Environmental Quality/Land Use Working Group Final Report
10-16-07
Updated 6-09

I. Mission, Goals, and Objectives

The mission of the Environmental Quality /Land Use working group is to research and explore alternatives in the environmental/land use realm that will lead to greater sustainability for the Bloomington campus and surrounding community. Our goal is to help IUB use resources sustainably so as to improve environmental quality locally and regionally and to protect the health of citizens on campus, in Bloomington, and beyond. Reducing resource consumption and saving money through reuse, recycling, and pollution prevention and waste minimization are also important objectives. Finally, the group endeavors to research and assess sustainability opportunities, prioritize them, and choose the initiatives which provide the highest benefits and are doable. In many cases, this will likely require increased resources or personnel, but in other cases, may only necessitate a change in data collection or recordkeeping or minor modification of tasks already performed.

II. Introduction

The working group identified six initial areas of study:

1. Outreach
2. Master Planning
3. Restoration
4. Maintenance-routine practices and standard operating procedures (SOP's) that reflect best practices
5. Hydrology/storm water
6. Hazardous materials use and reduction

While some of these areas such as storm water, hazardous materials usage, and waste minimization have been partly addressed on the Bloomington campus already, sustainability measures have not generally been incorporated into regulatory compliance-based programs unless required. This is function of a system that has emphasized regulatory compliance instead of proactive sustainability goals and measures, and current regulations generally do not call for sustainability measures.

From the group of six areas of study, more narrowly concentrated internship proposals were developed and funded during 2007, 2008 and 2009. Additionally two new internships have been funded for the summer of 2009, one addressing recycling and one continuing on the theme of the campus Tree Inventory. Both are further described below. In each case, the working group focused on projects that could lead to the greatest environmental and health benefits in the shortest period of time. These internships were:

1) Two internships involving: The Jordan River Watershed Master Plan; 2) Two internships involving: The Campus Tree Inventory/GIS Analysis; 3) The Green Chemistry Initiative. 4) Green Cleaning and IPM 5) Green Cleaning and 6) Integrated Pest Management (IPM) and 7) Electronic waste. Full reports for all of these are available at the Sustainability site on OneStart with summaries below.
Section 4 considers areas where IUB is already making considerable progress in improving environmental quality and land use management. Section 5 compares IUB's relevant practices with peer institutions. Identification of metrics for environmental quality and land use are described in section 6. Curricular and service-learning dimensions of the group's work are considered in section 7, followed by a set of recommendations and next steps.

III. Priority Projects in the Arena of Environmental Quality and Land Use

As mentioned above, the Task Force identified three priority problem areas for campus sustainability in the arena of environmental quality and land use. Interns were retained in 20072008 and 2009 to research these problems and to provide recommendations for next steps. Below are summaries of the research findings and draft plans for moving forward.

A. Jordan River Restoration

2007 Nancy Arazan and Rachel Powers initial Jordan River Restoration analysis

As Sustainability Interns Nancy Arazon and Rachel Powers report in their "Jordan River Master Plan Feasibility Study," David Starr Jordan, Indiana University's 7th president, famously rejected a proposal to have an IU campus building named after him. He preferred having his memory attached to a quiet, meandering waterway that winds through campus. President Jordan, a naturalist, believed the creek might endure longer than manmade structures on campus. By a variety of measures, that prospect is at risk. Arazon and Powers report that water quality and in-stream habitats in the Jordan River are in fragile condition. Most conspicuous, stream banks have eroded along many stretches of the river, putting infrastructure and pedestrian safety at risk. Some passages of the riverbank are so badly eroded, infrastructure may be one "large rainfall event away" from lasting damage or loss, they assert.

The Jordan River, an upper basin waterbody in the Clear Creek-Jackson Creek watershed, is a distinctive feature of Indiana University and is integral to IUB's reputation as one of the nation's most scenic campuses. Environmental conditions in the river have varied over the years. Beginning in 2000, discharges from the campus central chilled water plant have been rerouted to sanitary sewers and away from the Jordan; manhole covers near the Jordan have been locked down. Both measures have rejuvenated Jordan River water quality. Buffers around the river, where fertilizer and pesticide treatments are forbidden, have helped, too. However, major rainfall events, periodic spills, sand salt and other road particulates, clippings from lawn maintenance, among other stressors, have taken their toll. Moreover, channelization of the river, installation of culverts, and other physical interventions have amplified the destructive

force of storm events, causing erosion, increased sedimentation, turbidity, damage to habitats, and death of organisms in and around the river, including trees. Conditions have deteriorated so badly along some stretches that both infrastructure and public safety are at risk.

