Growing a Green Campus

A Case Study of Sustainable Landscaping at Skidmore College

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LITERATURE REVIEW

History of the American Landscape

The United States has a long history of poor land management practices. When colonists first arrived in the Americas, they imported a land use doctrine appropriate for the European environment. They saw the landscape they found themselves in as "wild," something to be feared and needing to be tamed (Koole, Van den Berg 2005). To provide comfort and familiarity in a new world, "the human tendency was to systemize the [diversity] and impose a more regular pattern on it." (Cronon 1983). Indigenous peoples also practiced widespread landscape management, however, once the colonists arrived, the dominant paradigm was influenced by the Old World. Settlers projected symbolic meaning on the land, so cultivated landscapes came to represent success and

Redesigning this method of high-maintenance landscaping on college campuses would have a positive impact on ecology, but it would require a shift in culture and aesthetics.

Ecological Impacts of Landscaping

need for large amounts of chemical and mechanical inputs. The use of chemical and mechanical inputs leads to further environmental degradation and initiates a cycle of input dependency.

Benefits of Sustainable Landscaping

Sustainable landscaping practices seek to strengthen ecosystems by preventing erosion, pollution and biodiversity loss. Rather than relying on chemical controls to promote plant growth, sustainable landscaping nurtures healthy ecosystems in order to promote plant growth. Practices

benefits for years to come. On a college campus specifically, addressing ecological problems while providing aesthetically pleasing environments can attract publicity, prospective students and investors, whose contributions to the institution are immeasurable. Landscaping practices are beneficial for social systems and a growing body of scientific research demonstrates that access to green spaces has a positive impact on people's mental well-being, and can even lower crime rates (Wolf 1998). Sustainable landscaping offers ecological, economic and social benefits and its implementation is supported by a wide demographic.

The Sustainable Landscaping Movement

The sustainable landscaping movement has been growing traction since it was labeled as such over 50 years ago. The movement began as a response to regional ecological issues in the 1960s

environments. Sustainable landscaping in the West and South stemmed from a lack of resources, while Northeastern landscaping initiatives were inspired by overdevelopment and urban sprawl. From the early 1800's to the mid 1900s, pioneers of the Greenway Movement such as Ralph Waldo Emerson, Henry David Thoreau, Frederick Law Olmsted, and Charles Eliot responded to a lack of green space by encouraging forest restoration and protection; glorification of waterways; and the development of beautiful green spaces for people to enjoy (Fábos 2003). The influx of the aforementioned environmental movement of the 1960s and 1970s, slightly altered the Greenway Movement by changing the focus from anthropocentric goals for green space to integrating more biocentric viewpoints (Fábos 1991). The sustainable landscaping movement in America differs regionally in the impetus for changing practices, but the effect on development is uniform across the country. Sustainable landscaping efforts have attempted to shift the widely accepted aesthetic to one that is suitable for local climates, bioregions and human necessities.

The Campus Sustainability Movement

Institutions of higher education are vitally important in the movement towards ecological sustainability for many reasons. First, they have large ecological footprints and consume resources at a greater rate than any individual household (Orr 2006). Second, they have purchasing power. According to the *Chronicle of Higher Education*

initiate large scale implementation of sustainability init

College's mission statement, practicing corporate social responsibility, increasing educational opportunities, enhancing the College's public image, and improving quality of life for students and faculty (Weenan 2000). Financial motivations include: monetary savings, resource availability, and attracting incoming students (Nicolaides 2006). Ecological motivations include: managing stormwater runoff, mitigating pollution, preventing invasive species, providing suitable habitat for wildlife, minimizing the use of nonrenewable resources, increasing biodiversity, and reducing greenhouse gas emissions. There is overlap among these three pillars of sustainability. For example, the financial motivations of monetary savings and resource availability work cohesively with the ecol

philosophy, a campus can implement changes more effectively and will realize more social, environmental and economic benefits than if sustainability is implemented after the fact (McIntosh et al. 2001).

