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Final report for KDHE-KSU rain garden demo project (grant period: 2/1/07 to 6/30/08)

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Final Report for KDHE – KSU Rain Garden Demo Project (Grant Period: 2/1/07 to 6/30/08)
Lee R. Skabelund, KSU – Principal Investigator (submitted October 23, 2008)

1. Summary of accomplishments for each project goal and objective.

PROJECT GOAL: Create a rain-garden within the Campus Creek Watershed at Kansas State University to enhance the environmental setting, reduce stormwater run-off, and improve water quality. Demonstrate specific ways to address urban stormwater runoff to KSU administrators, staff, faculty, students, and visitors. *One two-cell rain-garden was successfully designed and implemented at KSU's International Student Center during Spring and Summer 2007. Monitoring and maintenance have continued since that time. A substantial amount of in-kind time was provided by students, faculty, staff and professionals during all phases of the project.*

OBJECTIVES:

- 1) Develop a graphic plan/design for a rain-garden along Campus Creek by building upon work initiated during the one-day design charrette (held Oct. 27, 2006). *Many graphic plans/designs were completed during the Fall 2006 planning/design charrette. A design for the ISC Rain-Garden was then developed and completed.*
- 2) Engage KSU administrators, staff, faculty, and students in a discussion of water quality concerns and solutions related to urban stormwater runoff. Work with landscape architects and other professionals to formulate plans and designs for this area of Campus Creek. Complete detailed plans/designs for a rain-garden and streambank improvements. *Completed for the ISC Rain-Garden project and initiated for other projects (such as the ongoing green roof design work for Seaton Hall). Completed detailed plans/designs for the first rain-garden to be implemented at KSU and prepared educational information (poster, fact sheet, power point presentation, news articles, website, and rain-garden guidebook). Shared results with many different groups and individuals.*
- 3) Secure approvals, equipment, materials, and participation; and complete other construction planning and coordination. *Completed for the ISC Rain-Garden.*
- 4) Use volunteer labor and donated materials/vegetation to create a rain-garden above Campus Creek in order to reduce stormwater inputs from a small area of upslope buildings, turfgrass, and eroding landscape. *Completed at the ISC Rain-Garden.*
- 5) If deemed feasible during final design, initiate minor streambank improvements along a small, adjacent portion of Campus Creek. *So as not to be undermined, streambank improvements should wait until additional upstream and upland stormwater BMPs are implemented within the Campus Creek Watershed. However, some work may be possible near the ISC.*
- 6) Document expected short- and long-term monitoring, management and evaluation needs. *Documented in Rain-Garden Guidebook.*

2. Lessons learned.

Rain-gardens can be constructed successfully on nearly every property (even on heavy clay soils) and will help address larger urban stormwater management concerns as sufficient numbers of these and other stormwater BMPs are effectively implemented and managed. As with all dynamic ecological systems they take intelligent, creative, and persistent effort.

3. Remaining project needs, if any.

There are no outstanding project needs. Ongoing monitoring and maintenance are required for any rain-garden project and are expected to continue in the years to come at the ISC.

Products Produced during the Project:

Project products included detailed plans/designs for the first rain-garden to be implemented at KSU and the following educational information: a project poster (displayed at three different conferences, two fact sheets, a power point presentation (shared at several different conferences and in KSU classes), news articles, a project website, and via the rain-garden guidebook. Project results have been shared with many different groups and individuals (on-site and via presentations and the Internet).

The two most significant products of the project are:

1) **KSU-ISC Rain-Garden** – installed to handle roof runoff for a portion of the International Student Center at Kansas State University as well as surface water runoff from the area east of the ISC.

Two potential rain-garden locations were originally seen as possible locations for the proposed demonstration project at the KSU-Manhattan campus given the need to slow and filter runoff in these areas as well as their visibility and adaptability. The “front yard” of the International Student Center (between the Taiwan Wing and Campus Creek) was chosen as an ideal location to create a highly-visible rain-garden on the KSU campus. This decision was strongly encouraged and supported by KSU Facilities/Grounds staff, by KSU’s Landscape Advisory Committee, and ISC staff.

2) Designer’s Guide to Rain-Garden Planning, Design and Implementation

This guidebook addresses key ideas related to rain-garden planning/design, implementation, and maintenance – and discusses lessons learned at KSU’s International Student Center Rain-Garden. The guidebook should benefit both landowners and planners/designers by describing important considerations related to rain-garden planning, design and management. The full title and an outline are presented below:

***Rain-Garden Design and Implementation for Kansas Property Owners:
With a Discussion of Lessons Learned from Kansas State University’s
International Student Center Rain-Garden Design-Build
Demonstration Project in Manhattan, Kansas***

Introduction

What a rain-garden looks like and how it functions

Why rain-gardens are needed and valued

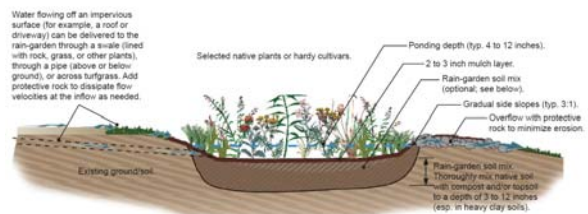
Other stormwater management options

Steps to Create a Successful Rain-Garden

1. Understanding Your Property and Its Context
2. Locating and Sizing a Rain-Garden
3. Preparing a Place-Specific Rain-Garden Planting Design
4. Excavating and Preparing Soil for the Rain-Garden
5. Installing and Watering Plants
6. Monitoring and Caring for Your Rain-Garden

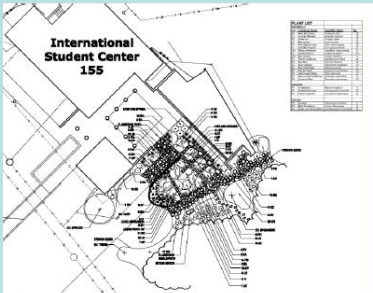
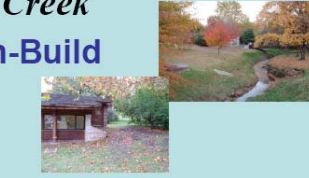
Common Rain-Garden Questions & Answers

Appendices (Case Studies, including designs and plant list for the KSU-ISC Rain-Garden)



Restoring Hydrologic Processes along Campus Creek

The KSU International Student Center Design-Build Rain-Garden Demonstration Project



Plan prepared by Cary Thomsen (MLA 2007)

Project inspired by KSU-LAR Stormwater Management Charrette



This image shows the pre-existing conditions, the planting design, and a few construction photos.

Integrating Education, Research, and Practice

project poster prepared in late May 2007

Kansas State University Stormwater Management Project - Manhattan, Kansas
Integrating Education, Research, and Practice

KSU School of Geography, Planning, and Environmental Sciences
KSU School of Architecture, Planning, and Environmental Sciences
KSU School of Civil and Environmental Engineering
KSU School of Environmental and Earth Sciences
KSU School of Landscape Architecture
KSU School of Life Science
KSU School of Public Administration
KSU School of Public Health
KSU School of Social and Behavioral Sciences
KSU School of Theology

The poster contains a grid of images and text. On the left, there are several small photographs showing construction and landscaping. In the center, there are larger diagrams and maps, including a site plan and a cross-section of the rain garden. On the right, there are several columns of text describing the project's goals, methods, and results. At the bottom, there are more photographs of the completed project and people working on it.

LAR 420 (Natural Systems & Site Analysis) students participate in a pre-semester field visit to Campus Creek where they learned practicals for sampling riparian instream quality by wading and sampling. The results of Fall 2005 sampling along Campus Creek alerted KSU to high fecal coliform (E. coli) counts, leading to additional studies by other KSU-LAR students in Spring 2007.

E-walk tests provide clues about water quality along Campus Creek.

LAR 420 students look for macroinvertebrates along Campus Creek on Oct. 26, 2006 as a way to better understand water quality indicators.

Poster shared at the American Ecological Engineering Conf. (2007) and Dialogue on Sustainability (2007 & 2008)

Project Timeline:

Pre-Project Activities:

May-June 2006 – Project Scoping. The project was initially discussed in late May and June 2006 with Mark Taussig and Dea Brokesh (Landscape Architects with KSU Facilities). Mark discussed the idea with KSU Housing staff and a field meeting was held to discuss the project on July 27, 2006. Several follow up visits took place since that time, including visits with staff at the International Student Center (ISC). *In December 2006, after completion of site analysis work by LA/RCP students, it was determined that design and implementation of a rain-garden west of the ISC is preferred.*)

July-October 2006 – Project Planning and Coordination by KSU faculty, staff and students.

October 2006 – Preliminary Water Quality Monitoring; Professional Presentations/Lectures addressing Innovative Stormwater Management; completion of the KSU-LA/RCP Planning and Design Charrette involving professionals and various KSU faculty, staff and students. *A full-day design charrette was held on Oct. 27, 2006 to develop conceptual plans/designs for stormwater BMPs in the Campus Creek Watershed and to creatively address their surrounding (upstream and downstream) contexts.* The charrette was preceded by three “integrated stormwater management and design presentations” on Oct. 26, 2006. Tom Price (Conservation Design Forum – Elmhurst, Illinois), Andrea Kevrick (Insite Design – Ann Arbor, Michigan), Dennis Haag (Tetra Tech – Kansas City), and a number of other professionals assisted with the conceptual planning/design work during the charrette. Student-faculty-staff-and-professional teams considered potential water-sensitive designs for the area along Campus Creek – in association with the very large parking lots northwest of the Wind Erosion Lab (lots B16 & B3) and in the vicinity of Boyd Hall, the Derby Dining Complex, and the International Student Center.