Ideally, impervious surface should constitute less than 11 percent of the watershed; Indiana University's impervious surface is around 16%. It may be unrealistic to aim for the <11% target shown in Figure 2, considering IU's comparatively low current ratio of built-up impervious surface area vs. pervious open and landscaped areas. New land acquisition could further decrease this ratio and/or alternatively, rehabilitation of currently impervious areas could offset future construction projects that inevitably involve some loss of pervious area.

Regarding water quality in the Jordan River itself, Arazon and Powers report mixed results for macroinvertebrate index studies (Pollution Tolerance Index) and only scores of "fair" based on the Visual Stream Assessment approach. It is encouraging that, on some recent occasions, PTI tests have yielded high or "excellent" water quality scores. The target for the Jordan is to achieve consistently excellent scores, especially during non-storm event periods when higher water quality should be expected.

Arazon and Powers lay out a variety of worthwhile projects to protect and rehabilitate the Jordan, include low- as well as higher-cost options. Planting of water-loving or "hydrophytic" vegetation have the advantage of reducing nutrient and sedimentation loadings to the river, reducing the volume of water reaching the channel, and lowering water velocity, thereby checking erosion. Planting of shade tolerant herbaceous vegetation and trees could have a similar effect. Planted wetlands along particular stretches of the river and elsewhere in the campus watershed would also have positive filtering and water flow management effects.

Restoration of the natural hydrography of the Jordan by, for example, removal of collapsing rock walls (replaced by native plants and trees) would also diminish the destructive, channelizing effects of past engineering efforts. Creation of porous pavements in new and existing built-up areas, including parking lots and pathways, would achieve reduced runoff, sedimentation, and pollution objectives.

Dedicated training programs for grounds crew focusing on no-mow zones in the riparian buffer are recommended, as is educational signage to raise awareness of the other remedies mentioned here, and described in greater detail in Arazon and Powers' report.

2008 Rachel Powers Jordan River Watershed Analysis and Cost Benefit Analysis

Watershed Analysis
a.

POTENTIAL WETLAND SITES ON THE JORDAN RIVER, INDIANA UNIVERSITY, BLOOMINGTON CAMPUS
A site suitability analysis using soil type, elevation and vegetative cover
By: Sarah Corbin
December 11, 2007
Edited by Rachel Powers
March 4, 2008

ABSTRACT

Jordan River is an approximately 2 mile long stretch of Clear Creek that runs across the Indiana University (IU) Campus in Bloomington, Indiana. Clear Creek is affected by non point source pollution from farm and residential encroachment and commercial and industrial development. Degradation to Clear Creek threatens the ecological integrity, the cultural and historical value, and the economic services that Clear Creek provides to the City of Bloomington and surrounding area. The IU Sustainability Taskforce has chosen the improvement of Jordan River as an integral component in the framework for IU's plan for sustainability. Specifically, they have focused on the establishment of wetlands in the riparian zone of the Jordan River. The main objective of this study is to identify the areas that are most appropriate for and most in need of wetland plant species. The study focuses on three criterions: elevation, vegetative cover, and soil type. The results of the study may help the IU Sustainability Taskforce to identify and prioritize areas for planting.

IV. Cost Benefit Analysis of the Jordan River Restoration

Abstract

The Jordan River Restoration plan is focusing on campus sustainability through improving land management on the campus to create a healthier, more natural environment within the Jordan River corridor. The Jordan River Restoration Plan needs to assess the environmental and economic benefits gained from using

habitat restoration along various degraded stretches of the Jordan River as it runs on the IUB campus. The primary focus of this analysis is to determine the costs and benefits of constructing wetlands on the IUB campus to verify whether the economic and environmental benefits are greater than the costs. A Kaldor Hicks Tableau analysis will be used to assess the various costs and benefits that could be incurred by both the City of Bloomington and IUB.

Wetland creation along stream channels can be used to improve water quality and decrease velocity and volume of water. Some commonly recognized functions of riparian zones that contain wetlands include: stabilization of banks and resistance to erosion, filtration of suspended solids, nutrients and harmful toxins and support and protection for fish and wildlife species. Other benefits that were assessed were the creation of an outdoor classroom, reduced maintenance costs, value of reduced road flooding, value of delayed capacity expansion, improved public relations value and improved campus aesthetics. The costs of the project were estimated based on a previous study. The additional cost used in the analysis was the possibility that some individuals might not like a more natural aesthetic on campus.[1] It was concluded that based on the assumptions made, along with the cost benefit analysis that was performed, wetland creation on the IUB campus would have benefits that outweighed the costs.

B. The Campus Tree Inventory/GIS Analysis

Health of the Jordan River depends greatly on the condition of another key natural resource at IUB: trees. Trees provide shade for the river, keeping the water cool and habitable for fish, invertebrates and other life. Tree roots stabilize the riverbank. Trees also transpire water – water that might otherwise form baseflow to the river or overland flow.

