Audit of the Campus Landscape at the University of Kansas

Potential for preservation and enhancement through sustainable methods as prescribed by students in Kelly Kindcher's Environmental Impact Assessment Class – Spring 2007 Semester

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Background

The University of Kansas, Lawrence campus, has witnessed a great deal of change since its beginnings on "Hogback Ridge," now more commonly referred to as "Mount Oread." At the time of the founding of KU in 1866, very few, if any, trees, dotted the campus hill. In fact, "The Hill" looked no different than numerous other hills found in a state often bleakly characterized for its relatively featureless landscape. It is clear today, however, that even the early campus environment had lots of potential to become something special. Campus visitors are now greeted with a beautiful expanse of open green spaces supplemented with a wide array of tree and plant species. While the KU Lawrence campus has grown considerably since its initial founding and currently covers nearly 950 contiguous acres of landscape,[1] it remains one of the most respected campuses in the nation when it comes to the campus landscape. KU was recently designated one of the twelve most beautiful campuses in North America by author Thomas A. Gaines who, in his book The Campus as a Work of Art, said he was particularly struck by the large amounts of open green space incorporated into the KU landscape. There is no question that the current landscape on the KU campus is a sight to behold – a sight that brings dreamy alums back year after year to experience its remarkable beauty.

The campus landscape at the KU Lawrence campus has been the focus of much time, effort and money dating back to the early twentieth century. Former Chancellor James Marvin made one of the first attempts to invigorate the campus landscape during his time as Chancellor in the late 1870s. However, it was not until the early 1900s that one of the first campus landscape master plans on record was created. This plan, called the "Kessler Plan," was largely rejected because the University lacked the funds to see it through. It is important to note, however, that it

[1] KU Design and Construction Management Website: "Lawrence Campus: The Past 130 Years." http://www.dcm.ku.edu/cmpuspln/historyb.htm. Accessed: May 6, 2006.

was the Kessler Plan that first called for Jayhawk Boulevard to serve as the backbone of campus. Several years later, KU officials hired the Kansas City landscape architecture firm of Hare and Hare to devise a more financially feasible plan. The Hare Plan was released in 1928 and several of the ideas highlighted in that plan still remain largely intact today, including their emphasis on the preservation of Potter Lake and Marvin Grove areas.[2] In fact, the Hare and Hare Plan was the first plan to designate Marvin Grove and Potter Lake as "no-build" areas. The Kansas City-based Jeffrey L. Bruce & Company completed the most recent campus master plan in 2002 and it continued to emphasize the importance of protecting campus green space. It also calls for further beautification of Jayhawk Boulevard, Memorial Drive, and Oread Avenue.[3]

Even after several years of hard work and planning done by hired landscape experts, the campus landscape still has a great deal of room for improvement. It is for this reason that our group chose to research the campus landscape and offer input into its future development. There are a couple aspects that our group chose to follow when evaluating the current effectiveness of the campus landscape. First, and probably most obvious, there is the aesthetic aspect, or what we chose to call "output," of the landscape – what the landscape conveys to the senses. The second and equally important component of the campus landscape is what we refer to as "input," or the upkeep and resources that allow and promote the natural campus landscape to flourish. Because both of these factors are so critical in the landscaping process, our group chose to incorporate both into our research. We wanted to know how the campus could continue to convey, and even enhance, its natural beauty, while at the same time reducing, or even eliminating certain inputs, such as water, harmful chemicals, and excess human labor. We also realized that we could not cover all areas of the campus landscape, so we chose to focus on five specific areas. Using the

[2] KU Design and Construction Management Website: "Lawrence Campus: The Past 130 Years." http://www.dcm.ku.edu/cmpuspln/historyb.htm. Accessed: May 6, 2006

[3] The University of Kansas Landscape Master Plan. Volume 1: "Design." Jeffrey L. Bruce and Company. August 2002.

guiding principle of resource conservation, the specific areas of the campus landscape we chose to audit were Potter Lake, grey-water (water recycling) use, litter on campus, the potential for native plant species to be planted on West Campus, and potential native plants for campus use. This document will be divided into five sub-units, each sub-unit highlighting the four focus areas of the landscape study.

