



**Clemson University**  
**Clemson, South Carolina**  
**Habitat – Green Roof**

**FELLOW**

Christa Jordan, MLA Candidate, 2010  
258 Carrie Road, Liberty, SC 29657  
cdjorda@clemson.edu, 864-561-8717

**SCHOOL**

Clemson University; Clemson, South Carolina

**ABSTRACT**

This green roof project is a collaborative effort between Friends of Lake Keowee (FOLKS) and Clemson University. There are two primary objectives for this project: the construction and evaluation of a green roof that will be used to showcase green roof technology; and to promote green roof technology on campus. Clemson University is home to more than 17, 500 students, and is located in Upstate SC in Pickens County along Hartwell Lake, the headwater of the Savannah River. It encompasses two watersheds, both of which are recognized by South Carolina Department of Health and Environmental Control as having a moderate to high potential for growth. Clemson University is a land grant public university, and is in a position to influence the growth that is coming to the state. The Environmental Protection Agency named Clemson University a Center for Watershed Excellence in July 2008. In 2003 Clemson University committed to building LEED certified buildings. LEED certification recognizes the benefits of green roofs including carbon emissions reduction through energy conservation, storm water retention and amelioration, and a lower reflective index that helps mitigate the urban heat island effect that can indirectly lead to an increase in ground level ozone. This helps our University achieve its commitment to reducing its carbon footprint by 20% by 2020.

**GOALS AND OUTCOMES**

**Goals**

Short-term Project Objectives (First Phase Objectives): During the period covered by this fellowship grant, the following results will be manifest:

- 10x20 green roof building constructed, and publicized with an opening ceremony for the surrounding community and other partners
- Completion of a report documenting the project up to this point, including a photo journal of the plant propagation and project development process
- Outreach materials to include a PowerPoint presentation, printed and online educational material, and poster to be used to educating college classes at Clemson University, school groups visiting the green roof on location at FOLKS headquarters, and at other outreach activities as available.
- Completion of articles to be submitted for publication in websites and newsletters across the Upstate of SC.

- Documentation of the specifics of this green roof in such a way that homeowners and other organizations can replicate it.

#### Long-term Goals (Second Phase Objectives):

- Replication of project at SC Botanical Gardens and on campus, increased student and/or community involvement in green roof, energy efficiency, carbon emission reduction, and/or global warming activities and education.
- Evaluation of durability and effectiveness of the green roof as a whole and in part, including the performance of the green roof plants and waterproofing membrane over time, and the improvement in storm water effluent from the green roof
- Improved partnership between Clemson University, Student Organizations, FOLKS, SC Department of Corrections Hamilton Career Center, green roof plant providers, South Carolina Botanical Gardens, green roof contractors, and other partners identified in the Upstate.

#### Goals for next 2-3 years

- Stay involved with FOLKS to provide assistance in outreach and monitoring efforts.
- Participate in NWF fellowship as a alumni of the program; serve this community as a resource on green roof information
- Serve larger community as a resource for green roof information
- Become a certified Green Roof Professional.

#### **Accomplishments and Outcomes**

Most of the goals were achieved. The FOLKS green roof project is active and ongoing; although the goals set out here have been met, new related goals and objectives continue to develop. As participants' knowledge of the technology has increased, items such as a second root barrier and roofing membrane protection layer have been added to the plan. These layers are on-site and awaiting installation later this spring. The monitoring of the effluent is one objective that has not yet been met. This originally was conceived as something FOLKS would simply provide to us for inclusion in our report. However, as this project has taken shape, give and take has been required from both parties, which has lead now to perhaps a higher investment in the long-term success of the project on the part of the NWF fellow than would have otherwise been the case. This effluent monitoring will be a subject that requires some literature review, design, sourcing of materials and installation.

The on-campus promotion has been the most challenging goal to meet. We gave many presentations, hosted a dog-house green roof construction project during homecoming week, and applied for additional funds to survey a campus building for suitability for a green roof retrofit. Finally, we offered a series of professional certification training courses on campus, and are equipping the campus library with the study guides needed to study for and pass this certification. These references serve the dual purpose of offering the training that can then be used to promote green roof construction, as well as serve as a complete and up-to-date quality resource for green roof information. This fills a gap in the campus library holdings related to the technical information supporting green roof technology.

#### **Challenges and Responses**

The most challenging goal to meet has been promoting green roof technology on campus. Originally, the concept was to challenge the university to construct a green roof, with the assumption that this would be a new concept to campus leadership. To the contrary, campus leadership is designing green roofs onto many of the building plans. The facilities management of the university has proven to be most cooperative

and helpful. Unfortunately, the availability of funds during a recession such as has been in effect since late 2008/early 2009 has halted all but a few construction projects on campus. New construction projects that had already begun and were under contract included green roofs in the design, but were halted and dismantled when the budget outlook began to reflect the down-turning economy. We responded to this challenge by locating, investigating and pursuing the few opportunities that arose to find additional funding to support the expansion of this project.