Of course, trees also serve many other purposes on campus including habitat for terrestrial and avian creatures and shade for buildings and study and picnic areas. Trees

[1] Argonne National Laboratory (University of Chicago under contract with the U.S.D.O.E.) Brookhaven National Laboratory: Technology fact sheet: Peconic River remedial alternatives wetland restoration/constructed wetlands. Assessed at: http://www.bnl.gov/erd/Peconic/Factsheet/Wetlands.pdf

clean the air and beautify curbsides and built-up areas. Trees capture and store atmospheric carbon, allowing IUB to help offset its own carbon emissions.

Many trees on campus have "respect value" as they are accompanied by name plates that recognize friends of the university. And trees do nothing less than sell the school to students and parents who are enchanted by the landscape.

Sustainability Intern Brandon Schmitt inventoried IUB's trees in 2007. In his report, "GIS Analysis and Tree Inventory for Indiana University, Bloomington Sustainability Task Force," Schmitt notes that Bloomington is a long-standing member of "Tree City USA" – a distinction that probably would not be possible without IUB's tree-friendly campus. Among American cities with a population density of at least 1,000 persons per square-kilometer, Bloomington has one of the highest ratios of tree cover to total land area – nearly 50 percent. Indiana's sylvan campus makes a key contribution to these and other high quality of life indices for Bloomington.

Using different techniques, but with particular reliance on hand-held computing technology and a geographic information system software package called "iTree STRATUM," Schmitt inventoried 2,110 trees in the main campus area bounded by Third and Seventh Street and Indiana and Jordan Avenue. (Hence, some major forest cover areas owned by IU, such as Bradford Woods, the IU golf course, and woodlots north of 7th Street were not part of this inventory).

Schmitt finds that IUB's trees are, on the whole, in good physical condition. Former Indiana State Forester, Burnell Fischer, a clinical professor at SPEA and adviser to the Task Force, reports that the overstory in Dunn Woods contains numerous snags and dying trees. This condition poses more risks to people passing through Dunn Woods than to the health of the woods, per se. Invasive species, on the other hand, clearly *do* affect the health of Dunn Woods and other wooded areas on campus, for example, forested areas to the east of the Kelley Business School and SPEA. Euonymous, honeysuckle, *ailanthus*, and other garden and introduced species are crowding out native vegetation and constitute a maintenance burden.

Schmitt described 14 acres on campus as heavily forested – areas such as Dunn Woods. Species diversity on campus is rich in these and other areas; Schmitt identified 58 species; the taxonomy of a handful of others could not be clarified. Using iTree STRATUM, he estimates that almost 1.8 million sq-feet of canopy is provided by IUB's trees – equivalent to around 41 acres.

iTree STRATUM also allows for the calculation of various benefits from trees, including reduced energy consumption due to provision of shade (less need for air conditioning), stormwater runoff reduction, carbon storage, air quality, and aesthetic benefits. Schmitt calculates that IUB's trees in the core campus area provide total annual benefits of $158,000. This sum does not include various other services such as permeability and other soil conditioning properties, habitat, and reduced need for lawn care.

Both the tree cover data and the monetary value of trees on campus represent two major sustainability indicators (Table 2). Indeed, they are proxies for a whole suite of values, described above. Baseline data for 2007 are provided for canopy cover and annual monetary benefits derived from IUB trees. Targets are established, including maintaining IUB's comparatively large canopy cover, and secondly, increasing the value of standing and future trees.

TABLE 2 HERE

C. Green Chemistry Initiative

2007 Chris Kumfer-Green Chemistry Internship

This project considered opportunities for green chemistry in both research and non-research activities on campus. Green chemistry includes the elimination, reduction, and substitution of products to lessen the effects of chemical (particularly toxic chemical) usage or associated waste. Opportunities for chemical management/inventory systems, green teaching and research labs, and green cleaning were evaluated under this initial project, which remains on-going as this report goes to press.

Due to the interest and opportunities identified in this internship, it has been renewed for funding for fall 2007 with an emphasis on non-research green chemistry and integrated pest management (IPM).

2008 Barberis, V. and P. Nathan Internship

Current and Potential Green Chemistry Practices

Introduction

Indiana University-Bloomington (IUB) has been working to identify ways to improve the environmental sustainability of its campus throughout the past year. A part of the equation is chemicals used on campus grounds in research and non-research based settings. Green chemistry is defined by the EPA as "environmentally friendly chemicals and processes that result in: reduced waste, eliminating costly end-of-the-pipe treatments; safer products; and reduced use of energy and resources—all improving the competitiveness of chemical manufacturers and their customers." IU's Sustainability Task Force has also identified green chemistry practices as those which use green products for cleaning, reduce hazardous waste, reuse waste, and process changes that result in elimination, reduction or greener replacement of products. The Environmental Health and Safety Department at IUB has therefore taken up the responsibility of carrying out a Green Chemistry Project focusing on non-research use of chemicals on campus. With this project, the interns have gathered data through meetings with various departments on campus, and have prepared and documented this report which includes current practices, some of which are already environmentally friendly and potential greener opportunities.