Potter Lake

Potter Lake has been a distinguishing feature on the KU campus since it was created in 1910 out of the need for a more reliable source of fire protection. The lake was filled primarily by stormwater runoff, but records show it was initially necessary to use city water supplies to fully fill the lake. Aside from its intended use for fire protection, Potter Lake quickly grew into a very popular feature on campus as it was home to boating regattas and was even considered a potential location for an outdoor swimming facility. However, concerns of pollution in the lake were voiced as early as the 1920s and over time, sedimentation filtered into the lake at very high levels. This forced the university to in 1958 drain and again dredge the lake. During the 1958 lake dredging, a small sediment-catching pond was constructed at the southwest corner of the lake and after the lake was re-filled around 1959, the lake was primarily used as a relaxing and convenient get-away spot for students avoiding the hustle and bustle of campus life atop Mount Oread.[4]

Today, the lake is again seeing increased signs of sedimentation. It is obvious that several portions of the lake are becoming quite shallow and litter can be seen lying on the bottom around the periphery of the lake. On top of sedimentation, algal blooms and contaminated stormwater runoff have contributed to the lake being placed on the Kansas Department of Health and

[4] Douglas Harvey, Department of History, University of Kansas. "A Lake's Progress", This Week In KU History (www.kuhistory.com), ed. Henry J. Fortunato. October 3, 2002. University of Kansas Memorial Corporation. Retrieved May 6, 2007 from http://www.kuhistory.com/proto/story.asp?id=92.

Environment's list of 120 polluted bodies of water in Kansas in 1999. Originally constructed to hold approximately four million gallons of water, the lake has seen considerable sedimentation and now probably holds closer to two-and-a-half to three million gallons of water, though there appears to be no precise record of its current capacity. Also, there is very little mention of the lake in the most recent Landscape Master Plan other than to say that it is an area to be preserved. The lake still serves predominantly as a relaxation spot as well as a visually appealing aspect of the campus landscape, but its increased levels of pollution and sedimentation are substantially limiting the lake's ability to sustain its important role as a scenic and healthy retreat on campus.

After researching the lake and its history, our group concluded that there is great potential to enhance the beauty and possibly even clean the lake naturally while still preserving its natural feel. The most recent Landscape Master Plan does point out that Potter Lake and the adjoining Marvin Grove are both located in what is referred to as a "sheltered cove;" meaning it is located near North and East facing slopes which are more apt to be sheltered from hot Southwest winds and the hot, dry periods during the summer. Cool air and increased soil moisture characterize regions located in sheltered coves. This is very significant in terms of the type of vegetation that is capable of growing around Potter Lake.

Currently, one will find numerous Cattails surrounding the lake. The Cattail plants provide somewhat of a buffer around the lake's perimeter, but it would appear that there is great potential for expanding the buffer zone around the lake's perimeter – planting more plants and grasses, such as Bowles Golden Sedge and New Zealand Hair Sedge, further up the sides of the embankment surrounding the lake. Several of these expanded zones around the lake would provide a more sufficient buffer zone for polluted runoff entering the lake basin at the same time

providing a more scenic vegetation arrangement around the lake to provide for a more diversified animal habitat around the lake.

Another alternative for the fertilizer runoff problem would be to construct plant and grass-filled terraces along the hills surrounding the lake. To be most effective, there would need to be two to three terraces and each would need to include native plant and grass species known for their ability to soak up silt, nitrogen, and other minerals found in fertilizer runoff. The terraces would serve to slow and catch fertilizer runoff, at the same time adding to the aesthetic appeal in the area around the lake. The terraces would be a practical alternative that if carefully arranged to include plants that grow well on slopes, would serve to supplement, rather than take away from, the natural and open feel provided by the Potter Lake area.

