

Protection and Development of IU's Forests

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“The university’s mission and identity is intimately tied to its woodland character. The mature tree canopy is the most essential building block of that character as it denotes the stability of the institution and the ideals it stands for.” This is the opening statement to the latest draft of the Indiana University Bloomington Campus Site and Landscape Design Guidelines (CSLDG) and it makes very clear that the protection of existing mature canopy and the further development of the mature canopy is the ultimate goal of the campus forest.

IU has an advantage over most institutions in its long tradition of forest stewardship, from the Dunn family’s stipulation that for every tree cut down on the land they donated (and later became IUB’s campus) a new tree must be planted to Herman B Well’s admiration of campus landscape. This historical stewardship has created a campus that is flush with mature trees of varying species for which the IUB campus is known. The beautiful trees on campus, along with the creation of the CSLDG and accompanying Bloomington Campus Tree Care Plan (BCTCP) has given the university the honor of being part of the Tree Campus USA’s inaugural class. With this history and honor IU is given great responsibility and must be more diligent to care for its aging forests and to develop a new class of trees to rejuvenate and expand an already beautiful resource.

Protecting Current Forests

Tree Campus USA required the creation of a campus Tree Care Plan to require universities to create a document that “should be goal oriented and provide the opportunity to set good policy and clear guidance for planting, maintaining, and removing trees,” (“The Arbor Day

Foundation”). This gives the university an opportunity to clearly articulate where it would like to develop the campus forest and the best practices to do so. In the Bloomington Campus Tree Care Plan it is clear that goals are still in the process of being established, but that a likely “specific objective,” will be “increasing the current canopy cover from 20% to 40%. Reaching this goal will include increasing the number of trees within parking areas, filling in gaps in the street tree grid and creating more, large canopy areas along the riparian corridors of the campus.”

In order to achieve this goal it is important for IUB to devote resources to the maintenance and protection of existing mature trees and to also look at ways to aid the survival of new or maturing trees. The best way to accomplish this is to add guidelines to the Campus Site and Landscape Design Guidelines to strengthen the BCTCP and to ensure that everyone who has interaction with trees is aware of these policies and adheres to them. Currently the CSLDG primarily concerns itself with damage due to new construction, but the mature trees that have been on campus for decades have begun to decline due to other factors including; sustaining root damage or increasing soil compaction, competition among other plants and improper maintenance. In addition, improved planting and maintenance of new trees will be a powerful tool to increase diversity and increase canopy cover in the future.

Soil Compaction

IUB is home to 30,394 (<http://www.petersons.com>) students and hundreds of professors and support staff. All of these people walk or bike around campus and have done so for decades. Unfortunately many of these people don't “stay off the grass” and in many situations pass over the exposed root zones of the campus trees. This disturbance has and will continue to cause soil compaction and negatively affect the roots ability to support a mature tree. On their own no one

person is not a threat to the long-term health of a tree, but hundreds, if not thousands of people disrupting the root zone of a tree over decades will cause its decline. In addition to pedestrians, vehicles ranging from riding lawn mowers to heavy construction equipment crisscross the campus, driving near trees and exacerbating this problem.

Problems

The problem of compaction is a serious one because the health of a tree is directly related to the health of its soil. The process that ensures tree vitality and continued growth takes place where the roots and soil interact (Coder 1). To grow and survive roots need a location with adequate water availability, warm temperatures, and oxygen. The soil's ability to provide for the requirements of roots depends on several factors including pore space, mineral materials, and living and dead organic material. 50% of healthy soil is mineral materials and living and dead organic material. These materials provide the tree with essential elements and the soil with the ability to hold a greater amount of moisture. Healthy soil also provides a home for beneficial organisms that keep the level of root rotting organisms low.