Descriptions of Categories

Integrated Pest Management (IPM)

IPM is described by the EPA as "an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment." This is especially important in some areas of campus that are expected to be aesthetically pleasing, such as athletic fields and the campus golf course. The university offices of Physical Plant, Campus Division and Athletics manage grounds with different strategies, but at the same time have a common goal of keeping aesthetic standards high while minimizing chemical applications of fertilizers and pesticides.

Green Cleaning

It is necessary that Indiana University keep a clean and sanitary environment for its employees, students, and guests. However, many chemicals that are effective disinfectants and cleaners can be harmful to the environment. Due to the growing popularity of environmentally-conscious cleaning, many manufacturers are making unsubstantiated claims about the "eco-friendliness" of their products. As a result, third party certification bodies have been created to assist in designating a product as green. Section three in this report gives descriptions of two certifiers: Green Seal and Green Guard. At Indiana University- Bloomington there are currently five Green Seal certified products used on campus (Appendix C).

Fuels

The university provides a free bus service as a mode of transportation around the Bloomington campus and surrounding neighborhoods. Additionally, the university has a fleet of cars that are used by employees. These two methods are managed by Campus Bus and the Motor Pool. Descriptions of practices of each of these can be found under fuels in section two of the paper (Green Chemistry: Products and Practices).

Water Chemicals

Utilities manages the water treatment and processing for the IUB campus. They provide heating, humidification, and hot water for ten million square feet of space by producing steam at the Central Heating Plant. They also provide roughly fifteen thousand tons of chilled water annually for air conditioning. For more detail about water treatment chemicals on campus please refer to section two of this report.

Descriptions of Offices and Divisions

Physical Plant: Campus Division, Building Services and Utilities

As stated on the IU Bloomington website, Physical Plant's mission is to "operate and maintain a high-quality physical environment to enhance student learning, faculty teaching and research." Within IU's Physical Plant there are seven divisions: Building services, Building Maintenance, Building Systems, Business Affairs, Campus Division, and Engineering Services, and Utilities. We will address three divisions: Campus Division, Building Services and Utilities. Campus Division maintains landscaping and maintenance of the campus grounds and outside facilities. Building Services handles custodial services, recycling, moving and set-ups, and solid waste disposal. Utilities department is responsible for electricity, steam, heating, air conditioning, water, and sewage on campus.

Athletics Facilities: Fields and IU Golf Course

The mission of the Department of Intercollegiate Athletics is to provide an athletics program committed to integrity, fairness and competitiveness that is consistent with and in support of the mission of Indiana University. This department maintains all of the campus athletic fields as well as the golf course.

Residential Program Services: Interior Pest Control and Cleaning

Residential Program Services (RPS) has approximately twenty two housing centers on campus, servicing nearly 12,000 residents. On their website you can find their mission statement, "to bring the academic life of the University into the student's living environment by providing a residential experience which best meets the educational and developmental goals of our residents outside the classroom, enabling them to succeed inside the classroom." It is clear that they understand the importance of keeping a clean and healthy living environment for their students, which includes safe and responsible use of chemicals. Our focus will be on the use of pesticides and cleaning products within buildings maintained by this division. RPS handles pest management for all residential halls and university kitchens on campus, as well as small kiosks and storage rooms at Jordan Hall and at the SRSC.

Division of Transportation Services: Motor Pool

Indiana University Motor Pool maintains university vehicles through offering facilities for fueling, washing, and repairing vehicles at the 801 N. Range Road location in Bloomington. The division's mission "is to provide safe, reliable, cost effective and convenient transportation to the University community". Motor Pool uses a large variety

of chemicals for all of its services, some of which have no greener alternatives at this time.

Utilities

Utilities provides safe, reliable, and cost effective utilities necessary to support the mission of the University and its facilities. This is accomplished chiefly through operation, maintenance, repair and improvement of the central steam and chilled water production plants, and distribution systems for electricity, steam, water, condensate, sewerage and chilled water. The objectives of the Utilities division are to ensure:

- Safety of the University's workers and customers from the hazards inherent in the utilities production and distribution business
- Reliability in providing utilities without interruption, except when required for work to assure continued excellent service
- Cost effectiveness and provide necessary utility services at minimum expense of resources.

2008 August Stephanie Redick Integrated Pest Management Internship

Executive Summary

The purpose of the Integrated Pest Management (IPM) internship was to evaluate the current pest management situation at Indiana University Bloomington, research pest management programs at other universities, and recommend changes to implement an IPM program at IU. IPM is the recommended method of sustainable pest control because it emphasizes prevention of pest problems through restriction of access to food, water, and shelter in areas of indoor concern and through competition with species in landscaped areas. IPM incorporates education of the community population to recognize and report or remediate conditions that may be conducive to pest problems and also to accept, when appropriate, some low levels of pest presence that do not present health or safety concern or interfere with the designated use of an area. Initially preventing pests reduces the need for future pesticide treatments and saves money that would be spent for such treatments. IU should adopt IPM because it is better for human health and the environment, is a better management practice, and is cost effective.