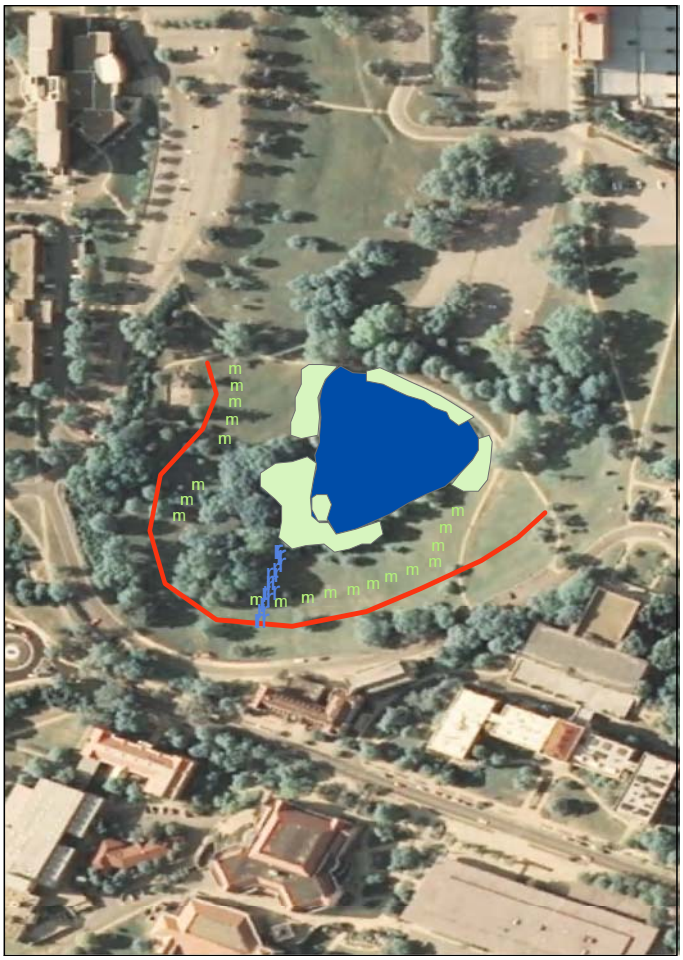

Figure 1. Created in KU ARC GIS lab

One of the biggest concerns surrounding the status of Potter Lake is the unfiltered stormwater that enters the lake. There are six concrete stormwater pipes that provide any and all chemicals, car fluid, and other harmful stormwater runoff unimpeded entry into the lake. Further, the lake is for the most part stagnant, so anything that enters the lake stays for a long period of time without moving and becoming less concentrated. Therefore, stormwater runoff must be abated either through increased filtering on existing stormwater pipes or by re-configuring the existing pipes. One suggestion would be to dig out and cut off the ends of the existing pipes and instead make the last few feet of piping elongated rock waterfall-like, each fall containing a series of connected limestone water holding basins. Absorbent plants could then be grown in the retaining basins of each waterfall to provide a natural filter for the stormwater. If limestone rock were used to create the waterfalls, it too would have some filtering qualities, mainly as an acid buffer for stormwater pollutants flowing into the lake.[5] Replacing the existing concrete pipes with waterfalls would not only provide a good stormwater filtering mechanism but would also provide a more aesthetically attractive feature to the lake than the existing, and very evident, concrete pipes.

Greywater recycling methods will be discussed in greater detail later on in this report, but the potential for Potter Lake to provide a source of greywater should not be overlooked. Because the lake is so stagnant in its current form, it would be beneficial not only to find a way to move the water through the lake but also to figure out a way to use small amounts of the existing lake water for irrigation purposes. One way to tackle both issues would be to figure out a way of slowly moving water through the lake to drip-water irrigation points on campus in close proximity to the lake. It would be important to closely monitor outflows from the lake if such a

[5] Notes from a lecture by Professor James Thorp, University of Kansas Aquatic Ecology Class. Lecture Date: February 20, 2007.

system were put into operation, but the need to cut down on public water supply use coupled with the need to make the water in the lake less stagnant would seem to be enough to warrant such changes.

Finally, one last idea concerning the stagnant lake water would be to install some sort of fountain feature in the lake that would serve as a water-moving device within the lake. Not only would the fountain help move water around within the lake, but it would also increase oxygen levels within the lake – oxygen levels currently being inhibited by the large presence of oxygen-depleting algal blooms and decomposers at the bottom of the lake. Subsequently, by moving water around the lake, more of the polluting substances would be exposed to sunlight resulting in a higher rate of breakdown of those substances. Like several of the other suggested features, a fountain could also serve as an aesthetically appealing feature of the lake.

Potter Lake has a lengthy history on campus and recent efforts in KU Design and Construction Management point toward making it a lasting presence at the university. A grant from the Getty Foundation will assist KU in preserving the Potter Lake and Marvin's Grove areas as open space.[6] This is important in staying consistent with the current landscape master plan as well as pre-existing landscape plans.

With the aforementioned considerations in mind, it will be increasingly important for the University to recognize not only the need to preserve Potter Lake as an important part of the landscape, but also to take a proactive approach toward enhancing its presence. The lake, in its current stagnant and polluted form is not sustainable. If untended, sedimentation and excess fertilizer runoff will result in the lake naturally in-filling with sediment and vegetation and eventual loss of the lake. Steps must be taken to filter and re-route stormwater runoff in addition

[6] Based on discussion with Peg Livingood, Landscape Architect in KU Design and Construction Management Department. April 2007.

to curtailing the amount of unabated fertilizer run-off flowing into the lake through well-planned natural buffer zones around the lake perimeter. These methods will serve the lake well in the long-run in addition to making the lake an even more aesthetically and naturally pleasing feature of the already beautiful, open, and tranquil KU landscape.

Water Usage and Water Recycling

The large amounts of landscaped and green space areas that adorn KU's campus require considerably large inputs of various resources to maintain these aesthetically pleasing areas. One of the most basic, and also one of the largest, inputs is water. For the fiscal year of 2006, KU Facilities Operations-maintained irrigation systems used 6,871,580 gallons of water.[7] This does not include the 4,989,900 gallons used by KU Athletics for their sports fields. Speaking just of Facilities Operations-maintained areas, there are 22 systems located though out campus, with 8 of these located on West Campus. Some of these systems cover landscaped beds and run approximately every three days and only during certain times of the year. The other systems cover turf areas and run one to two times weekly. These systems are on timers, so irrigation is done only in the morning hours to minimize evaporation losses. Also, each system is outfitted with a rain sensor so that during periods of rainfall, systems are not operational. Although there are these water conservation practices currently being observed, there is still room for much innovation and further conservation practices in water usage.