Defining a Sustainable Landscape

Traditional landscaping practices in America are problematic because they ignore the rules of ecology in their design. Landscaping can be sustainable and even regenerative if it mimics natural biological process, maximizing the productivity of land in the long term. Many people, organizations, and private entities refer to sustainable landscaping as a more ecologically sensitive method of landscaping that will benefit both humans and the environment.

There are discrepancies among definitions of sustainable landscaping as well as certain underlying commonalities. Some standardized methods for measuring the sustainability of a landscape have been developed. Organizations such as Tree Campus USA, Green Star Awards, LEED, and Sustainable Sites Initiative (or SITES), offer tools for evaluating the ecological impact of landscaping practices. Still, these evaluation tools rely on vague measurements and many landscape design organizations tend to develop their own definitions.

Cardinal Direction Landscape Architecture PLLC, a self-described sustainable landscape architecture firm, describes these practices as components of sustainable landscaping: "perennials & grasses used to reduce maintenance," "soil restoration and revegetation of disturbed sites," "native plantings and edible landscape design," "lawn reduction plans (mowing reduction, chemical reduction, composting)," "habitat restoration plans," "stormwater reduction strategy," "sustainable landscape training and education for facilities and grounds staff" (Cardinal Direction Landscape

LLC describes sustainable landscapes as ones that "are managed with practices that conserve limited, valuable natural resources, reduce waste, and prevent pollution of the air, water, and soil. The goal is to provide as much value as possible with the least environmental impact" (Sustainable Landscape Design LLC, 2014).

Some groups call sustainable landscaping by a different name altogether. The Ecological Landscaping Association, in its pamphlet *Discover Ecological Landscaping*, defines "ecological landscaping" as a "method of designing, building, and maintaining landscapes that considers the ecology of a site and creates gardens that enhance the surrounding environment for the benefit of humans and all other life in the ecosystem" (Ecological Landscaping Association 2005). Within this organization, members appear to use the terms "ecological landscaping" and "sustainable landscaping" interchangeably.

Perhaps the most definitive source of a sustainable landscape definition is the one provided by SITES in their report, "The Case for Sustainable Landscapes". SITES defines "sustainability" as the SITES provides a rating system for individuals, design firms, companies, and institutions to dete deigdiv90.5 io-0.3 (t) 0iv5 (it) 05 (3 (ig) 0.5 (io) -0. de) 0.5 .5 (e) 0.5 ("T (in) -0Q.5 io-0.3 (t) 0iv) 0.3 (5 (it) 05 0

healthy systems" that are not reflected in our current methods of measuring economic success (i.e. pollinators responsible for crop health) (Sustainable Sites Initiative 2009). Sustainable landscaping practices have the ability to provide these services because they are modeled on healthy ecosystems. Strategies that would be included under the overarching definition of sustainable landscaping include, but are not limited to: permaculture, biomimicry, ecological design, organic gardening, xeriscaping, edible landscaping, native plant gardens, ecological stormwater management practices, and more (See Glossary).

At colleges and universities, sustainable landscaping practices can be categorized based on the level of impact on campus ecology and the culture of the institution. Some practices such as native plant purchasing policies and sustainability master plans have a major impact on local ecology and the campus culture, while low impact practices include mowing at 3 inc0.2 (y)9 pcac0.2 (y(r) -0.5 (le) 0.5 (d o)

identified 10 schools that are similar to Skidmore in location, climate, size, and are a peer or aspirant school. We conducted semi-structured phone interviews with: Mike Wetzel, Associate Vice President for Facilities Management and Campus Planning at Franklin & Marshall College; Tim Parsons, Middlebury College's Landscape Horticulturist; Jennifer Kleindienst, the Sustainability Coordinator at Wesleyan University; Louise Gava, Coordinator of Sustainability Projects at St. Lawrence University; and Marcus Sherburne, Grounds Manager of Facilities Operations at St Lawrence University. We chose these individuals because they are influential stakeholders on their campuses and could explain the campus' landscaping practices. Through these interviews, each about an hour in length, we evaluated sustainable landscaping practices at these institutions. The interview questions were designed to identify major successes and failures within the institution, motivations for their landscaping changes, the key stakeholders that caused the change to a more sustainable landscape, and what recommendations they had for other campuses (See Appendix A, Table 1). From this information we identified many forms of sustainable landscaping practices and categorized their landscaping practices on a scale of dark green to light green. We also identified the major motivating factors for implementing a sustainable landscape based on the three pillars of sustainability. We used a Venn Diagram to categorize schools by what we found to be their primary motivation: social, economic, or environmental (See Appendix A, Figure 2).