November-December 2006 – Post Charrette Dialogue and Planning; Site Analysis of the Project Target Area by KSU-LA/RCP students; Site Selection for Stormwater Management BMP.

January 2007 – Final Design of a Rain-Garden for selected International Student Center site.

Project Activities:

January-February 2007 – Construction Planning and Coordination (secured approvals, equipment, materials, and participation by volunteers and other project partners).

March-June 2007 – Installed the Rain-Garden (site preparation and rain-garden excavation, creation of berms and a level-spreader, rock work, permeable pathway construction, and planting). *Construction of the ISC Rain-Garden took place beginning in March 2007 – following detailed design work; securing of approvals, equipment, materials, and labor; and completing other necessary construction planning and coordination activities.*

July 2007-August 2008 – Maintained the ISC Rain-Garden, Took Photographs, installed Three Rain-Bowl Sculptures, and Prepared a Document to Describe the Project Process and Outcomes. The document was given the following title: *Rain-Garden Design and Implementation for Kansas Property Owners: With a Discussion of Lessons Learned from Kansas State University’s International Student Center Rain-Garden Design-Build Demonstration Project...*

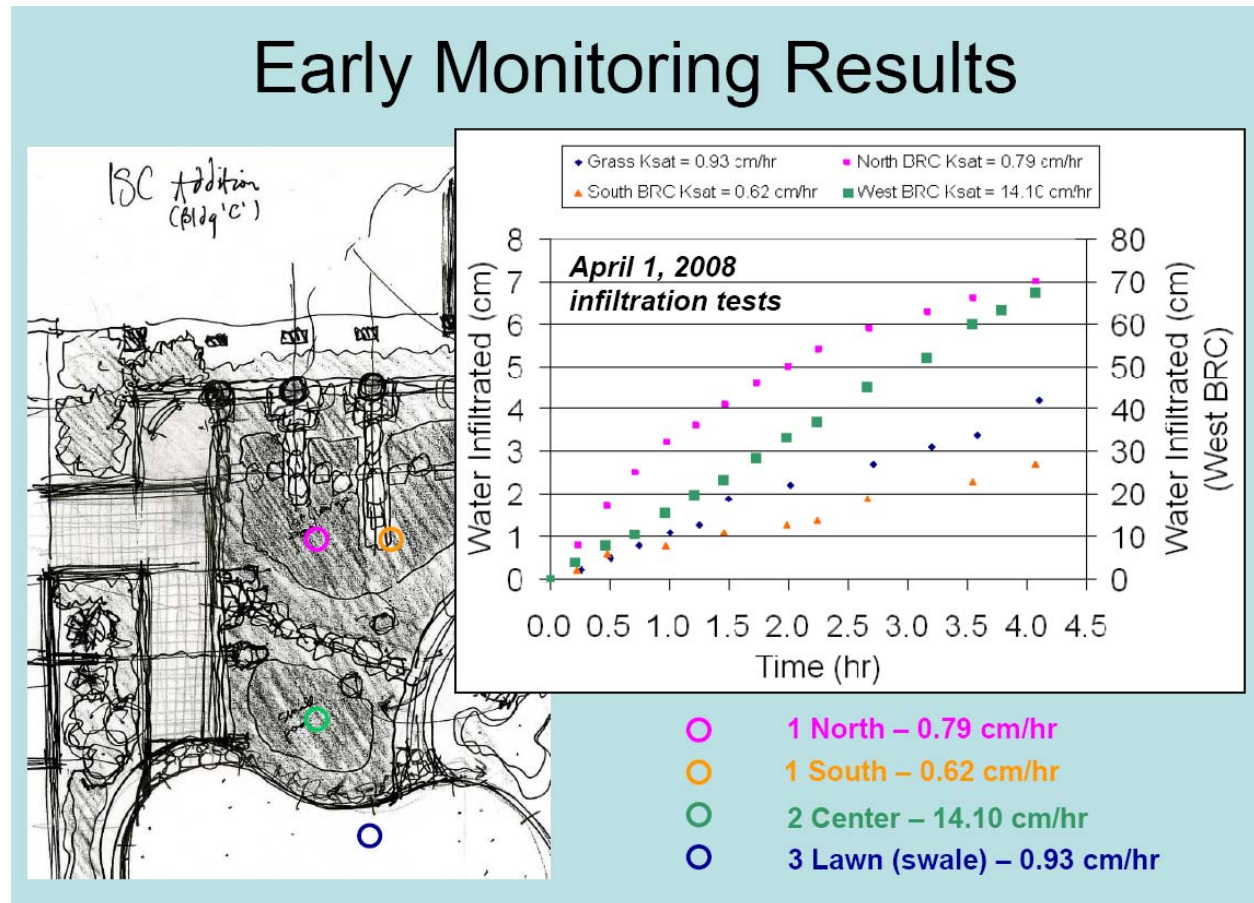
August 2008 – Prepared a Final Project Performance Report for KDHE, addressing what was accomplished, lessons learned, and future tasks, plans or actions. *KSU students have been involved in planning, design and water-quality monitoring, and are expected to contribute to construction, water-quality monitoring, and longer-term maintenance/management.*

Water Pollution Control Technology:

No new technologies were proposed or implemented. Rather, a rain-garden demonstration was designed and implemented to encourage better stormwater practices at KSU, throughout Kansas, and beyond. Given the interest shown by Kansas communities to date, the project has achieved this objective.

Monitoring and Urban Pollutants Addressed:

The Project Manager consulted with biological engineering faculty at KSU and determined that formal monitoring was **not** necessary given the nature of water moving into the ISC Rain-Garden. Nevertheless, several infiltration and bulk density tests were performed in early 2008 to provide a sense of soil conditions in the rain-garden at that point in time (see results below).



Excerpted from a PowerPoint Presentation prepared for the EPA Wetlands and Watersheds Conference (April 2008)

Additional funding would be required in order to undertake longer-term monitoring and to document the performance of the implemented rain-garden in relation to nitrogen, phosphorus, sediments, and thermal pollution. We hope to do a flood test to determine exactly how quickly water evaporates, transpires, or infiltrates into the soil.

Monitoring and management of vegetation has been the primary concern and was initiated in April 2007.

Maintenance Issues:

As expected, many common weeds and invasive species need to be removed during the first year, with bush honeysuckle and buckthorn seeding into the informal permeable pathway and into parts of the rain-garden. Because of the proximity of the rain-garden to a significant source of mature honeysuckle and buckthorn pulling seedlings from these and other species will be an on-going maintenance issue, even with excellent coverage by native grasses, sedges, and wildflowers. An excerpt from the rain-garden guidebook (see next page) provides additional insights regarding monitoring and maintenance.

Innovations and Long-Term Prospects:

The project is innovative within its local context. This was the first design-build rain-garden to be implemented at KSU in Manhattan, Kansas. To jump-start the planning/design process, professionals interacted with students and KSU graduates and transferred knowledge about innovative stormwater management practices.

Of necessity the implementation of this demonstration project was small and focused – with a primary goal being education (generating greater interest, commitment, and understanding in ecologically-based stormwater management at KSU, in the City of Manhattan, and in other parts of Kansas).

Our hope is that larger projects will be designed and implemented at KSU as a result of this completed demonstration project. The Rossville Community Rain-Garden Project is an example of one project that benefited greatly from the work at KSU's International Student Center.

Lessons Learned:

Rain-gardens that fit well with their local and regional context and that are designed and implemented to look and perform elegantly take a significant commitment of creativity and resources. Plant lists prepared for other rain-gardens need to be adapted to the specific soils and microclimatic conditions present. Heavy clay soils can be used for rain-gardens, especially if plants adapted to heavy clays are selected and planted and if adequate water is provided during their establishment period (particularly the first growing season). The concentration of stormwater in rain-gardens allows for abundant growth, and during the second year (when rainfall has been abundant) clipping excess vegetation will likely be necessary. People generally do not like the look of messy ecosystems in urban settings and so framing the garden (for example, using rock work and/or trimmed edges) and treating the rain-garden like a garden (regularly weeding and clipping and transplanting) show that the rain-garden is being cared for. Involving community members in the process of caring for the garden is ideal but takes persistence and ongoing coordination.



KSU-ISC Rain-Garden – July 23, 2008 (Photo by Lee R. Skabelund)

Monitoring and Caring for Your Rain-Garden

Weeding is a necessary part of gardening and the time spent weeding can be a great opportunity for each of us to learn about the dynamic nature of perennial plants (how quickly and abundantly they grow and propagate and how they compete with one another), other invading plants, as well as the influences of wildlife (including squirrels, rabbits, voles, moles, butterflies, moths, bees, birds, beetles, ants, and a multitude of insects), changing climatic conditions, the effects of flowing and infiltrating stormwater, and other factors.

Larger rain-gardens having plenty of weeds or invasive species nearby the rain-garden will naturally require regular monitoring and weeding, especially during the first two years as the desired rain-garden plants fill in. Smaller rain-gardens, surrounded by non-invasive turfgrass and few weedy species, will require much less care in terms of weeding.