Five different entities manage pests at IU: Building Services, Athletics, Residential Program Services, Campus Division, and Indiana Memorial Union. For this study, visits of representative buildings and interviews with managers of each entity were conducted. During the visits, we examined for pests or evidence of pests, conducive conditions, and pesticides. Information gathered from the interviews included what pests were thought to be present, how they were treated, and who treated them.

Results from the study show that, while all entities are observing some aspects of IPM, currently none of the entities are implementing IPM programs to standards proposed by the USEPA, CDC or IPM certification organizations. In the past 10-15 years, pest control practices

have been altered to reduce the toxicity of pesticides used and have moved away from routine applications in the absence of reported or observed problems. During our interviews, we encountered an open ethical response and willingness to achieve better pest management for the campus community. Recommendations were made for each entity to achieve the goal of full IPM implementation. One main recommendation is that better monitoring for pests is needed before pesticide treatments are applied. In addition, it is recommended for the five separate entities to work together and share information regarding pest control.

D. Electronic Waste

Executive Summary-2008-09, Laura Knudsen Internship

Electronic waste (e-waste) is the hot topic of our current era. E-waste is comprised of electronic equipment such as computers, televisions and cell phones that have reached the end of their useful life. This e-waste is then either improperly or properly treated. Improper disposal methods consist of storing the waste for years in the home, disposing the waste in a landfill or giving the waste to "sham" recyclers who then export the waste to developing countries with poor environmental regulations. Proper disposal involves disposing the e-waste via drop off centers, permanent small e-waste collection programs or mass community collection events. The latter of these "proper" options formed the basis for the spring 2009 Indiana University Task Force project and the overarching goal; to collect as much e-waste in the Bloomington and Indianapolis communities as possible while also educating the community about e-waste. Additionally, the project team decided that it would be useful to collect quantitative and qualitative information at the e-waste collection event from the participants. As a result, this report begins by detailing the process involved with the creation of the first major e-waste collection experience for the cities of Bloomington and Indianapolis with the support of Apple Inc. that took place on April 30, May 1 and May 2, 2009. Additionally, this document provides greater insight into e-waste recycling tendencies. The intensive advertising efforts and dedicated individuals from the IU campuses, Apple Inc. and the community resulted in the success of the event. A total of 832,000 pounds or 416 tons of e-waste was collected in total. Hopefully this event will be conducted again in the future at Indiana University or at other universities around the United States and this report will serve as a template for the project work.

IV. Other Success Stories

While the projects attend to priority concerns on campus, IUB has made great progress in other areas of environmental quality and land use management, and these accomplishments should be recognized. Below, some notable successes are summarized.

A. Range Road Coal Ash Pile

IUB is currently completing the voluntary remediation of approximately five acres of coal ash at Range Road disposal site. This project is being remediated under the Indiana Department of Environmental Management's (IDEM) Voluntary Remediation Program (VRP) and involves capping approximately 375,000 cubic yards of coal ash that was deposited at the site through 1979. The cap consists of 2 feet of compacted engineered soil cover that will virtually eliminate leaching of rainwater through the coal ash. The site will also include a constructed wetland at the base to treat stormwater runoff from the cap drainage basin and to provide additional environmental benefits by trapping sediment in the runoff before it impacts an existing wetland between the site and Indiana Creek. This remediation will also serve as an outdoor classroom to support the academic mission of IU.

B. Range Road Gun Ranges

Three outdoor gun ranges were remediated by August Mack Environmental in 2001. This remediation removed lead bullets and shot and associated contaminated soil was scraped from the surface of the ground, consolidated, and capped on-site to reduce environmental risks.

C. Griffy Woods Nature Preserve

In May of 2001, IU Trustees voted to designate 185 acres of land located northeast of the 45/46 Bypass as a nature preserve. This area serves as outdoor lab and is accessible to the public with an existing trail system.

D. Bradford Woods Sewage Treatment Wetlands

In 2007, IU's Bradford Woods teaching facility in Morgan County transformed the treatment of all sanitary sewage from a traditional wastewater treatment plant to a constructed wetland and mound absorption field with prairie cover. This eliminated the energy and chemical burden of the traditional treatment plant and subsequent polluted discharge into Sycamore Creek and replaced it with a zero discharge natural system that can be used as an outdoor classroom.

E. Stormwater Program

In April of 2005, IUB received permits for storm water pollution control from IDEM for the IUB campus and five branch campuses. Now, storm water is comprehensively managed as a pollutant with active construction site pollution prevention plans, preventive maintenance, and education and outreach components.