Greywater is defined as domestic wastewater composed of wash water from kitchen, bathroom, and laundry sinks, tubs, and washers. Stormwater, on the other hand, is defined as runoff resulting from rainfall or snow melt. The use of recycled water in the form of greywater would be impractical, especially for the water demands of landscaping. The containment and use of stormwater, on the other hand, would be relatively easy and practical for landscaping uses.

[7] Lang, Mike; Facility Operations, KU

There are several different ways we could, on our campus, create the means to capture and store stormwater runoff.

As per a City of Lawrence ordinance, for every square foot of paved surface there must be a detention basin of regulated size as a control measure for flood events as the 100-year flood. Due to several newer construction projects on West Campus, such as the new Park and Ride lot, a detention basin has been built to suffice for the recent construction. [8] Within this detention basin there is an orifice to not only drain but also regulate how much stormwater is being released. It would be possible, with the city's permission, to close off this orifice in order to catch and contain an amount of runoff deemed reasonable, so as to still allow enough room for flood control should a major flood event occur.

Another resource at the University's disposal is a 250,000-gallon concrete fuel storage tank located under the parking lot at the Computer Center. This tank originally held fuel but was abandoned when the University switch fuel types and the tank was no longer acceptable under Kansas Department of Health Environment regulations. The University is federally responsible for, at some point, to have the tank cleaned and decommissioned – a cost estimated at $150,000. The use of this storage tank for stormwater retention has been a topic of discussion by many at the University and there is in fact a class currently being held on the issue of stormwater runoff and greywater. This class is doing extensive research on the feasibility of the use of this tank for stormwater retention and will hopefully, by the end of this term, have made some helpful conclusions regarding this issue. A few components inherent in the use of this tank for stormwater would be retrofitting storm sewer lines to empty into the tank (down hill flow already directs stormwater to that location), a filtration system to control sediment (among other things), and a system for pumping the stored water into either water trucks or to a sprinkler system. The

[8] Livingood, Peg; "Landscape Architect", Design and Construction Management, KU

most obvious difficulty with this third component is the energy expense to pump water the potentially long distance to a sprinkler system.

A third option for the containment of stormwater runoff would be the construction of several large underground cisterns, sometimes called Rain Water Catchment Systems or RWCS, for the storage of roof runoff. Using the following formula, the potential maximum collection volume from several of the University's larger buildings is as follows:

Formula: rainfall (inches) x roof area (sq. ft) x 0.62 gal/sq ft /in. rain x collection efficiency (0.85) = potential collection (gal)[9]

BUILDING	AREA (feet)	Average Rainfall (mm/yr)	Runoff (gallons)
Student Rec Ctr	60303.84	36.5	1,159,974.51
Robinson	107274.74	36.5	2,063,483.21
Anshutze Sports Pavilion	104401.98	36.5	2,008,224.36
Watson Library	32485.98	36.5	624,884.13
Dyche Museum	21719.06	36.5	417,777.05
Lied Center	47770.25	36.5	918,884.66
Multidisciplinary Building	26745.45	36.5	514,462.03

It is obvious that just the collection potential from the Anshutz Sports Pavilion and Robinson Gymnasium is more than enough to cover the water demands of athletics for sports fields. The potential for the remaining buildings could supplement more than half of the demands of the Facilities Operations systems. This, along with the potential storage of the old fuel tank under the Computer Center, could mean that landscaping might be able to meet all of their water demands with recycled stormwater. With enough stormwater captured and stored though these

[9] "The Texas Manual on Rainwater Harvesting" Third Edition, by The Texas Water Development Board (2005, Austin, TX) http://www.twdb.state.tx.us/publications/reports/RainwaterHarvestingManual_3rdedition.pdf

means, it is feasible to have an ample supply held to meet the demands even throughout the dry season when rainfall is considerably less.

There are several factors to be considered with the implementation of RWCS. It is my understanding that most of the buildings on campus, especially those larger in size, drain at several locations around the roof of the building; the gutters would need to be retrofitted to downspout at one place. Also, keeping in mind the aesthetics of campus, in some or maybe all locations it would be desired to have the cisterns located under ground. A pumping system (just as with the old oil tank) and a leaf guard would be needed but because it is roof runoff, it is free of most sediment and dissolved salts and therefore no further filtration is needed. Maintenance is low; inspections for clogging and structural soundness once to twice a year as well as removal of any accumulated sediment once annually.[10] Due to the size of cistern required by the demand and volume of catchment, coupled with the desired underground location, start up costs may be high. Generally, cisterns may be constructed out of a variety of materials, such as polypropylene, fiberglass or galvanized sheet metal. These types of tanks generally top out at the 10,000-gallon range.[9] Having custom concrete tanks pored would be the most economical as they can also be made to hold extremely large volumes.

