canescens* Lead Plant – 16 @ 1.31 = \$20.96  
*Asclepias tuberosa* Butterfly Milkweed – 32 @ 1.31 = \$41.92  
*Callirhoe involucrata* Purple Poppy Mallow – 32 @ 1.50 = \$48.00  
*Dalea purpurea* Purple Prairie Clover – 32 @ 1.31 = \$41.92  
*Oenothera macrocarpa* 'Missouri' Evening Primrose – 32 @ 1.31 = \$41.92  
*Ratibida pinnata* Yellow Coneflower - 16 @ 1.20 = \$19.20

### Trees and Shrubs supplied by Blueville Nursery:

- Aronia melanocarpa* Black Chokeberry (3) - \$26.50ea  
*Betula nigra* 'Heritage' River Birch (Heritage) (1) - \$80.00 – with 6-8 bags of Cottonburr compost added  
*Hydrangea quercifolia* Oakleaf Hydrangea (9) - \$28.00ea  
*Juniperus communis* 'AmiDak' Common Juniper (Blueberry Delight) (6) - \$28.00ea  
*Ostrya virginiana* American Hophornbeam (1) - \$48.00  
*Physocarpus opulifolius* Purple Leaf Ninebark (Summer Wine) (2) - \$28.00ea  
*Pinus mugo* 'Mops' Miniature Mugo Pine (Mops) (3) - \$12.00ea  
*Rhus aromatic* 'Gro-low' Fragrant Sumac (Gro-low) (12) - \$12.00ea  
*Rhus typhina* 'Bailtiger' Staghorn Sumac (Tiger Eyes) (1) - \$44.00  
*Symphoricarpos x chenaultii* 'Hancock' Chenault Coralberry (2) - \$28.00ea  
*Viburnum dentatum* 'Christom' Arrowwood Viburnum (Blue Muffin) (10) - \$28.00ea

For more on plants named above refer to Kansas Wildflowers & Grasses: <http://www.kswildflower.org/about.html>  
and USDA-NRCS Plants Database: <http://plants.usda.gov>





Photo by Lee Skabelund – August 30, 2011 during tear-out of impervious asphalt and concrete paving.



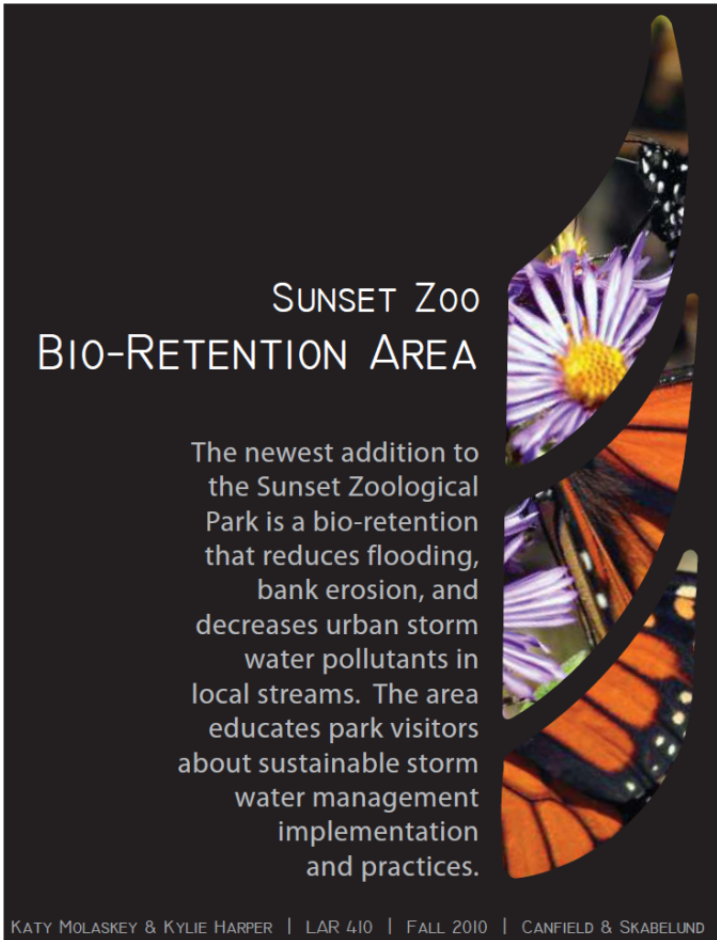
Photos by Lee R. Skabelund – October 20, 2011 & December 21, 2011 planting of native species within one of five pools. Kylie Harper, Will Mann & Katy Molaskey help plant the basin closest to the concession stand and amphitheater.



**SUNSET ZOO  
BIO-RETENTION AREA**

The newest addition to the Sunset Zoological Park is a bio-retention that reduces flooding, bank erosion, and decreases urban storm water pollutants in local streams. The area educates park visitors about sustainable storm water management implementation and practices.

KATY MOLASKEY & KYLIE HARPER | LAR 410 | FALL 2010 | CANFIELD & SKABELUND




Fall 2010 LAR 410 Final Planting Design project – selected by Sunset Zoo administrators as the guide for the Bio-Retention Area. Project prepared by Katy Molaskey & Kylie Harper (studio professors – Lee R. Skabelund & Jessica Canfield)



Bio-Retention Area project site prior to construction (underutilized parking area and sidewalk) – July 1, 2010 (Irs)





June 21, 2012 photos (lrs) of the pools less than 10 hours after a two-inch, four-hour storm event filled the pools. Infiltration works!