F. Campus Food Stores Ammonia Elimination

In 2004, IU decommissioned the ammonia based cooling system associated with Campus Food Stores located just northwest of downtown Bloomington. This was performed to

eliminate the risk associated with a possible catastrophic release of toxic ammonia from the plant.

V. Comparison with Peer Institutions

IUB benchmarks its activities with peer institutions by attending conferences, networking and sharing program materials with colleagues, and participating in listservs. While these strategies have led to many initiatives in the past, accomplishments have not always been well-documented, as there was no sustainability program requiring such record-keeping. Also, except for the recent storm water program which is metric-based, few metrics were kept for traditional programs which are compliance-based. We recognize that simple compliance does not always lead to robust programs, as compliance standards are frequently unambitious, not comprehensive, or both, For these reasons, environmental quality programs at IUB often go above and beyond what is required by extant regulations. Better documentation of metrics and comparison to peers will allow these programs to move to an even higher level.

Environmental Health and Safety (EH&S) participated in benchmarking evaluations of various functions via the Campus Safety Health and Environmental Management Association (CSHEMA) benchmarking programs in 1995, 1997/1998 and in 2004/2005. Results from these benchmarking studies were used to assess program deficiencies in comparison to peers and used to better manage programs by managing operations differently or by obtaining more resources and personnel

Other universities are managing environmental quality, health, and safety problems in ways that IUB can potentially learn from and adopt. For example, the University of Vermont has an active construction and demolition waste program. Traditionally, most of that university's building-site waste went to the landfill. However, the university has actively sought out recyclers and re-users of these waste materials in order to divert them from the waste stream. LEED credits are granted for recycling, with 1 point for 50% recycling and 2 points for 75%. IUB could implement these strategies at all demolition and construction sites, reducing the landfill burden. The costs of recycling are generally balanced by the reduced landfilling costs.

The University of Wisconsin at Milwaukee has a 100 year plan for zero storm water discharge that involves incorporating raingardens, permeable pavement and other means to keep storm water on-site. IUB could set a goal to reduce storm water discharge to a certain level by incorporating certain best management practices (BMPs).

Many colleges and universities have chemical inventory systems to track and better utilize chemical usage. IUB currently does not have a campus-wide system. Much of the wastes received by Environmental Health and Safety (EH&S) are in the form of expired, unused chemicals. A chemical tracking system could reduce the waste stream by

allowing researchers to better manage their chemicals. IUB is developing such an inventory system under the MAXIMUS initiative.

Chemicals in the lab can be eliminated, reduced, or less toxic substitutes can be found. This was done in the early 1990's when EH&S Environmental Management Group hired an intern to research chemistry teaching lab practices. The teaching labs adopted a "less use macroscale" chemistry model. One of the task force internships for fall 2007 is researching similar methods to minimize chemical usage and waste-production in various non-academic units such as building services, campus division, athletics, and physical plant. The intern will also research IPM practices.

Currently, many of the green fluorescent light bulbs on campus are landfilled. While this practice is legal, it misses a waste recycling opportunity and releases mercury into the air if the bulbs are crushed. IUB can amend this situation by working with Building Services and recycling vendors to research costs and obtain funding.

VI. Identification of Metrics

In several of the areas of environmental quality and land use described above, we are able to provide metrics for current performance. However, more metrics are needed to accurately track baseline sustainability conditions and to establish targets and timetables. The following metrics are either being measured currently or are proposed as possible measures. All can contribute to our understanding of sustainability on campus. Data collection and reporting are performed by various groups on campus and in some cases are compiled at EH&S, e.g., storm water reporting. Some of these metrics can be converted to long term targets as experience is gained and achievable trends are identified.

A. Land Use

% of greenspace
% of forest/shrub cover
% of native species
% of wetlands or retention basins
% of mowed grass
% of pervious surface
% of impervious surface by type
% of impervious converted to pervious
% of sediment load prevented from entering Jordan
% of riparian buffer

B. IPM

of pesticide applications (inside and outside reported separately) /yr
# of less toxic product substitutions/yr
hours of IPM training

C. Chemical Use

Amount of chemicals purchased/yr/research $$$
Amount of hazardous waste generated/yr/research $$$
Lbs of chemicals/year reduced by product curtailment or replacement with non-toxic alternative
Lbs of waste reduced/yr via waste minimization activities

D. Environmental Education

# of service learning opportunities created
# of service learning sessions/yr
# of students provided service learning opportunities
# of educational signs posted (already have ~200 storm water buttons on sewers)