Ideally the other 50% of soil is made up of pore space. These pores are created between sand, silt, and clay particles, from soil movement due to temperature changes, and by biological process such as decayed roots or animal borrow (Coder 5). The larger pore spaces in soil often hold air while the smaller pore spaces are filled with water. It is through these interconnected pores that a tree's root system is able to expand. In order for root growth to continue the pores in the soil must be larger than the diameter of the root tip. If pores are too small the main root will begin to thicken and generate more lateral roots, if the pore spaces are too small for the lateral roots to penetrate then root growth will cease.

The process by which these pore spaces are destroyed and a tree's health is negatively impacted is broadly called compaction. More specifically there exist three forms of deeper soil compaction; soil compression, compaction, and consolidation (Coder 3). Compression is the state of soil when it loses volume and the large and primarily air-filled (macro) pores become smaller water-filled (micro) pores, compaction occurs in soil when the pores in the soil completely collapse, finally consolidation is where pore space and soil structure is destroyed when water is squeezed from the soil and particle to particle contact creates soil bonding.

Along with deeper soil compaction, surface compaction can occur in the form of crusting, pudding, and rutting. This surface compaction prevents oxygen and water from infiltrating the soil surface and destroys the pores in the upper level of soil. These conditions are those more commonly associated with pedestrian and equipment movement. For all forms of deep and surface compaction the effects are made greater by moisture saturated soil. In addition, soil compaction is currently considered permanent and current research suggests, "after one-half century compaction still affects soils under natural forest conditions." (Coder 3,4).

Once compaction has occurred in the root zone of a tree systemic damage and decline will begin to occur. The roots of a tree will be prevented from extending outward and instead will generate thicker roots that begin to branch out laterally. This change in root growth will result in less colonized soil and less nutrient collection. This problem is furthered by the roots inability to survive in increasingly compacted and anaerobic deeper soils. These anaerobic soils make mineral uptake difficult and put the roots at a disadvantage against lower oxygen environment fungi and anaerobes. The tree is then forced into a shallower roots system which will be more susceptible to heat, drought, and mechanical damages. The gradual shift to shorter and

shallower roots stunts the trees form, reduces its ability to take advantage of new resources, and makes its vulnerable to stressors.

Causes

The causes of soil compaction include pedestrian and animal traffic, vehicles, intentional manipulations, construction and vibrations, and water interactions and organic matter loss (Coder 7).

- Pedestrian and Animal Traffic- This is perhaps the largest threat to IUB's soils. The pounds per square inch of force exerted on the ground by people and their animals is great enough to cause significant soil compaction over time. Areas of campus that are often used for large events, such as Dunn Meadow and the 'tailgate fields' have already been compacted to a point that restricts tree growth and in many cases significant tree decline is already occurring. Pedestrians have also compacted the soil around the meandering paths on campus and when they wait for a bus on a trees root zone instead of the sidewalk.
- Vehicles- Vehicles disturbing the soils on campus include everything from a bicycle to a ride-on lawn mower or the occasional piece of heavy construction machinery. These larger vehicles can transfer a large force to the soil and contribute to compaction. Interestingly bicycle tires, with their narrow wheels are the worse for the soil and in wet soils can contribute to rutting.
- Intentional manipulations- This includes the intentional and necessary compaction of soils under the infrastructure of IUB's buildings, roads, and walkways. These compacted

areas are a barrier to root growth, but new technologies, such as the development of porous pavements and structural soils promise to reduce the impact of future projects.

- Construction and vibrations- Construction vehicles on campus have the potential to compact large areas of soil. However, the university has a tree preservation plan for these situations so compaction near established trees roots zones is often avoided. After construction is complete the soil leveling process is often completed by heavy equipment that leads to compaction several inches deep. In addition to the obvious compaction from heavy machinery the vibrations caused by construction and even by heavy traffic can be significant if soils are moisture laden.
- Water interactions and organic matter loss- These natural processes can cause soil compaction and often times not much can be done to alleviate the problem, but in certain circumstances the problem can be exacerbated by IUB's landscaping practices. In areas with soil erosion rainfall will cause crusting and eventual compaction. In the winter soils with large amounts of heavy snow or ice, such as the sides of the campus roads, have the ability to compact soil. This is made worse by students walking over the snow in areas where they cannot see the sidewalk. Finally as organic matter is taken from the soil by trees or other plants it must be continuously replaced or the soil will slowly become more compacted. In most lawn areas built up organic matter, such as leaves and grass clippings, are removed and not replenished.