Also noteworthy is that cisterns designed to catch the first 0.5" of rainfall are considered to be Best Management Practices. RWCS are also associated with potential LEED credits for "Water Efficient Landscaping", "Stormwater Management" and "Innovation and Design Process".[10] Additionally and keeping in mind both the existing 250,000 gallon tank and RWCS, City Code 16-506 (E) states "an adjustment shall be made equaling 58% of the stormwater system drainage charge made pursuant to this ordinance for properties which provide on-site

[10] "Low Impact Development for Big Box Retailers", prepared by The Low Impact Development Center, Inc under EPA Assistance (2005, Beltsville, MD) htttp://lowimpactdevelopment.org/bigbox/lid%20articles/bigbox_final_doc.pdf

detention or off site improvements, or both, and which comply, on a continuing basis, with the stormwater management criteria".[11]

As previously stated, Facilities Operations maintains 22 systems located throughout campus, which consist entirely of sprinkler systems. An alternative irrigation method, which happens to use 30%-40% and is much less costly over time compared to traditional sprinkler systems, is sub-surface drip irrigation or SDI. An SDI system consists of underground tubing with small openings, or emitters, releasing water beneath the soil surface directly to the roots of vegetation.[12] The tubing is generally 4 inches deep and spaced 12 inches apart, dependent upon the type of vegetation. It is similar to above ground drip irrigation but because of high traffic areas on campus, a drip irrigation system on the surface is not feasible. A few components needed for this type of irrigation system are water filtration, proper air-vacuum relief and check valves (to prevent aspiration of soil particles into emitter openings), pressure regulation and flow measurement.[12] With these measures in place, along with a system equipped with a rain shut-off device, SDI can be much more efficient with water use and with its costs.

The initial costs of installation can be high, but only because a sprinkler system infrastructure already exists. The high-end initial cost of a SDI system is approximately $2,030 (assuming 7000 sq. ft. irrigated area) compared to an estimated $2,240 initial high-end cost for a conventional sprinkler system.[13] An SDI system at its worst will last 20 years while a conventional sprinkler system will last that long at its best. Total average annual costs over the lifetime of both systems, taking into account yearly maintenance and repair and water used per

[11] City Of Lawrence, City Code: CHAPTER XVI. STREETS, SIDEWALKS AND RIGHT-OF-WAY; ARTICLE 5. STORMWATER UTILITY AND MANAGEMENT; 16-506 ADJUSTMENT TO STORMWATER SYSTEM DRAINAGE CHARGE; section (E)
http://web.ci.lawrence.ks.us/legal_services/citycode/chapter16.html#_Toc114037698

[12] "SUBSURFACE DRIP IRRIGATION - PAST, PRESENT, AND FUTURE" by C. R. Camp, F. R. Lamm, R. G. Evans, and C. J. Phene; Reprinted from proceedings of the 4th Decennial National Irrigation Symposium, Nov 14-16, 2000, Phoenix AZ. Proceedings edited by R. G. Evans, B.L. Benham, and T. P. Trooien. (ASAE: St. Joseph MI.) p.363-372

[13] Greenscapes: Environmentally Beneficial Landscaping; Environmental Protection Agency
http://www.epa.gov/epaoswer/non-hw/green/tools/drip.pdf

gallon (still assuming the irrigation of 7000 sq. ft. and a water cost of $2 per 1000gallons) is $504.77 for a 20 year SDI system compared to $1, 371.73 for a 20 year conventional sprinkler system.[13] Just average maintenance costs alone differ as much as $291.25 per year and $1,167.00 per year, respectively.

Another dimension of green landscaping is in the form of rain gardens. Rain gardens are areas landscaped with native plants and flowers, which have deep root systems (for increased infiltration) and designed to intercept stormwater runoff. They can allow 30% more water to soak into the ground as well as filter out pollutants, such as sediment, fertilizer, pesticides, oil, grease, and heavy metals that get carried away with stormwater.[14] Once established, rain gardens are extremely low maintenance and require no watering or fertilizers, but simply a yearly clean up and possibly mulch to help retain moisture.[15] Strategically located rain gardens will not only serve campus in reduction of stormwater runoff but also add to the campus aesthetically with beautiful native flowers and grasses. A group within KU's current greywater class is working on implementing a rain garden between Mallot and Summerfield (in addition to their work on the abandoned oil tank located under the Computer Center). Several other locations on campus could be well suited for a rain garden, including areas around the Student Recreation and Fitness Center.

Litter on campus

Few students realize that when trash is left behind, it is up to the landscaping employees to clean it up. This diverts valuable time and money away from tending to landscaping issues and cuts down on efficiency. Specifically, it requires 30 out of 32 University of Kansas landscaping employees picking up trash for about one hour out of each day to maintain the environment.