photos taken by Google on September 19, 2013 and categorized the campus landscape through GIS mapping. Due to shadows, tree cover, the angle of photos, and human error, these are just estimates, however, they gave us an idea of the size and percentage of different types of land coverage.

To deepen our understand of the landscape maintenance at Skidmore we interviewed: Dan Rodecker, Director of Facilities; David Nicholson, Assistant Director of Facilities; and Bruce Murray, Grounds and Fleet Maintenance Supervisor. We developed a spreadsheet of landscaping inputs and asked Mr. Rodecker to gather data on how much money, fuel, fertilizer, pesticides etc. are required annually (See Appendix B, Table 1). We also asked questions to find out how much and what type of labor is involved, how decisions are made and how aesthetic is defined and measured (See Appendix B, Table 2). We also held a focus group with the 10 groundskeepers. We asked them to identify areas of campus that are easiest and most difficult to maintain. We asked questions of each individual about their jobs and daily activities (See Appendix B, Table 3). These interviews helped us to understand the complexity of the Skidmore landscape and the costs of maintaining it, as well as sustainable landscaping practices that facilities has already implemented and opportunities for further change.

To expand our knowledge of Skidmore's sustainability efforts, we interviewed: Karen Kellogg, Dean of Sustainability; Sue Van Hook, Former Professor of Biology at Skidmore and current Mycologist At Ecovative Design; and Kim Marsella, Former Professor of Environmental Studies and current Director of the Office of Academic Advising. In these semi-structured interviews, we asked questions about the timeline of sustainability initiatives at Skidmore and what motivated changes in the past (See Appendix B, Table 4). These interviews provided an administrati

RESULTS

Best Practices from Other Institutions:

Franklin & Marshall College:

Wesleyan University:

Wesleyan University is situated in Middletown, CT along the Connecticut River. The University is located near the heart of this suburban town and has around 3,100 students including graduate students. The physical campus of Wesleyan is 316 acres with more than 300 buildings. The University has an endowment size of $688.8 million.

Wesleyan has implemented a series of sustainable landscaping practices. The University uses 80% organic pesticides, the remaining 20% are synthetic pesticides used only on the athletic fields. They successfully implemented other light green practices such as creating a 9-acre no mow zone that was planted with native wildflowers. The College is experimenting with other areas for reduced mowing. In fact, there is an institutional priority to reduce the total a 1 8 8.5 (i)] TJ ET Q q 0.24 0 0 0.24 273. 0 0

comprised of many different landscapes and encompasses a variety of ecosystems. The campus landscape includes Haupt Pond, the adjacent green known as South Park, the highly manicured performance lawn of Case Green, small lawns with tree cover, and a few unmaintained forested areas. These landscapes raise the quality of life at Skidmore by giving access to greenspace, and providing health and educational benefits. These landscapes also have specific needs in order to maintain a certain aesthetic. Maintenance of the landscape has a significant impact on the campus' ecological footprint.