Solutions

Due to the many causes of compaction there is no one solution. In problem areas such as construction IUB already has some restrictions put into place in the CSLDG, such as the tree preservation plan and tree specification section of the Tree Care Plan (Page 5). It states that the

contractor should “identify approved locations for staging, laydown, topsoil stockpile...,” and while this is a good start it should be added that these locations should be sure to take into account the long lasting impact of compaction from machinery, people, and materials, especially in a trees rooting area. In areas where soil needs to be disturbed heavy mulching and plywood driving pads can be used to distribute the forces of compaction (Coder 13). It is also important to remember that compaction is made worse by high soil moisture content so extra care must be taken by construction workers in wet conditions.

The second major cause of compaction is the population flow around campuses roads and walkways. Many areas of campus have paths that were created by pedestrians and result in soil compaction. To combat this more effective flow control must be developed. The university already uses natural landscaping features such as rocks, mulch, and plants to keep people on the intended path. These features can be used alone or in combinations and are often aesthetically pleasing. Rocks make an excellent way to keep bicycles, pedestrians and vehicles from cutting corners and a combination of mulch and shade loving bushes keeps organic material around a mature tree while protecting its root zone. The university can also use non-natural features such as curbs or fences. These make explicit that people are not supposed to move off the path and may be necessary in high traffic areas.

For new projects it's important to design walkways that are able to efficiently move the flow of people without encouraging them to wander off the path. In all situations education and communication can be an important tool. Construction and university staff may not know they are harming the trees by driving off the pathways and pedestrians may not think twice about riding their bike over a trees root zone.

At Michigan State University the problem of compaction has been recognized as killing some of their “largest, oldest and most beautiful trees,” their campus arborist says “soil compaction accounts for a significant number of the approximately 100 campus trees that are lost each year” (“Parking Rules”). They are also doing something about it, at football games tailgaters used to park on the grass, but with signs reading “Save Our Tress... Off the Grass Please,” and roping off grassy areas MSU officials hope to keep cars in the parking lots and keep their mature trees alive. IUB can institute the same practices on the “tailgating fields,” if it is serious about saving those mature trees. IUB can also add reducing compaction in high traffic areas through the use of landscaping features as a stated goal in the CSLDG.



The above picture was taken near the back of the Herman B Wells Library off of Jordan Ave. In this situation plywood driving pads were put in place in an attempt to lessen the effects of the heavy machinery driving over the grass. In this instance it is clear that proper care was not taken and as a result compaction, rutting and probable erosion has occurred. It is important to remember that in most cases compaction is a permanent condition and this activity may have long lasting negative effects on the Small Leaf Lindens' whose root zones were compacted. It also shows that additional monitoring may be needed to enforce guidelines present in the CSLDG.



These three photos illustrate the ways good flow control has been used on campus to keep pedestrians on the intended path and to reduce compaction.

The top photo shows the use of mulch and bushes to restrict access to the parking lot to only the stairs. This gives the sugar maples in the photo ample amounts of undisturbed soils to root in.

This middle photo shows an extreme example of rocks and flowers used to keep people on the sidewalk and to increase aesthetics near the IU auditorium. This set-up also gives the trees plenty of undisturbed soil to root in.

This bottom photo shows the effectiveness of fences in keeping pedestrians off the grass and off a trees rooting zone in front of the IU auditorium. Note the green grass behind the fence and the bare crusted soil once the fence ends.