The key is to remove weeds before they release their seeds and so regular monitoring is needed.

After the first growing season, native plants and other well-adapted plants should need no supplemental watering—unless the rain-garden experiences a prolonged dry period, or if plants requiring consistently wet soils were planted in the garden.

Plants located under the canopy of trees may need extra water as they will likely not receive the same amount of rainfall that plants in the open receive.

Annual Maintenance:

It is helpful to keep a record of changes that occur in your rain-garden so that you know when to complete certain maintenance activities and to provide insights for others contemplating the creation of a rain-garden on their property.

Just as with any perennial garden, weeding will be required throughout the season as will some clipping and deadheading of old flowerheads. Plants that are prolific seed producers may need to be clipped back once or several times so to minimize the number of seeds released. Plants that get too large may need to be cut back or removed and replaced with more appropriate plants. Many species can remain over winter and then be cut back each spring (in March or early April) depending on the look that is desired. If sediments, leaves, or other debris accumulates then these can be cleaned up. This will be needed if such elements pile up where water is entering the garden, especially if it begins to form a dam or barrier.

Over time, less weeding should be required (especially after the second or third growing season) and you should learn when you need to look for certain kinds of weeds. If you retain a three-inch layer of mulch in the rain-garden, weeds will be limited and when they are present will be easier to remove.

As time progresses, you may see that water infiltrates quite rapidly and you may then be able to raise the berm or dam on the downhill side in order to capture and hold more stormwater.

BMP Planning/Design Contributions by Professionals and KSU Faculty, Staff and Students Documentation of Fall 2006 KSU Stormwater Management Design/Build Project Activities

Several courses in KSU's Department of Landscape Architecture/Regional & Community Planning (KSU-LA/RCP) were used to support Fall 2006 stormwater management project efforts at KSU. Students in Natural Systems & Site Analysis (LAR 420/440) were introduced to water quality issues related to Campus Creek during a lecture by water quality extension-specialist Rhonda Janke on October 25, 2006. During their lab that morning, Landscape Architecture students took four water samples along the stretch of Campus Creek between Umberger Hall and Manhattan Avenue. These samples, taken after a period of no or little rain, found higher than expected phosphorus and nitrate levels in the water. After a greater than one-inch storm event another water sample was pulled from Campus Creek (west of Boyd Hall) on the morning of October 26. This 10/26/06 water sample indicated a very high level of E. coli (estimated at 300 cfu/ml), and is now being followed up by additional investigations as to the potential source(s). LAR 420/440 students also completed a two-week rapid urban site analysis for the area between Clafin Road, Mid-Campus Drive, Old Clafin Road, and Manhattan Avenue – with a primary focus on stormwater management. The LAR Construction III (LAR 647/765) also focused on water quantity and quality issues during part of the semester and Professor Dennis Day invited Andrea Kevrick to give a special presentation on calculating runoff for stormwater management on the evening of 10/25/06. Additionally, students in LAR 741 (Fluvial Systems) focused on research related to streams and rivers.

This collaborative charrette engaged approximately 125 students, faculty, staff, and professionals in the task of considering ecologically sound ways to treat stormwater that falls on the KSU campus. Approximately 110 students participated in presentations on 10/26/06 and/or the full-day charrette on 10/27/06, including five Biological Ag-Engineering (BAE) students. Approximately 55 LAR students took part in water-quality sampling on 10/25/06.

Time volunteered during the KSU-LA/RCP planning/design charrette is considered integral to the design and implementation of future stormwater management BMPs along Campus Creek.

In combination, Professors Lee R. Skabelund and Dennis Day, and Mark Taussig (KSU Landscape Architect) provided at least 200 hours of time to Fall 2006 Charrette planning and related Stormwater Management project activities (200 x \$50/hour = \$10,000).

Five KSU-LA/RCP students (SCASLA officers) provided at least 20 hours of time to the 10/27/06 charrette and KSU BMP planning/design efforts (100 hours x \$10/hour = \$1000); an additional 105 KSU students provided at least 8 hours to the BMP planning/design on 10/27/06 (840 hours x \$10/hour = \$8400); in addition, at least 10 professionals and 10 KSU faculty/staff provided at least 8 hours to BMP planning/design on 10/27/06 (160 hours x \$50/hour = \$8000).

Additional in-kind time was provided by KSU-LA/RCP faculty, staff, and students for water quality monitoring tests on 10/25/06 and for site analysis work in LAR 420/440. A conservative estimate of in-kind time offered for Campus Creek water quality monitoring and site analysis work at KSU is 700 hours (70 persons x 10 hours x \$10/hour = \$7000).

Adding the contributions noted above the total in-kind contribution for BMP planning/design is **\$34,400**. This estimate is deemed to be a conservative valuation (lower than the actual amount of volunteer time provided) for volunteer services rendered to the project during Fall 2006. WaterLINK funds were also provided to support food, materials, and monitoring equipment for the Fall 2006 Charrette.

Costs associated with construction of the ISC Rain-Garden are highlighted on page 11 of this report.

KDHE – KSU Rain Garden Demo Project (Grant Period: 2/1/07 to 6/30/08)

Lee R. Skabelund, KSU – Principal Investigator

Nov. 27, 2007 report on Project Management and Information & Education...

Formal and Informal Team Meetings Held and Work Accomplished (Feb.-Apr. 2007):

Jan. 8-Feb. 9, 2007 – after meeting with KSU-ISC staff in late December 2006, I worked with Cary Thomsen (LAR Graduate Student) on design concepts and preliminary sketches for the ISC rain-garden; preliminary ideas were reviewed with Don Sneath, KDHE on Jan. 17th in Wichita.

Feb. 6-7, 2007 – e-mail correspondence with Mark Taussig (KSU Facilities) and Tom Rawson (KSU VP of Finances) regarding the ISC rain-garden project.

Feb. 12-13, 2007 – e-mail exchanges and meetings with KSU-LAR faculty (Lorn Clement, Dennis Day, and Chip Winslow) regarding preliminary rain-garden designs.

Feb. 22, 2007 – met with Cary Thomsen regarding the KSU-ISC rain-garden design, plant list, and rock and material needs. Significant improvements to the design were made in mid-Feb.

Feb. 26, 2007 – e-mail exchanges regarding rain-garden plants and suppliers.

Feb. 28, 2007 – met with the KSU Urban Water Group (including Alok Bhandari, Stacy Hutchinson, David Chandler) and briefly discussed ISC rain-garden design work.

Mar. 2, 2007 – met with Cary Thomsen and Rod Harms, Civitas (field visit to look at stone).

Mar. 7, 2007 – met with Cary Thomsen to discuss the final rain-garden design.

Mar. 8, 2007 – met with Mark Taussig, Cathie Laevis, Greg Davis, Jackie Toburen, Daniel Hunt, Skyler Harper, and John Woods (KSU Landscape Committee) to review rain-garden plans and secure necessary approvals and support; KSU Grounds offered equipment.

Mar 12-Apr. 17, 2007 – e-mail exchanges regarding final plant lists and plant orders.

Mar 13-16, 2007 – visits by phone/e-mail and/or in person with Bayer Stone, Higgins Stone, Coonrod Construction, and Midwest Materials Concrete to secure stone and transporting/off-loading support for rain-garden work.

Mar. 19-23, 2007 – initial work on rain-garden at the project site (layout design at the ISC, secure tools and equipment for rain-garden construction, initiate and complete grading, haul in stone and rock for permeable paving for two pathways and stepping stones across the two-cell rain-garden, fine grade the rain garden and pathways, place stone as the base for the flagstone pathway, place permeable paving (rock and donated cut stone) for the formal pathway, establish the location for and place the level spreader, place mulch to prevent erosion, muddiness, and compaction, coordinate work by 3 KSU faculty, 12 KSU students (from 3 different departments), 1 Manhattan High School student, and the donations of materials, equipment, and tools from eight different entities (including KSU, contractors and businesses).

Apr. 4-6, 2007 – secure donated tools; continue work on rain-garden construction (pathway and fine grading).

Apr. 19-23, 2007 – plan for and move topsoil and three limestone splash-pads into position to direct surface water flows and direct rooftop runoff into the rain-garden cells. Coordinate tilling of top 2-3 inches of dense clay soils and approx. one inch of topsoil. Fine grade basins and place additional mulch on the topsoil berm and transition areas.

Apr. 27, 2007 – travel to Prairie & Wetland Nursery in Belton, Missouri to pick up plants

Apr. 28, 2007 – planted ~120 plants and re-set level spreader to a lower elevation. Coordinate the work of nine other faculty and student volunteers.

Summary of I/E Activities for the First Quarter:

NOTE: Changes to the I/E schedule were made by the Project Manager given the amount of time required to coordinate a much more intensive project design that included bringing in large quantities of stone for two permeable pathways. For instance, fact sheets and a project website were not developed in Spring 2007.

1) Members of the Student Chapter of the American Society of Landscape Architects (SCASLA) worked with KSU-LA/RCP Assistant Professor Lee R. Skabelund and Graduate Student Cary Thomsen to encourage participation in this rain-garden design-build project throughout the Spring 2007 Semester. Work at the site provided superb opportunities for hands-on learning.