As shown in the maps we created of what we call "campus proper" or the cultivated campus, the landscape is broken up into 11 different components (See Appendix B, Figure 1). Campus proper consists of about 10% roads, 12% parking lots, and 15% buildings and covered walkways. Patios, which are large impermeable surfaces such as in front of Case, take up only 1% of campus proper. Forested lands take up about 20% of campus proper. The North Woods is excluded from campus proper since Facilities services does not maintain that forest. Planters are the mulched areas with ornamental plants. Chemical fertilizers, pesticides, and herbicides are used on most planters. Planters take up less than 2% of campus proper. Athletic Fields, which are all astroturf or tennis courts and need very little maintenance, take up about 5.5% of campus proper. Stormwater management systems like the rocks and gravel around the Sussman and the Northwoods Apartments take up about 0.6% of campus. Water bodies include the stream that leads into the pond, the pond, and the overflow outlet for the pond. Water features take up less than 1% of campus proper. Lawns such as the Case Green, which need a high level of maintenance, are about 8.5% of campus proper. Lawns with tree cover such as the eastern part of Case Green and the area between Saisselin and Dana still require significant maintenance and take up more than 6% of campus proper. Green spaces, are areas that we have established as either less maintained or less utilized lawns. Green spaces include the residential lawns around Northwoods Village, underutilized

lawns near Zankel, and the hills leading from the Northwoods Apartments to the North Woods Forest. These areas take up just over 25% of campus proper. Green spaces offer opportunities for sustainable landscaping pilot projects since they are small areas maintained to a lower standard of aesthetic.

opinions that must be taken into consideration. Some of these stakeholders include: members of the

gallons of diesel during this season last year. August to November is the season of removing dead plants and leaves. Facilities consumed about 920.9 gallons of gasoline and about 622.3 gallon of diesel during this season (See Appendix B, Table 5) Fuel usage throughout the year includes lawn mowers, tractors, snow plows, leaf blowers, and other handheld gas powered machines and off road vehicles.

Pesticides and Herbicides

Facilities has stopped applying pesticides and herbicides prophylactically over the whole campus. Instead, they are applied in the form of spot treatments. Because of this, the amount used changes year to year depending on when and where they have issues. To obfuscate the process more, most of the pesticide and herbicide use on campus is contracted out to other landscaping agencies that change each year. When speaking to one sub-contracted landscaping crew on Tuesday April 8th 2014 they said that this was the first time their company had been hired and that they were only contracted for three full days. The pesticide that is used mainly is called Dilox and is applied to all mulched landscaping areas.

Soil Nutrition

The fertilizers used are granular and water soluble. Facilities used about 14,550 pounds of fertilizer last year (See Appendix B, Table 6). Fertilizer is used mainly on athletic fields that need to function as aesthetically pleasing performance-based landscapes. The mulch and soil used on campus comes mostly from local vendors and is applied by third party contractors.

Plant Species

The grass on campus is called “Trilogy Mix” and is mainly rye grasses. In general, rye grasses

truck for planters. Recently, there was an organized effort by students and faculty to eradicate invasive species around campus. These species included common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), Japanese knotweed (*Fallopia japonic*), garlic mustard (*Alliaria petiolata*), Japanese barberry (*Berberis thunbergii)* and burning bush (*Euonymous alatus*). Purple loosestrife was almost completely removed from its hold on the wetlands next to Falstaff's, however burning bush,

landscaping and led to light green actions such as supporting student-run initiatives such as WILD Wes at Wesleyan University. However, social and ecological factors alone rarely led to concrete change. While these factors more often than financial ones got the conversation going, cost is the main limiting factor. As stated in the St Lawrence Interview, "getting money for green projects is hard" (Gava and Sherburne 2014). Or at Wesleyan University where the implementation of some sustainability projects was viewed as either, "too expensive or not possible" (Kleindienst 2014). Projects that are ecologically and socially beneficial will not be implemented unless they are economically feasible. This being said, many campuses implemented sustainability projects regardless of economic expenditures. As stated in the Wesleyan University interview, there is support for "projects that don't necessarily have economic value but have intrinsic values (educational value)" (Kleindienst 2014). Many institutions of higher education do not value financial savings as much as they may claim to. This is evident in the lack of concrete data demonstrating proclaimed financial savings from these institutions, with only Middlebury and St Lawrence University able to provide numbers of dollars saved. Regardless of the assertion that money is a limiting factor, there is no shortage of finance streams for sustainability projects on campus. Despite expensive initial capital investments, many institutions make sustainability initiatives financially feasible by utilizing grants, rebates, green funds, and revolving accounts as in the case of Franklin & Marshall College.