This photo illustrates a path created by pedestrians walking from Wright Quad to Jordan Ave. because the alternative path was inefficient. In this instance the path has been in existence for many years and severe compaction along with erosion and death of turf grass has resulted. This compaction has most likely destroyed the pore space in the soil underneath it and greatly lowered the rooting area of the two black locusts already impacted by the infrastructure of

Jordan Ave. Over time this could lead to the decline and eventual death of these two trees. To combat this a fence or bushes could be added to discourage the use of the path or a sidewalk could be added to limit the width of the compacted zone (although this will still have a negative impact on the trees it will enhance the aesthetics and control erosion).



This photo was taken near a bus stop at Kirkwood and Dunn near the Sample Gates. It illustrates the difficulties in increasing the survival of street trees, which is a goal of the BCTCP. Without protection this Red Maple's root zone has been severely compacted and crusted. This has exposed delicate roots and lowered the amount of water that can enter the soil. In cases such as these a fence can be put up to protect the tree, but natural barriers will likely prove

ineffective as they too will likely get trampled.

Soil Usage

To define how land should be used for many parts of campus it is simple. The land under Balantine or Woodburn should be used for building foundation and the land under the streets and sidewalks on campus should be used for supporting infrastructure. Still, many other parts of campus are much harder to classify. This “open space” can include grassy fields, forested areas with undergrowth, landscaped sections with rocks, mulch or flowers or some combination of the three. Making matters more complicated some areas are also used for gatherings and sports while others are designed for relaxation and reflection. In all areas of campus it is important to mate the proper soil usage with the intended land usage.

Problems/Causes

Although in many situations turf grass is the appropriate land cover it comes with many inherent disadvantages over other soil usages. The first disadvantage of turf grass is its cost associated with upkeep. According to the CSLDG mowing takes place “weekly in areas that are actively growing and when conditions allow. Some areas may need mowing two times a week if conditions warrant,” with mowing IUB must spend money on riding lawn mowers, mower maintenance, labor, fuel, and the collection/disposal of grass clippings. In addition to the costs associated with mowing, IUB’s turf grass requires funds for labor and supplies in order for it to be irrigated, fertilized, treated with pesticides, aerated and renovated with fresh seed.

From a sustainability standpoint the CSLDG lists environmental issues that the campus should consider. Among others they include

- Provide native wildlife habitat when conditions allow, such as when adjacent landscapes do provide habitat

- Select plants with low water needs whenever feasible. Limit high water use plants to specialty plantings or where the natural water table will support the plants without supplemental irrigation.
- Avoid plants that will require significant pest management. Select disease resistant cultivars and avoid insect prone species.”

First, when comparing mowed grass to other options grass does not provide as much wildlife habitat when compared to fruiting bushes with leaf litter cover. Additionally, in order to keep turf grass green and looking healthy it requires more water than the alternatives. Finally herbicides used to kill weeds and pesticides used to kill harmful insects are indiscriminate killers that can also kill or harm other vegetation and other, more beneficial, insects (“Healthy Lawns”) and this goes against avoiding plants that will require significant pest management. Besides running contrary to newly established campus guidelines grass also harms IUB’s sustainability through the burning of gas used to mow a lawn which increases the emissions of carbon dioxide and as a result contributes to global warming. The nitrogen and phosphorus used in fertilizers often gets into the waterways where it can cause contamination and increase algae growth (“Healthy Lawns”). Often times even with all the steps taken by the university to maintain their grass heavily shaded areas, such as under the thick canopy of a sugar maples prevalent on campus, cannot support healthy grass growth and as a result bare spots are created.