[14] Rain Garden Presentation, by Patricia Ogle; City of Lawrence, Stormwater Division, Stormwater Pollution Prevention
[15] Rain Gardens of West Michigan
http://www.raingardens.org/Qualities_And_Benefits.php

That means the university is spending nearly $1000 per week on picking up litter, assuming these employees are paid $6.50 and hour, which most are likely paid higher wages. Studies show that litter can be decreased by 50 percent or more through educational campaigns. This is the route that other universities have taken to decrease littering behavior on campus. While many campus's attempts to eliminate littering on campus were spurred by the time and money spent picking up discarded cigarette butts, the focus could be easily shifted to combat newspaper and flier waste. Penn State University and South Carolina's Clemson University are two examples of University efforts to reduce the amount of litter that landscape crew members were responsible for.

Much like at the University of Kansas, it had been estimated that the landscapers at Penn State[16] were spending 10 hours a week picking up litter at an estimated cost of $150,000. With little money to put towards a solution, they began by increasing the number of trashcans and recycling bins in high-traffic public areas. The next step was to initiate an anti-littering campaign by printing laminated, pro-recycling messages that would be placed in bathroom stalls, classrooms, bus stops and other common areas. Since their studies found that fliers make up a main percentage of litter on campus, they avoided this tactic and sent out a mass email to University groups and organizations encouraging them to limit their flier usage and take advantage of the University's on-line network as well. In time they are hoping to convince the University to make rules restricting the amount of fliers handed out on campus. Their final step was to arrange for Saturday morning clean up sessions in which volunteers would spend a few hours picking up trash around campus and be rewarded with free pizza. They are hoping to convince local pizza shops to donate the pizza to keep the process cost efficient.

16 "Center for Sustainability at Penn State" <http://www.engr.psu.edu/cfs>

Clemson University[17] has set up a litter control task force dubbed Solid Green which is primarily an educational campaign encouraging people to take responsibility for their actions on campus and in their community. Their elaborate marketing plan began with the creation of a brand. They came up with a logo and slogan ("Solid Green: Keep Clemson Clean") to develop a visual identity. The next stage was to get the University's president involved by having him announce the goal to achieve a litter free campus. Next, Solid Green targeted all of the University's media outlets along with some outside sources. They also painted trucks, trashcans, and recycling bins used for litter and trash collection with their logo to identify them as part of their litter control efforts. Finally, Solid Green hosted competitions between student organizations through an "Adopt-a-Spot"[18] campaign on campus to see which group could keep their spot the cleanest. Their ultimate goal was to educate students and visitors of the goal to be a litter-free campus.

The University of Kansas could easily adopt some of these ideas with little cost. While Clemson undoubtedly spent a large sum of money in establishing their impressive campaign, Penn State was able to install more trash receptacles in common areas and start a modest campaign with a budget of $1,000 (which is less than the amount spent on litter collection weekly). The first and perhaps easiest course of action would be for the Center for Sustainability to look into running advertisements in the University Daily Kansan promoting an anti-litter movement on campus. It would be a good idea to model some of Clemson's marketing ideas, for example, developing a logo and perhaps a catch phrase, and advertising on KJHK radio station. With any luck, that will help educate students and faculty as to how much money and time is wasted as a result of apathy. The most effective course of action would be to get University

17 Clemson University Website: "Solid Green" <http://www.clemson.edu/solidgreen>
18 Clemson University Website: "Solid Green" <http://www.clemson.edu/solidgreen/adoptaspot.html>

organizations involved. The Center for Sustainability is the ideal organization to look into implementing a version of Clemson's "Adopt-a-Spot" program here on campus. The center could approach local and University businesses to see if they would be willing to donate free or discounted item coupons for groups who maintain their designated areas. If the initiative takes off, it will be a source of positive advertising for the University and the Center for Sustainability, and a transcript worthy volunteer opportunity for groups and organizations that get involved. If successful, the money that is saved can be put towards more landscaping projects that will better serve the students and visitors of the University.

Conversion of Turf Grass to Native Prairie on 20 acres of West Campus

The University of Kansas, known for its beautiful campus, has in the last 50-70 years maintained an abundance of perfectly green turf grass. And although this turf grass is nice to see and utilize, it doesn't seem fiscally and environmentally sound to have the entire central and West Campus be landscaped with fescue and blue grass. The newly created Dole Institute located on West Campus is an example of how native prairie grass can be utilized in a landscape to not only look beautiful, but be economically beneficial as well. That is why we are proposing that the twenty acres of turf west of the Lied Center, and adjacent to the current acreage of natural prairie vegetation be converted to natural prairie grass as well, to not only maintain visual continuity, but to provide a learning habitat for University students, and a local research area for the Kansas Biological Survey. Natural prairie vegetation can greatly improve the condition of the soil by improving its structure, and infiltration rates due to the complex and deep root systems that these native plants have in adapting to the stressful environment that the comes with