2) E-mail and one-on-one contacts by various team members were the major vehicles for sharing information and inviting participation in this design-build project. Throughout the process, key staff and administrators were informed about the project, via e-mail and word-of-mouth. Signs (flyers) were posted in KSU's Seaton Hall to build awareness and invite participation by faculty and student volunteers. A newspaper story was run in the Kansas State Collegian ("Garden to conserve rain water, educate students") to inform the campus readership (well over 5,000 people) about the project. Professor Skabelund also discussed the project in his 113-person Environmental Issues and Ethics course (in class and via e-mail) during Spring 2007.

News Article

<http://media.www.kstatecollegian.com/media/storage/paper1022/news/2007/03/30/News/Garden.To.Conserve.Rain.Water.Educate.Students-2814853.shtml>

3) KSU staff, faculty, students, and professionals learned a great deal from the hands-on effort to construct the rain-garden at the ISC. Discussions about project intentions at the project site facilitated student learning. Students were asked to help make decisions about how the design ideas expressed on paper should be implemented at the project site. Adaptations and adjustments were required at nearly every step of rain-garden implementation.

Technology Transfer: Urban Rain-Garden with Permeable Paving and Level-Spreader

Describe Pollution reduction performance to date:

Reduces volume of stormwater running quickly down to Campus Creek (on large storms from the Taiwan Wing of the ISC and adjacent lawn/open space). Reduces to a small degree sedimentation and erosion.

Accomplishments to Date – Final Rain Garden Design and Specifications:

Cary Thomsen and Lee Skabelund prepared final rain-garden designs (including a detailed materials list, planting plan, and plant list) during February and March 2007. Lee Skabelund refined the plant list and secured all materials and plants during March and April 2007.

Purchased items were secured using WaterLINK funds (see below), while many donated materials and services were provided by local businesses and contacts.

ISC Rain-Garden Project (Spring-Summer 2007) - WaterLINK Expenses

Purchases made for the ISC Rain-Garden Design/Build Project

The Civitas Group (preliminary grading of rain-garden basins) - \$78.75

Bayer Construction (delivered washed filter stone & topsoil) - \$362.46 + \$85.00

Higgins Stone (delivered flagstone and Dover shell limestone strips/stepping stones) - \$1217.00 + \$221.00

Atwood Rentals (work gloves & rental of tools) - \$23.60 + \$61.48

Horticultural Services (weed barrier & metal pins) - \$150.95

Crit Site Prairie & Wetland Nursery (rain-garden plants & micorrhizal inoculum) - \$1014.39

Applied Ecological Services/Kaw River Restoration Nurseries (prairie plants) - \$240.00

Blueville Nursery (plants, aluminum sulfate, stone & mulch) - \$196.89 + \$157.78

Bluebird Nursery (supplemental prairie grasses) - \$98.17

KSU Motor-Pool (van rental transportation of plants from CritSite) - \$123.48

Three Rivers Engraving (long-lasting bronze tone rain-garden sign) - \$800.00

Lee Skabelund purchases & reimbursements

(Home Depot – lumber; Blueville Nursery - plants) - \$84.49

(Westside Market - plants) - \$67.42

Total WaterLINK-funded Expenses - \$4,982.86

Donations made to the ISC Rain-Garden Design/Build Project as of 7/30/07

Bayer Stone (stone & consultation time) - \$3,000.00 (donations made beginning on 3/19/07; 7/17/07 e-mail)

Midwest Materials & Concrete (loading & hauling stone) - \$450.00 (3/21/07 services; 7/27/07 invoice/phone record)

Coonrod & Associates Construction Company (off-loading stone) - \$295.00 (3/20-21/07 services; 6/28/07 invoice)

Atwood Rentals (donation of tools for multiple work-days) - \$745.00 (\$677 for Mar-Apr invoices & \$68 for 5/16/07)

Kaw River Restoration Nurseries (prairie plants) - \$50.00 (5/2/07 invoice & 3/12/07 e-mail)

Blueville Nursery (5 cubic yards of mulch) - \$200.00 (5/8/07 invoice)

Three Rivers Engraving (rain-garden sign) - \$58.00 (6/15/07 invoice)

The Civitas Group (tools & consultation time) - \$407.50 (6/21/07 invoice)

KSU Facilities & Grounds (use of skid-loader for nine days, in-kind time by several Grounds personnel, and consultation time by J. Toburen, M Taussig, J. Myers, and D. Berner) - \$1,250.40 (7/13/07 memo)

Total Donations (by external partners and non-academic departments): \$6,455.90

KSU College of Architecture, Planning & Design and other departments

(use of truck & tools for multiple workdays; volunteer time by ~60 KSU students, staff & faculty between January and August 2007)

Use of KSU-CAPD truck for multiple workdays (March to June 2007):

The Civitas Group charges at least \$30/hour for the use of a truck. During Spring/Summer 2007 the KSU-CAPD truck was used for an average of 2 hours each day on 5 days during and after Spring Break (March 19-22, and March 27), for 2 hours each on April 5-6, on April 20-21, and on April 27-28, for 4 hours on May 4-5, for 2 hours on May 25-26, and for 2 hours on June 8, 2007. Value of CAPD donation for use of truck – **24hrs x \$30/hr = \$720**

Total Nonfederal Contributions for KDHE Grant (# 2005-0002 – KSU Rain Garden Demo): \$7,175.90

Accomplishments to Date –Rain Garden Construction and Planting:

KSU LA/RCP faculty planned several formal workdays during the Spring Semester and students were invited to participate as time allowed. Formal workdays included the entire week of Spring Break (March 19-23), as well as workdays conducted April 6, April 20, and April 28 (the first planting day).

Approximately 30 KSU students contributed to the rain-garden construction effort during the first quarter (Feb-Mar 2007). Support was also provided by KSU faculty and staff. Other younger volunteers also contributed to the effort by assisting with mulching and plantings.

Accomplishments to Date –Rain Garden Operation, Maintenance, Observation and Repair:

As will be noted in future reports, ISC Staff assumed primary responsibility for watering and KSU Grounds/Maintenance Staff have kept an eye out on the garden and have helped suppress weed growth adjacent to the garden.

After discussions with KSU's Stacy Hutchinson it was determined that formal monitoring equipment was not needed for this site given that stormwater comes from several rooftops, walkways, and nearby open space (lawn and trees). Additionally, there is not a single point of entry for stormwater runoff entering the two-cell rain-garden nor a single exit point. Based on personal observations, during major storm events, water generally leaves the rain-garden in a non-concentrated fashion over and under a leaky level-spreader.

Accomplishments to Date –Designer's Guide:

Project notes and photographs were recorded during the period Feb-Mar 2007 to provide material for the Designer's Guide (to be completed in late Spring 2008).

Work Accomplished related to the KSU-ISC Rain-Garden (May - Jul. 2007):

May 2, 2007 – finalized plant order from Kaw River Restoration Nurseries; approximately 32 starter plants were donated and 75 native wildflowers were purchased using WaterLINK funds (these wildflowers were secured to supplement fringe area plantings).

May 4-5, 2007 – secured donated tools; continue work on rain-garden plantings ~100 additional Prairie & Wetland Nursery plants (purchased using WaterLINK funds in April 2007) were placed within and on the fringe of the rain-garden. 107 Kaw River plants were also planted. Hauled and spread donated mulch around newly planted perennials. Coordinated the work of three other faculty and student volunteers.

May 10, 2007 – inspected rain-garden after more than six inches of rain fell in a 24 hours period. Ordered additional stone to complete the flagstone path. Sent an e-mail message to KSU-LAR faculty and students calling for help to repair and complete the flagstone pathway in case another large storm sent water around the south side of the ISC.

May 16, 2007 – coordinated with our college accountant to cover salary for Cary Thomsen and Lee Skabelund using KDHE funding; secured donated tools; repaired washed-out berm and finished flagstone path along the south side of rain-garden (to direct surface water flows into the drier, western rain-garden cell). Coordinated work by nine other faculty and student volunteers.

May 18, 2007 – accounted for rain-garden donations and sent thank-you notes and photos to donors of materials and tools; prepared ISC Rain-Garden poster for presentation and display at the American Ecological Engineering Society Meeting in Manhattan, Kansas.

May 23-24, 2007 – presented and displayed the KSU ISC Rain-Garden poster at the American Ecological Engineering Society (AEES) Meeting. Copies of this poster were also displayed at Seaton Hall outside the Landscape Architecture office and at the International Student Center. Led a tour of the rain-garden for several professionals attending the AEES Meeting.

May 25-26, 2007 – purchased well gravel and additional plants from Blueville Nursery using WaterLINK funds (plants were secured to supplement plantings along the flagstone path and slopes south of the ISC Rain-Garden). Planted and watered in five perennials and six shrubs.

Jun. 2, 2007 – led tour of rain-garden for Sherry Davis and 12 citizens (Kansas Pride Program).

Jun. 7-8, 2007 – purchased mulch and additional plants from Blueville Nursery using WaterLINK funds to supplement fringe area plantings and add plantings along the flagstone path and slopes south of the ISC Rain-Garden. Coordinated the work of 28 student volunteers during two shifts on 6/8/07. Planted and watered in 21 perennials with one other volunteer.

Jun. 11-22, 2007 – worked on rain-garden article for college public affairs officer. Designed and ordered an interpretive sign/recognition plaque. Ordered and received 96 native grasses from Bluebird Nursery to supplement wildflower plantings in adjacent planting beds and rain-garden fringe areas. Planted and watered in 96 grasses and weeded the rain-garden area. Coordinated the work of five student volunteers on 6/22/07.