The second issue with turf grass is its detrimental interaction with trees. Many of the trees on IUB’s campus, such as sugar maples, are native to forested areas with leaf detritus ground covers and haven’t had the opportunity to evolve along with turf grass. As a result when trees roots encounter grassy areas it is the tree that loses out on nutrient and water uptake. This is because grass roots will grow faster and are composed of smaller “thread-like,” roots that can

quickly occupy the upper 12 inches of soil (Watson, 1). A study at the Morton Arboretum showed that turf grass can reduce the amount of sugar maple roots by as much as 90% in the top few inches of soil (Watson, 1). This is especially damaging to trees in compacted soil that cannot form deeper roots to support itself or trees where the rooting area is already restricted by infrastructure. Scientific studies have also shown a possible chemical interaction between grasses and trees where grass produces a chemical that inhibits tree growth. This further reduction in rooting ability and possible chemical growth restriction makes trees more vulnerable to insects and disease and over time will stunt the growth of a tree. Finally, in addition to the natural deterrents of grasses interaction with trees man made problems can also arise when mowing equipment and trimmers make contact with a tree and cause serious trunk damage or even tree death ("Tree Care Information") during the lawn maintenance process.

Solution

Grass has its place, it is the best soil usage when you have a high traffic area that you do not want to cover with an impermeable surface (Dunn Meadow) and many people find it attractive. Grass also is an effective erosion control and has many of the same benefits as trees, such as creating oxygen, reducing the heat island effect, and reducing noise pollution (Merrill, 1). The important decision for a landscape manager then is to make sure grass turf is used only when appropriate and to make sure its interaction with trees is limited by mulching, other plants, or a natural leaf cover.

Grass also has a cost. This cost is incurred financially in mowing, fertilizing, seeding, aerating and removal of leaves in the fall. This cost I also incurred by the trees where grass

competes for water and soil nutrients, reducing trees vitality and making them more vulnerable to other stressors. The solution to the overreliance on turf grass is simple. It needs to be replaced by alternative soil covers. These alternatives include a combination of groundcovers, mulch, annuals, perennials, bushes and natural leaf litter or mulch. These alternatives have less of a negative effect on a trees root system by more closely mimicking the native soils in which trees evolved and helping retain moisture while providing a habitat for beneficial insects and microbes.

The CSLDG already states that “maintaining a 2-inch minimum layer of mulch in planted areas is recommended. To increase the use of mulch it should be changed so that mulch will be used whenever possible in not just planted areas, but for all trees in lawn areas as well. The CSLDG also state that “new open areas of campus have been identified as future woodland areas, with tree plantings and no mow practices being initiated in the fall of 2007,” this is a step in the right direction and new no mow areas should be identified to lower costs and increase tree health on campus.



This photo
was taken

behind Wylie Hall and in the background is Dunn Woods, an area with mature trees and natural leaf litter. This identifies an area of campus that could benefit from no mow practices. By not mowing this area Dunn Woods would effectively increase in size and IUB would not need to spend the time or money maintaining grass that cannot thrive under the thick sugar maple and

beech canopies. In addition to saving money the sugar maple and beech will benefit from decreased competition, improved soil and a lower chance of mechanical damage.

Tree Pruning and Management

Trees are a long-term investment with many long-term benefits. It is for this reason that IUB must maintain their urban forest as effectively as possible. One of the best ways to do this is by practicing proper pruning and management techniques. In this area IUB has created safety and practice guidelines for pruning in the CSLDG. The 14 practice guidelines focus on a wide range of aspects including; street trees, trees under 5 years of age, donor trees and pruning for shape, health and safety. If these guidelines are adhered to most tree issues will be quickly resolved, but there is still room for improvement in both the guidelines and in the practices.

Problems/Causes

The largest issue facing the universities tree pruning and management is costs. The planting of just one tree can cost up to \$1,000 in labor and supply costs in order for it to be planted, established and initially pruned. Once a tree is established IUB's pruning labor costs are estimated at \$43.64 per man-hour without taking into consideration the cost of equipment. In order to recoup these costs and get the maximum benefit from their investment the university will need a tree to establish itself quickly and live for as long as possible. For this reason it is critical that the university take care to make sure any tree planted has the best possible chance of long-term survival.