The other significant challenges have been internal to the team. Levels of commitment and responsibility were not evenly distributed through the duration of the project. A project this long is taxing. It is important to have an outside source of authority to arbitrate any difference on opinions, and to hold accountable the students doing the work. Lastly, the time required for this project has been equal to any graduate level course, and this has been an on-going challenge. We have responded to this challenge by being persistent in seeking guidance when needed, independent in making decisions when information or time is lacking, and flexible in accommodating differing views and methods.

### **Campus Climate Action: Your School's Carbon Footprint**

Our project indirectly addresses global climate change because it promotes the use of a technology that can make an impact. By providing the information and example, we hope to help ease the way for an increased number of green roof projects in our and surrounding communities.

## **ENGAGEMENT AND SUPPORT**

### **Leaders and Supporters**

This project began as a class project in a graduate level horticulture course on sustainable landscape design taught by Dr. Mary Haque. Dr. Haque was instrumental in this project from its inception to its conclusion. She has remained our primary source of inspiration and leadership throughout the project. Also key to the project have been Dr. Jeff Adelberg for his help and knowledge about plants, his connections to the broader horticultural community, and his leadership of our greenhouse experience. Mr. Ben Turetzky and Reggie have been our primary contacts with the FOLKS organization. Their patience and willingness to try have been critical to our successes. Dr. Vikki Chanse has been helpful in generating ideas and meeting objectives. Fellow graduate student Erin Cooke has been a partner through the project, and equally involved and responsible for the success of the project.

### **Funding and Resources**

The funding for this project has come from collaboration between all of the involved parties mentioned above, as well as their extended circle of contacts. The funding for the FOLKS building and roof came from FOLKS, Hamilton Career Center, and Siplast, the roofing contractor. The green roof plants, media and trays were provided by It Saul Natural and Saul's Nursery in Atlanta, Georgia. The propagation of the green roof plants was provided by Dr. Adelberg and his plant propagation classes. The expenditure of the grant funds are detailed on the attached spreadsheet.

### **Education and Community Outreach**

Outreach efforts for the campus and community have included multiple presentations, the dog-house green roof demonstration on campus, several poster exhibits, and the certification lecture series this past March. The FOLKS green roof is designed to serve community outreach, and so will continue to do so into the future. Interested students may also visit this green roof, but since it is not on campus, the primary audience is likely to be Lake Keowee residents.

### **National Wildlife Federation's Campus Ecology Program**

The Campus Ecology Program has helped to make the entire project possible. It funded the propagation of the green roof plants, some of the roof materials, the certification lectures, and the reference guides that will be donated to the campus library. The Campus Ecology Program resulted in the commitment of the two graduate students, 3 faculty members, and multiple FOLKS volunteers that have been needed to complete the project.

## **CONTACT INFORMATION**

Christa Jordan  
258 Carrie Rd.  
Liberty, SC 29657  
cdjorda@clemson.edu  
cdjordan1@gmail.com  
864-561-8717

Erin Cooke  
1806 Owens Rd.  
Seneca, SC 29678  
elcooke@clemson.edu  
864-325-5363

## **MORE ABOUT YOUR SCHOOL**

### **Campus Sustainability History**

Clemson University is a land grant public university, and is in a position to influence the growth that is coming to the state. The Environmental Protection Agency named Clemson University a Center for Watershed Excellence in July 2008. In 2003 Clemson University committed to building LEED certified buildings. LEED certification recognizes the benefits of green roofs including carbon emissions reduction through energy conservation, storm water retention and amelioration, and a lower reflective index that helps mitigate the urban heat island effect that can indirectly lead to an increase in ground level ozone. This helps our University achieve its commitment to reducing its carbon footprint by 20% by 2020. In addition, environmental sustainability is one of the eight emphasis areas for the university, and we are a member of the Association of University Leaders for a Sustainable Future.

## **COMMENTARY AND REFLECTION**

Three considerations, had they been known, would have been helpful at the start of this project: 1) a graduate student has less time than an undergraduate to pursue extracurricular activities not directly related to coursework and projects; 2) team member commitment is important early and throughout the project, so select your team with the long haul in mind, and, if possible, integrate commitment-building/sustaining mechanisms in the design of your project (i.e. A shared and involved committee member, or perhaps something to do with the budget and reimbursements, or an officially shared fellowship); 3) graduate professors are even busier than graduate students, and communication is critical to efficiency and ultimate success.

Through the fellowship, I have learned much about the requirements of leadership. I believe this knowledge will be most valuable, as it has helped me to grasp the differences between individuals in terms of motivation, levels of responsibility, and communication styles, as well as allowed me to begin to see how these factors can be managed and integrated into work processes. As a result of the fellowship, I am up-to-date and knowledgeable green roof design and construction. I believe I will be able to use this knowledge to design effective green roofs on future professional projects, and in doing so, advance the market of this sustainable technology.