Jul. 2-3 and Jul. 12-30, 2007 – watered and weeded the ISC rain-garden (including fringe areas) to reduce competition to rain-garden plantings; working with several volunteers, rain-garden plants were watered (as needed) using rooftop runoff and/or an ISC hose; we also regularly weeded the garden. During July, I coordinated maintenance (watering and weeding work by ISC staff and one international student volunteers), observed rain-garden conditions, and took photos for records and future presentations and publications. On July 19, 2007 I discussed the rain-garden as part of my presentation at KSU's Dialog on Sustainability held in Manhattan, KS. I also led a tour of the rain-garden for seven people attending the Dialog on Sustainability.

Summary of I/E Activities for the Second Quarter:

1) KSU-LA/RCP Assistant Professor Lee R. Skabelund encouraged participation in completion of the KSU-ISC Rain-Garden Design-Build Project via e-mail, flyers, and one-on-one contact during late Spring and early Summer 2007. KSU staff, faculty and students continued to learn from hands-on efforts to complete the rain-garden. Discussions about project intentions and required adaptations and repairs at the project site facilitated student learning. Students were asked to help make decisions about how to construct the permeable paving and where to plant grasses and wildflowers.

2) E-mail, a display (prepared for KSU's April 2007 Open House and retained through the summer), conference presentations, development of a project poster, tours and site visits, and one-on-one and small group discussions were the major vehicles for sharing information and inviting participation in the second quarter of this design-build project. Throughout the process, key staff and administrators were informed about the project, via e-mail and word-of-mouth. Posters were displayed in two locations over the summer and early fall at KSU's Seaton Hall and the International Student Center. A poster was also displayed during the American Ecological Engineering Society Meeting. Two articles were prepared for the College of Architecture, Planning and Design website.

Notes:

a) The term "Other" is used to indicate when we had a work-day on-site where KSU students were involved; each of these were educational events (this was also true for the use of this term in the 1st Quarterly Report).

b) The 6/12/07 e-mail was sent to Manhattan City Stormwater Planning and Public Works staff and copied to KSU, WaterLINK, an KDHE contacts for distribution. This e-mail highlighted work accomplish and the primary contributors. All other e-mails were sent to encourage participation in rain-garden workdays.

c) Two articles were prepared (for a CAPD newsletter and website) while additional information was shared with KSU Public Relations folks.

d) Several classes were regularly informed about the project, including LAR 322, "Environmental Issues & Ethics" and LAR 439/764, "Landscape Construction". A website (accessible via K-State On-Line for all LAR students and faculty as well as other interested KSU faculty and students) was used to archive project information and inform potential volunteers about project progress.

Technology Transfer: Urban Rain-Garden with Permeable Paving and Level-Spreader

Describe Pollution reduction performance to date:

The rain-garden is infiltrating water more quickly than expected (given the very heavy clay soils present on the site). In the upper basin, the KSU-ISC Rain-Garden typically holds water for 2-3 days after the end of a major rain-event and for less than a day in the lower basin. Stormwater continues to leave the rain-garden in a non-concentrated fashion.

Accomplishments to Date –Rain Garden Construction and Planting:

KSU LA/RCP faculty planned several workdays during late spring and summer. Workdays were held on May 5 (the second major planting day), May 16 (permeable flagstone pathway and rain-garden berm repairs), May 26 (planting), June 8 (planting), and July 2 (watering and weeding).

More than 30 KSU students contributed to the rain-garden construction effort during the second quarter (May-July 2007). Support was also provided by KSU faculty and staff. Other younger volunteers also contributed to the effort by assisting with mulching and plantings.

Accomplishments to Date –Rain Garden Operation, Maintenance, Observation and Repair:

Working closely with Project Manager, Lee R. Skabelund, ISC Staff and one international student volunteer assumed primary responsibility for watering and weeding. Three 40-gallon garbage cans were used to collect water for later re-use and proved an effective way to facilitate watering. Weeding was often done by the Project Manager during regular visits to the garden. KSU Grounds/Maintenance Staff continued to help suppress weed growth adjacent to the garden and they placed a wire cage around one of the chokeberry plants to stop browsing by rabbits.

Based on personal observations the rain-garden is infiltrating water more quickly than expected given the very heavy clay soils present on the site. In the upper basin, the KSU-ISC Rain-Garden typically holds water for 2-3 days after the end of a major rain-event and for less than a day in the lower basin. Stormwater continues to leave the rain-garden in a non-concentrated fashion (over and under a leaky level-spreader during larger rain events). Water typically remains in the ISC rain-gutters (above the garden) several days longer than it does in either of the two rain-garden basins. Observed infiltration rates indicate that the rain-garden is not now and should not become a mosquito breeding ground.

Accomplishments to Date –Designer’s Guide:

Project notes and photographs were recorded during the period May-July 2007 to provide material for the Designer's Guide (to be completed in late Spring 2008).

**Kansas Department of Health and Environment
Affidavit of Grant Expenditures and Nonfederal Contributions
Status: Paid**

Project: # 2005-0002 - KSU Rain Garden Demo Project
Sponsor: Kansas State University
Kansas State University, Pre-Award Services; 2 Fairchild Hall
Manhattan, KS 66506-1103
FEIN: 48-0771751
Reporting Period: May - Jul 2007

Amounts will be rounded to the nearest dollar
NOTE: Please enter numbers only. No commas.

Expenditure Category	Grant Expenditures	Nonfederal Contributions
Personnel	2289	1250
Fringe Benefits	694	0
Travel	0	0
Equipment Purchase (Items over \$2000 only, send Invoice)	0	0
Supplies	0	3250
Contractual Services	0	0
Other	0	2676
Indirect Cost	243	0
	3,226	7,176
Remaining Encumbered Grant Funds after current expenditures		6774
Remaining Nonfederal Contributions after current contributions		-509

Attribution on KSU-ISC Rain-Garden Sign (designed June 15, 2007):

Funding provided by WaterLINK: A Kansas Campus Compact Project and a KDHE, Clean Water Neighbor Grant.

Language used on LRS Kansas Hydrology Seminar 2007 handout:

The Kansas Department of Health and Environment provided financial assistance to the KSU-ISC Rain-Garden Project through EPA Section 319 Nonpoint Source Pollution Control Grant #C9007405-12. Three WaterLINK (Water Quality Restoration and Protection Service Learning Mini-Grants awarded to KSU by KDHE utilizing EPA funds) provided financial assistance for the Fall 2006 KSU Campus Creek Planning/Design Charrette, Spring & Summer 2007 KSU-ISC Rain-Garden Construction, and Fall 2007 rain-bowl designs for the KSU-ISC Rain-Garden.

Attribution on KSU-ISC Rain-Garden Website - <http://faculty.capd.ksu.edu/lskab/raingarden.html>:

KDHE provided financial assistance to the KSU-ISC Rain-Garden Project through EPA Section 319 Nonpoint Source Pollution Control Grant #C9007405-12. Three WaterLINK (Water Quality Restoration and Protection Service Learning Mini-Grants awarded to KSU by KDHE utilizing EPA funds) provided financial assistance for the Fall 2006 KSU Campus Creek Planning/Design Charrette, Spring & Summer 2007 ISC Rain-Garden construction, and Fall 2007 rain-bowl designs for the ISC Rain-Garden.

E-Mail sent to Beth Mack 12/3/07 (copy to David Mitchell and Rod Harms):

Use of KSU-CAPD truck for multiple workdays (March to June 2007 - lrs):

The Civitas Group charges at least \$30/hour for the use of a truck.

During Spring/Summer 2007 the KSU-CAPD truck was used for an average of 2 hours each day on 5 days during and after Spring Break (March 19-22, and March 27), for 2 hours each on April 5-6, on April 20-21, and on April 27-28, for 4 hours on May 4-5, for 2 hours on May 25-26, and for 2 hours on June 8, 2007.

Value of CAPD donation for use of truck – 24hrs x \$30/hr = \$720

CAPD truck contact:

David Mitchell, Building Manager - (785)532-1092 / dstmck@ksu.edu

Civitas Group contact:

Rod Harms - (785)537-3773 / rharms@purpleprairie.net

OTHER CONTRIBUTIONS:

CAPD also loaned a wheelbarrow, four large garbage cans, a metal bar, several shovels, brooms, hammers, a tape measure, and other tools for use on the KSU Rain-Garden project for a several weeks during March, April and May 2007. Rental costs for the use of these tools would likely have been several hundred dollars. For example, Atwood Rental charges \$18/week for a wheelbarrow and \$8/week for shovels.

Volunteer time provided for the KSU Rain-Garden Design/Build project (including approximately 60 KSU students, staff & faculty [and two other middle and high school students] between January and August 2007) totaled ~325 hours. The value of this would likely be around \$5,000.

A more precise estimate of in-kind donations for tools and the value of volunteer time can be provided if needed (or held for use as "match" if I am able to secure additional funding).

Please let me know if you have any questions.

Lee R. Skabelund, Project Manager and Principal Investigator

Work Accomplished related to the KSU-ISC Rain-Garden (Aug - Oct. 2007):

Aug. 2007 – with the assistance of an ISC staff member, trained three international students in rain-garden watering and weeding practices (including how to identify a “weed” and what to do if you don’t know what or what not to weed); watered and weeded the rain-garden as needed. Prepared plans (via a WaterLINK proposal) for a combined service-learning activity at the ISC Rain-Garden – to bring Landscape Architecture and Art/Sculpture students together to prepare designs for mini-detention basins (called “rain-bowls”) at the rain-garden. Completed the final report for our Spring 2007 WaterLINK grant (for KSU-LA/RCP’s 2007 ISC Rain-Garden Design-Build project).