The university recognizes the challenge and the pruning of trees is an established goal in the CSLDG, "young trees will receive annual pruning for up to five years after planting...to direct

the tree into the appropriate form for the species and the site.” While pruning it is important to remember that each cut could permanently change the growth of a tree and that poor pruning methods can forever damage the form or potential of a tree. In addition the proper training of a young tree will help to avoid larger cuts later in a trees life ("Tree Care Information"). Once a tree is established the need for pruning continues. The CSLDG states that “pruning should be targeted at dead branches, crossing branches, suckers, water sprouts, infested branches, etc,” this practice must ensure a tree is aesthetically pleasing by maintain their natural form, healthy by removing diseased branches and encouraging a strong structure and safe by removing branches that could fall or interfere with lines of sight ("How to Prune Trees").

Taken at face value none of the guidelines are problematic, but the problem arises from the fact that these guidelines are often not adhered to and in some cases guidelines may need to be added. In many cases IUB’s campus is simply too large to cover and many pruning issues go undiscovered. In other cases the wrong tree was planted in the wrong place and substantial management will be needed to ensure trees survival among competition, power lines and infrastructure.

Solution

Of the three issues identified this one is unique in the fact that many concrete guidelines exist, but as a function of resource availability, cannot be adhered to. To compensate for the lack of resources for the observation of potential problem trees the university will need to either allocate more resources to tree management or look outside for additional help. Although this additional help, whether it came from volunteers or from a forestry class on campus or a sustainability intern, would not be able to do the actually pruning due to legal and safety

concerns, a minimally trained volunteer from could identify and report problems to speed the time from a problem arising to it being dealt with. By shortening this lag time it could be possible to slow insect infestations, allow trees to heal quicker and avoid property damages due to failing dead or dying branches.

Outside of increasing the enforcement of current guidelines new ideas about management could be created in order to more effectively use the universities resources. One of the biggest issues is the diversity of tree species that are established on campus and those being planted. A monoculture on campus or in street tree populations can result in catastrophic losses and pest outbreaks ("A Methodology For Assessing And") as seen in the loss of most elm trees from Dutch elm disease and the coming losses of most ash trees by the arrival of the emerald ash borer. On the IUB campus the majority of trees are a variety of maple leaving the campus vulnerable to a single insect or diseases wiping out much of the campus canopy. In the CSLDG the goal of diversification is mentioned, but nothing explicitly against the practice of monocultures is stated. If monocultures were explicitly banned it would help increase diversity on campus and act as insurance against potentially devastating tree loses.

In addition to increasing diversity the university should adopt a policy of foresight by creating a tree location guide (Appendix A) that could be added to the "Landscape and Ground management Guidelines; environmental Stewardship," section of the CSLDG. Requiring a document such as this to be filled out before a planting a single tree or group of trees would add another page of paperwork, but it could result in better tree planting decisions that could result in lower costs of maintenance and longer tree life.

Conclusion

Indiana University has a great history of tree stewardship and the benefits of this history are readily apparent. Within the last year IUB has been included in the inaugural class of the Tree Campus USA program and a Tree Care Plan has been added to the Campus Site and Landscape Design Guidelines. While it would be nice if IUB could begin to reap the benefits of their work still more must be done. Mature trees face challenges in new construction and compaction along with detrimental interaction with other plants. Insects and disease are always looming and the emerald ash borer promises to wipe out an entire species.

On this campus there have been successes and failures, but it is clear that IUB's trees are an essential and worthy part of the campuses work towards a sustainable future. It is also clear that the current administrators both in the Landscape and Sustainability offices recognize this worth through the creation of the Tree Inventory Internship program and in sections of the CSLDG. I believe it is important to assure that this spirit of stewardship continues after administrations have changed and student have graduated and I believe that by strengthening the CSLDG and getting it into more peoples hands IUB can create a document outlining sustainable practices for the future.



These photos are an example of an ash in an untraveled location between two parking lots that would be difficult for the university arborists to find. It shows signs of weakness and will need to be removed in the coming years. Tress such as this could be easily identified and reported for quicker identification and removal by a group of volunteers or paid interns.





These photos are of a young scarlet oak donor tree on campus south of the union. The top photo shows the weak growth of the tree and the bottom photo shows the trees vertical branches in red being impeded and shaded by elms and ash.

