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).
Prairie Species supplied by Applied Ecological Services:
Grasses and Sedges – planted in Fall 2011
*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) – top 4 planted in Fall 2011; bottom 7 planted in Fall 2012
*Asclepias incarnata* Swamp Milkweed – 16 @ 1.53 = $24.48
*Careopsis 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
*Baptisia bracteata var. leucophaea* Plains Wild Indigo – 9 @ 1.70 $15.30
*Liatris punctata* Dotted Gayfeather – 9 @ 1.53 = $13.77
*Liatris pycnostachya* Thickspike Gayfeather – 9 @ 1.25 = $11.25
* Lobelia siphilitica* Blue Lobelia – 9 @ 1.25 = $11.25
*Mimulus ringens* Allegheny Monster Flower – 9 @ 1.25 = $11.25
*Penstemon cobaea* Cobaea Penstemon – 10 @ 1.53 $15.30
*Penstemon digitalis* Foxglove Beardtongue – 9 @ 1.25 = $11.25

Prairie Species supplied by Bluebird Nursery:
Grasses – planted in Fall 2011
*Bouteloua gracilis* Blue Grama – 32 @ 1.20 = $38.40
*Sporobolus heterolepis* Prairie Dropseed – 64 @ 1.50 = $96.00

Forbs (Wildflowers) – planted in Fall 2011
*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: planted in Fall 2011
*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 – with cottonburr compost added
*Juniperus communis* ‘AmiDak’ Common Juniper (Blueberry Delight) (6) - $28.00ea
*Ostrya virginiana* American Hophornbeam (1) - $48.00 – with cottonburr compost added
*Physocarpus opulifolius* Purple Leaf Ninebark (Summer Wine) (2) - $28.00ea
*Pinus mugo* ‘Mops’ Minature 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.

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!