Aug.-Oct. 2007 – continued to regularly visually monitor the ISC Rain-Garden (to check on weeding and watering needs) and to closely observe and photographically document vegetative growth and seasonal changes at the rain-garden. Began to develop a publically-accessible website to go beyond the KSU Stormwater Management Design / Build Project “course” website (available to selected faculty and students via K-State OnLine).

Summary of I/E Activities for the Third Quarter:

Shared the Final WaterLINK Report on the ISC Rain-Garden with faculty and students.

Kept in close communication with ISC staff about rain-garden watering and weeding needs, and regarding vegetative changes. Below is the e-mail that went out on Aug. 23, 2007 from ISC staff to the ISC LISTSERV: "Dear K-Staters, The International Student Center in conjunction with the Department of Landscape Architecture is looking for student volunteers to help maintain the newly created Rain Garden in front of the Taiwan Wing at the ISC. Volunteer work will include weeding and watering the rain garden as well as learning about plant life native to Kansas. If interested, please meet at the International Student Center on Tuesday, August 28, 2007 at 5 p.m."

Shared information about the rain-garden with faculty, staff, and students during class time, field visits, and via e-mail exchanges and through the KSOL "Stormwater Management Design/Build Project" website and the new ISC Rain-Garden website -- <http://faculty.capd.ksu.edu/lscab/raingarden.html>.

Paragraph prepared for the ISC Brochure (8/13/07): "Professor Lee R. Skabelund led a project to create a rain-garden on the southwest end of the Taiwan Wing. KSU's Landscape Architecture students were actively involved in designing and implementing this garden -- which demonstrates how stormwater can be captured for re-use in a perennial garden, thus helping to conserve local streams and watersheds. Cary Thomsen (KSU-MLA) played a leading role on this ambitious service-learning project."

Shared photos and a written description of the ISC Rain-Garden with the contacts at ArtfulRainwater.net (based out of Penn State) and encouraged them to spotlight this KSU project on their website. They indicated that they were experiencing some difficulties with website management and were not adding projects for the time being. (Note: this correspondence was sent on June 27, 2007 but was not reported in the May-July 2007 Status Report.)

Shared photos of ISC Rain-Garden work with Cary Thomsen and other alumni (including designers at BNIM and other design firms); encouraged Cary to submit our design-build rain-garden project work in the “Monsters of Design” competition.

Technology Transfer: Urban Rain-Garden with Permeable Paving and Level-Spreader

Describe technology demonstration activities completed to date.

Urban Rain-Garden with Permeable Paving and Level-Spreader

How many demonstration sites were established this quarter? 1 (KSU International Student Center Rain-Garden; KSU-Manhattan Campus -- near the intersection of Mid-Campus Drive and Claflin Road)

Describe Pollution reduction performance to date:

The rain-garden typically infiltrates water in less than 1-2 days after the end of major rain-events (with evapotranspiration also at work). During late summer and early fall 2007 standing water rarely accumulated in the lower basin for more than a few hours. During larger storm events, stormwater continues to leave the rain-garden in a non-concentrated fashion (over and under the level-spreader).

Accomplishments to Date –Rain Garden Construction and Planting:

Completed earlier (final plantings for 2007 went in on June 22, 2007).

Accomplishments to Date –Rain Garden Operation, Maintenance, Observation and Repair:

Working closely with Project Manager, Lee R. Skabelund, ISC Staff and three international student volunteers helped with rain-garden watering and weeding. Weeding was often done by the Project Manager during regular visits to the garden. Several international students assisted with watering and weeding. KSU Grounds/Maintenance Staff continued to clean areas of debris adjacent to the rain-garden.

Accomplishments to Date –Designer’s Guide:

Project notes and photographs were recorded during the period Aug-Oct 2007 to provide material for the Designer's Guide (to be completed in late Spring 2008).

**Kansas Department of Health and Environment
Affidavit of Grant Expenditures and Nonfederal Contributions
Status: Submitted**

Project: # 2005-0002 - KSU Rain Garden Demo Project
Sponsor: Kansas State University
Kansas State University, Pre-Award Services; 2 Fairchild Hall
Manhattan, KS 66506-1103
FEIN: 48-0771751
Reporting Period: Aug - Oct 2007

Amounts will be rounded to the nearest dollar
NOTE: Please enter numbers only. No commas.

Expenditure Category	Grant Expenditures	Nonfederal Contributions
Personnel	4098	0
Fringe Benefits	1352	0
Travel	0	0
Equipment Purchase (Items over \$2000 only, send Invoice)	0	0
Supplies	0	0
Contractual Services	0	0
Other	0	0
Indirect Cost	818	0
	6,268	0
Remaining Encumbered Grant Funds after current expenditures		506
Remaining Nonfederal Contributions after current contributions		-509

Comments:

Personnel costs and fringe benefits for Lee Skaebelund (project manager and co-designer of the KSU-ISC Rain-Garden) and Cary Thomsen (student and co-designer). Cary helped Lee coordinate construction of the rain-garden during spring 2007. Lee coordinated all construction, monitoring, and maintenance work during the summer and fall of 2007.

Work Accomplished related to the KSU-ISC Rain-Garden (Nov. 2007 - Jan. 2008):

Nov.-Dec. 2007 – Continued to check on rain-garden and photograph its winter conditions, including during the ice storm and just before Christmas, when Lee Skabelund and Casey Westbrook met to test rain-bowl ideas – experimenting with snowmelt falling onto the splash-pads and into metal bowls.

Coordinated rain-bowl design reviews and creation with KSU Art/Sculpture faculty and students.

The following “news piece” describes efforts to expand the impact of the ISC Rain-Garden by working with Sculpture faculty and students to create rain-bowls at the garden:

KSU Sculpture Faculty/ Students Presented Rain-Bowl Design Proposals for the International Student Center Rain-Garden to Stakeholders and Landscape Architecture Specialization Studio

On Monday, Nov. 26, 2007 twelve landscape architecture students and six sculpture students met at KSU's International Student Center Rain-Garden to discuss the design of mini detention basins (called "rain-bowls" by professors Lee R. Skabelund [Assistant Professor of Landscape Architecture, member of the Landscape Advisory Committee, and co-designer/project manager for the ISC Rain-Garden Design-Build Project] and Casey Westbrook [Assistant Professor of Art/Sculpture]).

During the next week, sculpture students prepared a variety of rain-bowl design proposals -- and with Professor Westbrook -- presented these thoughtfully conceived designs to Professor Skabelund's Specialization Studio on December 3rd. Professor Skabelund's class provided a review of each design proposal and the sculpture students received additional thoughts on their innovative design proposals from other KSU faculty and staff.

Next steps include: selecting a final design, securing materials, fabricating the rain-bowls, and installing them at the International Student Center (ISC). It is hoped that these sculptural pieces will be in place in time to interact with spring 2008 rain events. The objective is to help visitors, staff and students more strongly link art, design, ecology and stormwater management best management, as water is slowed and infiltrated into the two-cell rain-garden.

Invited KSU faculty and staff who participated in the December 3, 2007 rain-bowl design reviews included: Mark Taussig (KSU-Facilities and member of the Landscape Advisory Committee), Donna Davis (ISC Senior Foreign Student Advisor), Grace Hwang (Assistant Professor in Educational Leadership), Sharon Breiner (Kansas WaterLINK Project Coordinator, K-State Leadership Studies and Programs), and Christa Smith (Research Associate, Office of Educational Innovation & Evaluation).

Jan. 2008 – set meeting time to discuss ISC Rain-Garden design and implementation with City of Manhattan planners and engineers and share lessons learned about water-sensitive design.

Summary of I/E Activities for this Quarter:

Prepared news articles for ISC staff to send to their list-serve and for KSU Public Relations contacts.

Shared additional information about the ISC Rain-Garden with the contacts at ArtfulRainwater.net and encouraged them to spotlight this KSU project on their website. Sent ISC Rain-Garden website address to primary KDHE and KSU contacts (including landscape architecture faculty and students).

As noted above, we brought together Art and Landscape Architecture students at K-State to discuss the International Student Center Rain-Garden and initiate work on the design of rain-bowls. This was followed by a review attended by stakeholders from the ISC and KSU. This work was highlighted in a news piece prepared for KSU Media Relations & Marketing. My contact wanted to run the piece after the rain-bowls were created and installed.

Scheduled a time to discuss ISC Rain-Garden design and implementation with City of Manhattan planners and engineers to share lessons learned from the project.

Technology Transfer: Urban Rain-Garden with Permeable Paving and Level-Spreader

Describe technology demonstration activities completed to date.

Urban Rain-Garden with Permeable Paving and Level-Spreader

How many demonstration sites were established this quarter? 1 (KSU International Student Center Rain-Garden; KSU-Manhattan Campus -- near the intersection of Mid-Campus Drive and Claflin Road)

Describe Pollution reduction performance to date:

The rain-garden typically infiltrates water in less than 1-2 days after the end of major rain-events (with evapotranspiration also at work).