the seasonality of the central plains (Dierks 2007). Studies have shown that some 30% of the extensive root system dies off annually, adding organic matter to the soil, improving available nutrient levels and the structure of the soil as well (Dierks 2007). This natural vegetation does not require the yearly application of expensive fertilizer that turf grass does, nor does it require the expenditure of costly fossil fuel in weekly mowing during the spring and summer months. What natural prairie grass does need is annual or biannual burnings to maintain the health of the plant species with the community. Because the University already owns prairies on campus as well as at the Nelson Environmental Studies Area that require burning, the expertise and personnel are readily available, so extra training would not be necessary. This expanded prairie on West Campus can be utilized as a learning tool for students wanting experience in prairie restoration, studying the change of soil nutrient and characteristics in physical geography and soils classes, the biological abundance and health in biology classes, and so on.

We are also advocating for the improvement and expanded maintenance of Prairie Acre located near the intersection of Sunnyside Drive and Sunflower Road on the University of Kansas main campus. This prairie remnant, dedicated in June of 1932, is thought to be the last remaining area not plowed or developed on the KU campus. Once home to 80-100 different plant species, in the last 40-50 years that number is thought to have dropped to as low as 28. Concerns and efforts increased in the 1980's and 1990's by Professor Kelly Kindscher as well as other concerned faculty and students, and Prairie Acre was again maintained and revitalized (Hersey and Campbell 2004). Although the health of this valuable asset has begun to rebound, we would like to see a continued effort in the planting of native species, annual burning and resources available to elevate this historically and educationally valuable area to a level of pride at the University.

Figure 2- Aerial photo of West Campus, the large building is the Lied Center;
the green highlighted area is the proposed 20 acres for conversion.

Converting the current twenty acres of West Campus from turf grass to prairie would be done in a multiple step process. During the winter months the area would have to be tilled three times over three months to ready the area for spring seeding. The proposed seed types for a successful native prairie for this area and climate include: Big Bluestem, Indian Grass, Switch Grass, Little Bluestem, Sideoats Grama, and Western Wheatgrass. The cost for seeding pure live seed is approximately $102.00/acre (stockseed.com). After the prairie is established, there would be minimal maintenance for the area in annual or biannual burning. Currently the cost of mowing the area weekly for 28 weeks of the growing season at an average cost of $2.80 per gallon of gasoline is $211.68 plus the salary of the employee. Although this is not a large expenditure, in the long term the prairie would pay for itself in 8-10 years in gasoline alone. This would also

enable more time to be spent on other areas of the campus that are more visible and require more intense maintenance. Numerous departments and classes could utilize the establishment and maintenance of the prairie on West Campus, as well as the Prairie Acre. For example, the Environmental Studies program currently has a Restoration Ecology class with a focus on prairie restoration, and the Biological Survey could use it as a nearby study, research and experimentation area, which could potentially enable grant monies to be brought in for urban prairie restoration activities and other research projects. Local grade school, middle, and high school students could also tour these prairies for educational purposes in identifying native plant species and native animals and insects in the native habitat.

Native Plants and Benefits for the University

The integration of native vegetation in green landscaping is an essential part of any green proposal. Many campuses use landscaping as an attractive tool for appealing to prospective students, as many soon-to-be freshmen go on campus tours in the spring. For a university campus to make the effort to become greener in their landscaping habits, the benefits are innumerable. By switching to native vegetation, a school campus can help the environment, create educational opportunities, cut down on landscaping costs, and show potential students the university's interest in helping the environment.

Native plants are ideal for landscaping because they are already adapted to the climate and cause less stress on the environment. An enormously great feature of native plants is that once they are established in the landscape, they will require less watering. Native plants' roots are designed to absorb and hold more water, as well as penetrate deeper to decrease soil erosion[19]. Native plants on steep slopes would be particularly effective in decreasing soil erosion. At the

[19] "A Source Book on Natural Landscape for Public Officials". www.epa.gov. 2006. 1 May 2007. http://www.epa.gov/greenacres/toolkit/index.html

University of Kansas, a patch of native prairie grass exists on the south slope creating a natural habitat that looks beautiful and helps the soil. Another benefit of native plants is their ability to thrive without fertilizers or pesticides, and without these toxins, birds, butterflies, and wildlife are more likely to make use of the plants. Finally, by planting native plants on campus, it can help restore endangered and threatened species of plants as well as birds and other animals.