E. Stormwater Metrics. (All stormwater metrics are already measured under IUB's stormwater program)

# of catch basins marked
Educational literature distributed
Community/student group collaboration
Illicit discharges detected
Illicit discharges eliminated
Citizen reports
Citizen requests for information
Percent of conveyances mapped
Material received at household hazardous waste collections
Citizen participation in household hazardous waste collections
Employee training
Contractor training
SWPPP reviews
Construction sites permitted
Construction site inspections
BMPs inspected
BMPs maintained or improved
BMPs utilized
BMPs cleaned
Open space preserved & mapped
Percent of citizens aware of stormwater issues
Citizen participation in stormwater projects
Outfalls mapped
Outfalls screened for IDDE
Citizen locations for automotive fluid drop-off
Pervious & impervious surfaces

Refueling areas with BMPs
Facilities with accidental releases
Area of pesticide/herbicide application
Percent of MS4s cleaned/repaired
Percent of roadside shoulders/ditches stabilized
Outfalls remediated from scouring conditions
Type of storage for salt/sand supply
Salt/sand used on roads
Salt/sand stored onsite
Snow disposal
Material collected from catch basins
Material collected from street sweeping
Macroinvertebrate survey Modified Family Biotic Index
Visual Stream Assessment
Amount of litter picked-up; floatables, organics, sediment
Spills contained
Fuel used
Hydrant/fire suppression tests
Recycling: cardboard, paper, aluminum cans, plastic, batteries, glass, toner carts.

VII. Opportunities for Service Learning and Co-curricular Activities

Service learning opportunities abound in the environmental quality/land use area, and much interest has been expressed by faculty in incorporating sustainability into existing curricula. SPEA and the Department of Geography already teach many subjects that could incorporate environmental health, safety, and land use planning concepts and activities. Likewise, the university could gain by employing students to research and assess opportunities for sustainability much as it did in the summer of 2007. To illustrate possible opportunities for service learning and teaching/learning about sustainability, we draw on a table from sustainability intern Tatyana Ruseva's report to the task force.

TABLE 4 HERE

Table 4 identifies eleven of the more promising sustainability-related courses out of a total of 297 courses with at least 25% of course content devoted to sustainability.

VIII. Other Opportunities and Recommendations

Environmental quality and land use cover a broad range of functions and environmental media at IUB, hence, opportunities and recommendations Abound. In general, our recommendations for improvements are conscious of both cost and feasibility. Opportunities are also informed by the work of the Sustainability Task Force interns whose work was thorough.

Recommendations include:

- In the short run, it is advisable to continue funding a student intern or set of interns to explore other environmental quality and land use projects and to compare/contrast successful initiatives at other major academic institutions. The payoff in such a strategy is already apparent in the outputs of the 2007, 2008 and 2009 Sustainability Task Force internships.

- In the case of the Jordan River, a funding source is still needed to continued planning and feasibility work for restoring the physical, chemical, and biological conditions of the river and watershed. The Campus Master Plan has provided significant impetus and justification to the proposed restoration needs and envisions the Jordan as a new significant focal point for the campus. Some projects that have been initiated or planned are:

    - Stream restoration, and wetland/retention pond construction associated with the reconstruction of the Ashton Dorm complex.
    - Native planting initiative north of Wright Education building associated with a class project by SPEA professor Peggy Schultz.
    - Invasives removal and pathway development associated with the jurisdictional wetland located between the MAC and the IU Auditorium on the south side of the Jordan.

- It is already apparent that the actual remediation work in the river will include planting of water-loving vegetation in and along stream banks and possibly planting of trees which can replace collapsing rock walls. Except for the native plantings N. of Wright Education a very small % of the stream length, no other plantings have occurred although the Ashton Dorm project will include some plantings. Some of these are mitigation from what will now be piped sections of the Jordan east of Union St. but the project should result in a net gain.

- Planting of constructed wetlands and creation of porous pavements in various parts of the watershed, including parking lots and pathways, are worthy next steps, following identification of the most promising areas for remediation. (Note also that the Jordan River Master Plan initiative will provide students with an outdoor classroom to observe restoration and will abet wetland research). Once again the Ashton dorm project will add retention basins and some wetland component that did not previously exist. Porous pavement and rain gardens have not been constructed on campus since the initial publication of this report.

- Regular training of ground crew to respect and maintain no-mow zones near the Jordan is needed. There are more no-mow zones along riparian areas such as N. of Wright Education and north of 10th and west of Tulip Tree. There is also no-mow SW of Wright Eduaction and at the IU Xcountry couse.

- Educational signage for pedestrians in and around the Jordan River, and at constructed wetlands is recommended in areas that are remediated. Educational signage has been posted in various no-mow areas.

- IUB should declare targets for maintaining IUB's already comparatively large tree canopy cover and endeavor to increase the value of standing and future trees.