Accomplishments to Date –Rain Garden Construction and Planting:

Completed earlier (March-June 2007).

Accomplishments to Date –Rain Garden Operation, Maintenance, Observation and Repair:

Except for removing fallen branches, no maintenance needed during the winter months. Continued to observe rain-garden every few weeks, including after snow and ice storms. Allowed leaves from Sycamore to continue to accumulate in the rain-garden.

Accomplishments to Date –Designer's Guide:

Project notes and photographs were recorded during the period Nov-Dec 2007 to provide material for the Designer's Guide (to be completed in late Spring 2008).

Dec. 3, 2007 e-mail from Lee R. Skabelund to Diane Potts

Copy to: cwestb@ksu.edu, taus@ksu.edu, ddavis@ksu.edu, Erinn Barcomb-Peterson <ebarcomb@ksu.edu>, Andy Badeker <abadeker@k-state.edu>, Sharon Breiner <glaenzer@ksu.edu>, SSattert@kdhe.state.ks.us, DSnethen@kdhe.state.ks.us, djday@ksu.edu, lacjr@ksu.edu, dandon@ksu.edu, sllhutch@ksu.edu

BCC (35 helpers): cthomsen@rdgusa.com, janso033@umn.edu, jschneid@ksu.edu, Emily Quackenbush <efq@ksu.edu>, tobujaa@ksu.edu, btagtmey@ksu.edu, tomh@ksu.edu, aarathi@ksu.edu, ecastle@ksu.edu, lynda@ksu.edu, dms4994@ksu.edu, hkemper@ksu.edu, ians@ksu.edu, cmurman@ksu.edu, rdebold@ksu.edu, aarathi@ksu.edu, ecastle@ksu.edu, eyoung@ksu.edu, jesseb@ksu.edu, jmerrill@ksu.edu, kburnham@ksu.edu, jtl2@ksu.edu, kkroen@ksu.edu, rebcm8@ksu.edu, kris8@ksu.edu, deschler@ksu.edu, afox@ksu.edu, cgiesler@ksu.edu, mhouse43@ksu.edu, cmorton@ksu.edu, dsr7977@ksu.edu, lindz004@ksu.edu, ashaffer@ksu.edu, ksob@ksu.edu, kjs@ksu.edu

Diane,

Here is my website address (contains a link to the rain-garden website):
<http://faculty.capd.ksu.edu/lskab/>

Below is a summary related to today's presentations and reviews in my LAR Specialization Studio (I will provide student names once I obtain the names of all of the sculpture students who participated):

KSU Sculpture Faculty and Students Present Rain-Bowl Design Proposals for the International Student Center Rain-Garden to Stakeholders and Landscape Architecture Specialization Studio

On Monday, Nov. 26, 2007 twelve landscape architecture students and six sculpture students met at KSU's International Student Center Rain-Garden to discuss the design of mini detention basins (called "rain-bowls" by professors Lee R. Skabelund [Assistant Professor of Landscape Architecture, member of the Landscape Advisory Committee, and co-designer/project manager for the ISC Rain-Garden Design-Build Project] and Casey Westbrook [Assistant Professor of Art/Sculpture]).

During the next week, sculpture students prepared a variety of rain-bowl design proposals -- and with Professor Westbrook -- presented these thoughtfully conceived designs to Professor Skabelund's Specialization Studio on December 3rd.

Professor Skabelund's class provided a review of each design proposal and the sculpture students received additional thoughts on their innovative design proposals from other KSU faculty and staff.

Next steps include: selecting a final design, securing materials, fabricating the rain-bowls, and installing them at the International Student Center (ISC).

It is hoped that these sculptural pieces will be in place in time to interact with spring 2008 rain events. The objective is to help visitors, staff and students more strongly link art, design, ecology and stormwater management best management, as water is slowed and infiltrated into the two-cell rain-garden.

Invited KSU faculty and staff who participated in the December 3, 2007 rain-bowl design reviews included: Mark Taussig (KSU-Facilities and member of the Landscape Advisory Committee), Donna Davis (ISC Senior Foreign Student Advisor), Grace Hwang (Assistant Professor in Educational Leadership), Sharon Breiner (Kansas WaterLINK Project Coordinator, K-State Leadership Studies and Programs), and Christa Smith (Research Associate, Office of Educational Innovation & Evaluation).

This WaterLINK-funded project (supported as part of a Fall 2007 Water Quality Improvement through Service Learning Grant awarded to KSU by the Kansas Department of Health and Environment utilizing USEPA funds) encourages the conservation of hydrologic systems in urbanizing areas by integrating hydrology, art, and landscape architecture.

12/21/07 note for the ISC LISTSERV:

Update on the K-State International Student Center (ISC) Rain-Garden

ISC Rain-Garden design and construction was completed west of the Taiwan Wing over a period of about six months in the spring and early summer of 2007. Volunteer labor was provided by approximately 60 K-State students from at least five different disciplines.

ISC Staff and several international students have assisted with rain-garden monitoring and maintenance during the summer and fall of 2007.

With the recent snow and ice, the rain-garden remains a lovely spot to visit, and the rain-garden has attracted many visitors to the ISC since its completion in early summer.

Work included the following construction activities: grade two shallow basins; relocate four existing shrubs; install nine large pieces of limestone (to respond to ISC architecture, allow access through the rain-garden, and provide seating); place weed barrier and washed filter-stone down as the base for two pathways; place three large limestone "splash-pads" atop the three silted-in dry wells; construct a level-spreader (to minimize concentrated flows as water exits the rain-garden); haul and place topsoil along the fringe of the basins; rototill soils and beds in preparation for planting; plant approximately 250 dry to wet prairie and a few wetland plants (representing, for the most part, species common to the Flint Hills Eco-region); plant additional perennials and shrubs; mulch all planted areas; and, repair the flagstone path (which was damaged while under construction by two very heavy May 2007 rain events).

The entire activity was sponsored by the K-State Department of Landscape Architecture/Regional and Community Planning and the K-State Student Chapter of the American Society of Landscape Architects.

Financial support for guest lecturers, a BMP bus tour to Kansas City, and the planning/design charrette which preceded the ISC Rain-Garden Design/Build Project was provided through the K-State Jarvis Lecture series, the American Society of Landscape Architects (National ASLA and Prairie Gateway chapters) and K-State's WaterLINK, a Campus Compact service-learning program funded by the Kansas Department of Health and Environment through USEPA funds.

Support for implementation and subsequent assessment of the ISC rain-garden has been provided by WaterLINK and KDHE Clean Water Neighbors grants. Additional funding and support were provided by KSU Facilities & Grounds, The Civitas Group, Bayer Stone, Midwest Concrete Materials, Higgins Stone, Coonrod Construction, Atwood Rentals, Blueville Nursery, Kaw River Restoration Nurseries, and CritSite Prairie & Wetland Nursery, Bluebird Nursery, and Three Rivers Engraving.

This summer, Professor Skabelund continued to work with ISC staff and KSU faculty and students to water plants, weed the rain-garden and surrounding areas, and complete the flagstone pathway.

This fall, Professor Skabelund's Landscape Architecture Studio class reviewed rain-bowl designs prepared by K-State sculpture students for the ISC Rain-Garden. Art Professor Casey Westbrook will be working with Art/Sculpture students to fabricate several rain-bowls during January 2007.

Dedication of the ISC Rain-Garden is expected to take place during Spring Semester 2008.

For more on this innovative stormwater management project please visit:

<http://faculty.capd.ksu.edu/lskab/raingarden.html>

KDHE provided financial assistance to the KSU-ISC Rain-Garden Project through EPA Section 319 Nonpoint Source Pollution Control Grant #C9007405-12. Three WaterLINK (Water Quality Restoration and Protection Service Learning Mini-Grants awarded to KSU by KDHE utilizing EPA funds) provided financial assistance for the Fall 2006 KSU Campus Creek Planning/Design Charrette, Spring & Summer 2007 ISC Rain-Garden construction, and Fall 2007 rain-bowl designs for the ISC Rain-Garden.

Work Accomplished related to the KSU-ISC Rain-Garden (Feb. - Apr. 2008):

Feb-Apr. 2008 – Continued to check on rain-garden and photograph its winter and early spring conditions. Coordinated with Art/Sculpture faculty on the rain-bowls for the ISC Rain-Garden.

Prepared award submissions for the ISC Rain-Garden design in Feb. 2008. Two awards for work on the rain-garden design and implementation were granted in April 2008. A news release was prepared in conjunction with KSU Media Relations & Marketing and published by K-State on April 25, 2008:

Source: Lee R. Skabelund, 785-532-2431, lskab@k-state.edu

News release prepared by: Andy Badeker, 785-532-6415, abadeker@k-state.edu

Reference: <http://www.k-state.edu/media/newsreleases/april08/raingarden42508.html>

K-STATE RAIN GARDEN EARNS LANDSCAPE ARCHITECTURE PROFESSOR DESIGN AWARDS

MANHATTAN -- A perennial garden at Kansas State University designed to absorb runoff from storms has earned recognition from two landscape architecture organizations.

The Prairie Gateway Chapter of the American Society of Landscape Architects presented Lee R. Skabelund, assistant professor of landscape architecture at K-State's College of Architecture, Planning and Design, with a 2008 award of excellence for his work on the project. The society's Central States Conference also has recognized Skabelund with a 2008 award of merit in the built-design category. Skabelund, who chairs K-State's green building committee, led the group of students, faculty and staff who created the International Student Center's rain garden in 2007.