Scarlet oak is a tree that grows in full sun (“*Quercus coccinea* (Scarlet Oak)”).and if some foresight was used in this situation it would have never been planted in this location and instead would have been planted in an area where it would prove more beneficial and a achieve higher growth rate.

One option is to prune back the ash trees from the site to allow light to reach the red oak. This would speed the oaks growth and allow it to replace the ash when they succumb to the emerald ash borer.





IUB has a history of preserving trees. This history has helped it develop into one of the most beautiful campuses in the country, but it may also bring with it some unnecessary maintenance and opportunity costs. In the top photo there is a mature ash located behind the library that has suffered major dieback and a large amount of bark die-off. In the bottom photo is an old redbud, a quick growing tree, in front of the business school that has been extensively pruned even though most of its trunk is rotted.

These provide example of wasteful pruning. The ash tree will die in the coming years from emerald ash borer and the rosebud is unaesthetic and a candidate for trunk failure and breakage. In these cases the trees should be removed and replaced so that the next generation of trees can establish themselves.

Appendix A

Tree Location Guide

Trees represent a significant investment to the university so it is important that locations and species be chosen that will best benefit the university.

1. Assess if the species chosen is under or over represented on campus and in the location you plan on planting. The more under represented the species is the more it will add to diversity and the campus forests health.
 - If it is over represented is there a specific reason why that tree was chosen?
 - If it is under represented is there a specific reason it is not common on campus?

2. Assess the needs of the site and the needs of the tree.
 - Is the site under power lines that would interfere with a large tree?
 - Is the site poorly drained or does it contain poor soil conditions?
 - Does the tree require full sun or can it tolerate shade?

3. Look to the future.
 - Will other trees inhibit the growth of this tree as it matures?
 - As this tree matures will it shade out smaller trees and inhibit their growth?
 - Do the site, the planted species and the surrounding species promise to coexist and flourish for the life of the tree (20-100 years)?

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Last, but certainly not least I would like to offer my additional thoughts (which are unbridled with naivety and ignorance to the political and resource driven reality of decision making) more based in my opinion than research that can serve as areas for future consideration by both the current employees and future interns.

- As I surveyed trees on campus I have found that the majority of the new street tree planting have been red maples. First, I must admit that according to a research paper by Agricultural Research Services on “Best Trees for the Street” four out of their six best picks were red maple cultivars or simple the red maple (<http://www.landscapeonline.com/research/article/9939>), but second I really think that the university needs to ban or greatly reduce the plantings of maples on campus. The same study suggested the crapemyrtle (*Lagerstroemia*) and the Frontier elm (*Ulmus*) as street tree alternatives and I believe they should be looked into in case a maple disease/insect is discovered.
- No one on campus knew what I was doing. After I explained it to them no one on campus understood why I was doing it and after I explained that no one on campus believed that it was a worthy cause. To that end a communication channel needs to be opened to the campus. I think (pretty much know) students and faculty don’t understand that people planted the trees they see today and they maintained by people and would most likely die without some human interventions since they are growing in an urban-suburban environment. People like the trees, but they don’t understand them.
- The emerald ash borer is coming and the time to act is now. While ash is not a dominant species on campus in areas where it is present it’s often is one of the only species. What

kills me is when an ash is shading out a tree that otherwise would be larger and healthier to replace the ash once it dies. I believe that the gradual pruning back of any ash shading out a different species and the planting of young trees near ash will ease the transition as they are eliminated from the IUB campus.

- I like the donor tree program a lot. I think that it is an excellent way to keep alumni contributing to the beauty of IUB's campus. I don't think I like that the \$500 is only spent on new trees. I have found that this campus has some truly giant specimens on campus that often times aren't mulched and are in need of some TLC. I think it would be great if the program was expanded to include the sponsoring of existing trees which can then be pruned, mulched/beautified and monitored to ensure their continued survival.