- There are potentially major improvements that can be made to reduce the use of toxic chemicals in non-research areas of the university, for example, use of cleaning chemicals and also application of pest control agents. More specific recommendations are likely to flow from the work of a dedicated intern who will focus on non-research green chemistry and integrated pest management issues during the fall of 2007. Three internships later, one focusing more broadly on Green Chemistry and one each focusing on Green Cleaning and Integrated Pest Management, much progress has been made. Both reductions in amounts and toxicity of products have been made and are documented in the internship reports and are continuing to be documented by the responsible parties. These are on-going initiatives and continued progress can be expected.

- Green chemistry in the laboratory setting offers possible educational opportunities for students. It may be worthwhile to consider creating incentives for professors and research scientists to promote reducing toxic chemical in the lab or to identify less toxic alternatives to current chemicals. EHS has hired four lab inspectors to more frequently assess the compliance and inventory of chemicals found in labs. This has resulted in an initial increased waste volume of outdated chemicals and should result in the purchase of less chemicals in the future due to known inventories. This waste removal and inventory reduction results in less spill, fire and exposure risk.

- IUB can ramp up its recycling and reuse of waste materials from construction and demolition sites. This will reduce debris burdens going to the landfill, save on landfill costs, and help IUB earn coveted LEED points. This is an on-going need that suffers from a lack of a robust recycling market in Bloomington. Recyclers have been identified but costs are generally prohibitive as labor costs and the shipping of materials are high. There are also institutional impediments of risk, and the legal concern of how to resell or recycle surplus materials.

- Increasing pervious surface, use of raingardens, and other storm water retention strategies are recommended, and are also linked to LEED points. These strategies will also abet maintenance of the Jordan River. The Ashton poject has very good stormwater components and IU has also been installing swirl chambers in most new construction projects. Notably we were able to recycle one chamber that was removed from the Basketball practice facilty to be used at another site. We still have a lot of surface lots that drain directly to catch basins and these could all eventually be converted to pervious pavement with rain gardens instead of raised curbs, green space, or more parking efficient parking garages.

- IUB should institute a program to recycle compact fluorescent lamps – preferably, taking advantage of existing, comparable recycling programs that are already in place in Bloomington or Monroe County. This has not been accomplished but is still being pursued with Building Services.

- The Environmental Quality/Land Use working group or a comparable body should be involved in the process of land use master planning for campus. That way, actors on campus with considerable knowledge of land use, landscaping, drainage, construction, and building impacts can help make the master plan more sustainable. The Master Plan process incorporated and even expanded upon a lot of the ideas suggested by our working group and we were gratified that it was a very collaborative process. It will however take administrative commitment,time and resources to allow it to come to fruition.

Co-task force members

Mia Williams-U. Architects

Matt Auer-SPEA

Key Contacts and Ad-hoc members:

Burney Fischer-Forestry

Heather Reynolds-Biology, native vegetation

Mike Girvin-Grounds and IPM

Brent Emerick-Athletics grounds and IPM

Building Services-Greg Fichter and Tom Falwell, Recycling, Green Cleaning

Rex Howard-EHS, IPM, waste minimization

Susan Howard-EHS, IPM, Waste Minimization

Marc Lame-SPEA,IPM

Chris Kohler-EHS, Chemical Use and Reduction

Michael Dorsett-EHS,Storm Water

Diane Henshel-SPEA

Bill Jones-SPEA, Water Quality

Peggy Schultz-SPEA, wetlands restoration

Chris Craft-SPEA, wetlands restoration

RPS-IPM and Green Cleaning

Roy Robertson-IMU,IPM and Green Cleaning

Dave Walter-Architects Office, Demolition and Construction waste reduction

Current Internships related to the Environmental/Land Use working group

Campus Waste Audit; Amy Countryman, SPEA Graduate Student

Past recycling reports have well established the percentage of IU's total waste stream that is recycled; however little is known about the real potential for improvement in this area, i.e. we do not know the amount of recyclable material that is still in the waste stream. The sustainable food initiative could also benefit from information gathered in this exercise, as a substantial component of that initiative includes composting food waste from the campus. Planning a successful composting operation will require knowing the makeup of the waste stream we intend to process. Knowing the volume of material and how it fluctuates over the course of the year based on the amount of fresh ingredients used will allow for setting realistic expectations and goals for reducing this waste stream. Determining the relative amounts of carbon and nitrogen in the raw waste stream will determine the need to add amendments to compost effectively and at what cost.

Campus Tree Inventory; Scott Byrne, Kelley School Undergraduate

Internships in the summers of 2007 and 2008 have made significant progress inventorying and performing analysis on nearly 4,000 trees on the IUB Campus. However this is only a fraction of the 10,000+ trees contained in the University Architect's database. Continuation of this project is vital to assessing the health and benefits provided by this important asset to the Bloomington Campus. In addition to continuing the inventory, an intern could be employed to support the efforts underway towards seeking the "Tree Campus USA" designation from the National Arbor Day Foundation.