"The rain garden highlights ways to reduce storm-water runoff and improve the water quality of local streams," Skabelund said. With the help of students and faculty, including Cary Thomsen, a 2007 master's graduate in landscape architecture, and Dennis Day, a professor of landscape architecture, Skabelund created two permeable pathways and a "level-spreader" to slow and temporarily hold runoff. "We also collected rooftop and surface runoff to re-use in the garden, which is planted with numerous perennials native to the Flint Hills and the central U.S.," Skabelund said.

Skabelund's coordination of the project began in 2006 with a planning and design charrette that involved about 125 students, faculty and staff as well as landscape architecture and engineering professionals. "That intensive event provided the analytical and creative foundation for the subsequent design and implementation," Skabelund said. About 60 students, faculty members and volunteers began construction in March 2007. It was completed in June 2007.

"In addition to improving water quality and stream-bank stability along Campus Creek, we wanted students and others involved to deepen their understanding of natural and human systems," Skabelund said. "They learned about collaboration between disciplines, as well as cost-effective techniques to create beautiful work," he said.

The project also aimed to share information about managing storm water with administrators, staff and local community members. Skabelund has created a Web site at <http://faculty.capd.ksu.edu/lkab/> to share ideas about the rain garden and other projects. Even on heavy clay soils like those found at K-State's International Student Center, rain gardens can provide habitat for butterflies and other wildlife, reduce soil erosion and decrease pollution of nearby waterways, Skabelund said.

Like any garden, rain gardens require tending. Skabelund coordinates with students and staff from K-State Facilities and the International Student Center to maintain the garden. Stacy Hutchinson, associate professor, and Reid Christianson, a water quality researcher, both with K-State's department of biological and agricultural engineering, are helping develop monitoring protocols for the garden. Skabelund also is working with art students to build rain bowls for the garden.

Each year, the Prairie Gateway Chapter honors outstanding contributions to landscape architecture from members in Kansas and Missouri. This year's submissions were judged by architects, landscape architects, planners and artists from the society's Wisconsin chapter. The awards were presented April 12 in Wichita.

The Central States Conference awards program recognizes outstanding work by professionals and students in Iowa, Kansas, Missouri, Nebraska, North Dakota, Oklahoma and South Dakota. This year's submissions were judged by architects, landscape architects, planners and artists from the American Society of Landscape Architects' Connecticut chapter. The awards were presented April 23 in St. Louis, Mo.

Funding for the project's various stages came from the Kansas Department of Health and Environment, the federal Environmental Protection Agency and WaterLINK, a Campus Compact service learning program.

Material and in-kind support came from the Civitas Group, Atwood Rentals, Bayer Stone, Higgins Stone, Midwest Materials & Concrete, Coonrod Construction, Bayer Construction, Blueville Nursery, Horticultural Services, Three Rivers Engraving, Applied Ecological Services/Kaw River Restoration Nurseries, CritSite Prairie and Wetland Nursery, and Bluebird Nursery.

Summary of I/E Activities for this Quarter:

Met with City of Manhattan planners and engineers to share lessons learned from the project.

Submitted the project to the Prairie Gateway Chapter of the American Society of Landscape Architects (PGASLA) and ASLA Central States Conference (CSASLA). Lee R. Skabelund received an Award of Excellence from PGASLA and an Award of Merit from CSASLA. This was written up in conjunction with K-State's Media & Public Relations office, and shared via the KSU homepage.

Shared images and information about the ISC Rain-Garden with Denton Nichols' Architecture Studio at KU. Shared photos of the rain-garden, information, and the project website address for a Middle Kansas WRAPS display being prepared by WRAPS Coordinator Rick Davis. Shared information about the rain-garden with KSU's VP of Finance, Tom Rawson, who responded "CONGRATULATIONS! Great job."

Shared information about the ISC Rain-Garden during two different presentations: Water and the Future of Kansas Conference (3/25/08 in Topeka); and USEPA's Wetlands & Watersheds Conference (4/11/08 in Kansas City). Combined, approximately 55 people learned more about the ISC Rain-Garden.

Worked with three KSU-LAR students to prepare ISC Rain-Garden display for the KSU Open House. Showed a slide presentation of the project during the Open House and hosted a tour at the ISC Rain-Garden from 11am-12noon (20 people came to the garden to learn about the process).

Building on lessons learned at the ISC Rain-Garden, oversaw work by two KSU graduate students on the Rossville, Kansas Rain-Garden (Feb.-Apr. 2008).

Technology Transfer: Urban Rain-Garden with Permeable Paving and Level-Spreader

Describe technology demonstration activities completed to date.

Urban Rain-Garden with Permeable Paving and Level-Spreader

How many demonstration sites were established this quarter? 1 (KSU International Student Center Rain-Garden; KSU-Manhattan Campus -- near the intersection of Mid-Campus Drive and Claflin Road)

Describe Pollution reduction performance to date:

The rain-garden typically infiltrates water in less than 1-2 days after the end of major rain-events (with evapotranspiration also at work).

Accomplishments to Date –Rain Garden Construction and Planting:

Completed earlier (March-June 2007).

Accomplishments to Date –Rain Garden Operation, Maintenance, Observation and Repair:

Continued to observe rain-garden every few weeks. Some weeding, and leaf and tree limb cleanup was accomplished with support from KSU Grounds staff. KSU Grounds Staff also mulched the adjacent berm, spot treated of weeds near the building (using herbicide). Worked with Bio-Ag. Engineering researcher Reid Christianson to complete four infiltration and soil density tests within and below the rain-garden.

Accomplishments to Date –Designer's Guide:

Project notes and photographs were recorded during the period Feb-Apr 2008 to provide material for the Designer's Guide (to be completed in late Summer 2008). Attended sessions on stormwater management, low impact development, and rain-garden design at the Wetlands & Watersheds Conference to learn from the experiences of David Dods, Ted Hartsig, and others.

Work Accomplished related to the KSU-ISC Rain-Garden (May - July 2008):

May-July 2008 – Continued to check on rain-garden and photograph its late spring and summer conditions. Worked with sculpture faculty and students to install three rain-bowls at the ISC Rain-Garden.

Organized two rain-garden workdays (to mulch and weed the rain-garden environs): May 2, 2008 with 13 LAR 322 student volunteers (17 hrs); and June 27, 2008 with two international student volunteers (4 hrs), with approx. 12 hours of additional time for monitoring, weeding, transplanting, clipping/clean-up.

Cleaned up a 25-foot branch that was tossed into the rain-garden during the June 10, 2008 EF1 tornado. Minimal damage was done to the garden and more than 11 inches of rain in June 2008 spurred tremendous plant growth in and around the rain-garden (including weeds along the ISC's Tiawan Wing; these weeds will need to be removed and replaced with appropriate native prairie plants).

Summary of I/E Activities for this Quarter:

Led several tours of the rain-garden, including to ten K-State "EXCITE! Workshop" students and mentors on June 11, 2008, to a landscape architect visiting from Arizona during KSU's July 17, 2008 "Dialog on Sustainability," and to three bio-ag. engineering professionals and students on July 22, 2008. Shared information about the ISC Rain-Garden via many one-on-one conversations and during presentations to Spring Semester 2008 Environmental Issues & Ethics (LAR 322) students and the Natural Resources & Environmental Science Capstone course. Presented a poster on the ISC Rain-Garden at the July 17, 2008 "Dialog on Sustainability." Combined, approximately 200 people learned about the ISC Rain-Garden.

Building on lessons learned at the ISC Rain-Garden, helped prepare the prairie plant order for the Rossville, Kansas Rain-Garden (May 2008 – transfer of info to Rossville on 5/19/08). Shared highlights from KSU rain-garden work at the Middle Kansas WRAPS Meeting (July 30, 2008).

KSU Media Relations & Marketing posted article and podcast on the ISC Rain-Garden on its online news archive: <http://www.k-state.edu/media/webzine/green/raingarden.html>

Technology Transfer: Urban Rain-Garden with Permeable Paving and Level-Spreader

Describe technology demonstration activities completed to date.

Urban Rain-Garden with Permeable Paving and Level-Spreader

How many demonstration sites were established this quarter? 1 (KSU International Student Center Rain-Garden; KSU-Manhattan Campus -- near the intersection of Mid-Campus Drive and Claflin Road)

Describe Pollution reduction performance to date:

The rain-garden typically infiltrates water in less than one day after the end of major rain-events (with root development and evapotranspiration seeming to play significant roles in the water cycle).

Accomplishments to Date –Rain Garden Construction and Planting: Completed earlier (2007).

On July 14, 2008 a final planting list was prepared to document the species planted at the ISC Rain-Garden. Over 40 native perennial plants were planted within or near the rain-garden. The rain-garden shows how a combination of wetland and drought-tolerant species can be used to create a dynamic and elegant perennial garden while slowing, filtering, and infiltrating stormwater runoff.

Accomplishments to Date –Rain Garden Operation, Maintenance, Observation and Repair:

Continued to observe rain-garden every few weeks. Weeding and branch cleanup was accomplished with support from students, KSU Grounds staff, and tree pruning companies.

Accomplishments to Date –Designer's Guide:

Project notes and photographs were recorded during the period May-July 2008 to provide material for the Designer's Guide, which was completed in early August 2008.