Having native plant patches on campus creates numerous educational opportunities. They create ecological awareness and knowledge for the community. Students taking classes in biology, environmental studies, and other natural sciences have a living classroom to study and learn from. They can see first hand the benefits that native plants contribute to the natural world. Educational opportunities extend beyond the university as well. Many school children visit the KU campus to see the Natural History Museum or the Spencer Museum of Art. Soon, they could be visiting patches of native habitat and seeing history at work. Native plants also encourage wildlife and birds to visit the campus. At the University of Indiana, a Prairie-in-the-Planters program was developed by administrative, academic, and student groups. Their project provided food, water, cover, and habitat for wildlife, as well as increase the campus' environmental stewardship. Even during the winter, birds were flocking to the planters showing their year-round benefits.[20]

Finally, while some cost is involved in the start-up of creating native vegetation patches on campus, the economic, and other, benefits outweigh these costs. First, the University will not need to spend money on fertilizers and pesticides. Because they do not need much watering, native plants will decrease water costs on campus as well, especially during the

[20] "The Green University". www.indiana.edu. 16 January 2004. 1 May 2007. http://www.homepages.indiana.edu/011604/text/feature1.shtml

summer. Maintenance of the landscape will decrease considerably as native plants will keep away invasive weeds and there is no need to replant annuals every year.

Specific costs for The University of Kansas to install native plants are unknown, but educated estimates can be made. According to the United States Environmental Protection Agency's Source Book on Natural Landscaping for Public Officials, the installation costs per acre for native grass seed is $2,000 to $4,000 while installing turf seeds would cost $4,000 to $8,000. Planting plugs of native plants may cost a little more to get that extra start-up boost[1]. There are many companies that specialize in wholesale native plant seeds and plugs, so finding a source is easy. Consulting groups also exist to aid in the installation process. Environmental Consultants and Prairie Landscape Specialists, or ENCAP, specializes in ecological consulting and native landscaping for developers. ENCAP says that the initial start-up cost is slightly more expensive than installing turf but that after three years, the costs are significantly less than traditional landscaping.[21]

For The University of Kansas, there are many beautiful native plant options to choose from. During the spring, *Phlox divaricata* or Blue Phlox can be found in the eastern part of the state. This low, mounding plant would be perfect at the front of landscape spaces. Also blooming the in spring is *Ceanothus herbaceous*, or New Jersey Tea. This plant grows 1-3 feet tall with globular clusters of white flowers. It is perfect for the back landscape area. It also had medicinal uses for some Native American tribes. Finally, *Quincula lobata*, Purple Ground Cherry, is another low mounding plant that blooms all season, April through September. [22]

[21] "Environmental Consultants and Prairie Landscape Specialists". Frequently Asked Questions. 2006. 1 May 2007. http://www.encapinc.net/faqs.html.

[22] "Kansas Wildflowers and Grasses". www.ksu.edu. 2007. 1 May 2007. http://www.lib.ksu.edu/wildflower/

During the summer, *Asclepias tuberosa*¸ Butterfly Milkweed, is the ideal plant for a native plant landscaping in Kansas. Its beautiful, bright orange flowers attract the people's eye and butterflies as well. It is an essential plant on the Monarch butterfly's migration route. *Monarda fistulosa,* Mint-Leaf Beebalm has a wonderful scent and a lavender colored flower. It also has had Native American uses and as its name suggests, it attracts bees. A third summer bloomer is the popular *Echinacea pallida,* Pale Purple Coneflower. This species can be found throughout Kansas and is native to the United States[4].

At last, we arrive at autumn. The beautiful *Lobelia cardinalis* or Cardinal Flower grows 1-5 feet tall with spikes of bright red blooms. This plant would be perfect around the edge of Potter Lake and other marshy areas on campus. Blooming September through October is *Aster oolentangiensis,* Azure Aster. This plant has pale purple blooms and a shrubby habit, growing to 40" tall. Finally, *Silphium integrifolium* or Whole-Leaf Rosinweed has bright yellow, sunflower-like flowers and grows 2-5' tall.

As mentioned before, all these plants are drought tolerant and would make a beautiful edition to any green landscape. The University of Kansas has many landscaping areas it changes several times throughout the season. Installing native perennial gardens would provide the campus with economic, environmental, and educational benefits. There would be an initial price to pay, but the long-term benefits would be countless.

Conclusion

Landscaping a large area such as the University of Kansas campus can be a considerably difficult task, and can lead to many environmental problems if not managed properly. The current landscaping team led by Mike Lang, however, employs many best management practices such as using organic fertilizer in the current amounts and not over fertilizing, as well as

mulching, and setting a high mower height to retain moisture in the soil. The suggested improvements and changes that have been outlined here are proposed projects to improve the overall health of the larger campus and also to aid the landscaping team in managing such a large area. With increased development on the campus it remains important to constantly re-evaluate practices including the inputs and outputs that go into the landscaping system to keep the campus up to set aesthetic guidelines. Technology and knowledge are always changing and improving and the University, in keeping with its educational goals, can also improve environmentally as well. The improvements and changes suggested here are to help the health of the campus ecosystem healthy for many semesters and generations to come.

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