Implementation

Students and faculty were heavily involved in the conversation at a preliminary level at all four schools but successful implementation required administrative support. As in the case of St. Lawrence University, the push for no pesticide use was a student initiative backed by the faculty. However, the environmental science department, sustainability office and student-led clubs, did not actually implement the changes. Projects cannot be successful unless the facilities that would

lack aesthetic value. While prairie gardens or meadows are very vibrant and naturally beautiful, it may require some awareness, outreach and education for people to become accustomed to the "unkempt" appearance. In accordance with the community's emphasis on aesthetics, we have developed sustainable landscaping plans that do not compromise the appearance of the campus.

Sustainable Landscaping Master Plan

Institute of North America, Inc. 2012). IPM is a dark green, holistic practice. If the College requires the use of pesticides, they should select organic versus chemical products in transition to a completely pesticide-free campus.

Simultaneously, acceptance of a new lawn aesthetic is needed. In order to completely phase out all chemical use (such as pesticides & herbicides), the College needs to embrace certain "pests" or "weeds." Weeds such as dandelions and clover are regular colonizers of lawns and provide ecosystem services. Instead of continuing inputs of chemicals, a diversity of plants and wildlife should be welcomed since they offer provide same benefits as these chemicals. If the College cannot accept new lawn standards, manual pest management can be implemented.

Planting Policy

All plants on campus should be evaluated from the perspective of their social, economic, and ecological benefit. For example, though daffodils hold little ecological and economic value, they do not pose a serious environmental threat and they offer social benefits since they were favorites of Lucy Scribner (CSS meeting, 2014). We have determined that their presence on campus, would be a good alternative to high-maintenance annual flowers at campus entrances and other highly trafficked areas. Because they have a short blooming period, daffodils should be planted in front of other beneficial plants, such as low-growing evergreen shrubs that offer ecosystem services.

The College has already agreed to exclusively purchase native plants in the future, however, this policy could be implemented more aggressively. Targeting and eradicating all invasive species on

and economic services without becoming invasive (See Appendix C, Table 2) and these should not be excluded from the landscape.

bioretention include bioswales (dry or wet), riparian zones, and rain gardens. Case Parking Lot is one such impervious surface on campus. To properly manage stormwater, the meridians in the lot should be repurposed as bioswales to conduct runoff coming from the pavement (see Appendix C, Figure 3). There are already existing examples of bioswales on campus. The stream draining into Haupt Pond was protected by a bioswale until recently when Facilities started cutting it. This stream should be allowed to return to its vegetated state and the pond would benefit from additional vegetated swales bordering its entirety (see Appendix C, Figure 4).

Irrigation

Irrigation is not the problem it once was at Skidmore, but there are many ways to improve the current system. Skidmore could reduce its water usage by xeriscaping, implementing drip irrigation, and swale building. Many other institutions have taken advantage of water-efficient irrigation systems built into the ground that utilize technology to respond to changes in the weather and apply water accordingly. Skidmore could also look into the collection of rainwater from the rooftops of campus buildings to help irrigate the grounds.

Waste Management Plan

Instead of sending its yard waste to an off-site facility, it would be more cost-efficient for Skidmore to build a large-scale composting facility on campus. Due to the high-volume of yard waste, food waste, manure from the Stables, there are ample materials for this system to happen. Students, faculty, and the Sustainability Office have been actively researching and advocating for this system for more than four years; all that is lacking is an institutional commitment to this project.

Soil Management Plan

Something for the College to plan for in the future is the designation of all of campus as a Nature Sanctuary, Preserve, Botanical Garden or Arboretum. Such designation would help the College market itself as an environmentally conscious institution, particularly to prospective students.

On a planning and communication level, we call for the permanent establishment of a Sustainable Landscaping and Grounds Committee (SLGC) that meets at least once a month to continue to pursue sustainable landscaping options at Skidmore. We recommend the presence of the following participants for this committee: Director of Facilities, Sustainability Coordinator, Dean of Sustainability, chairs of Biology, Environmental Studies, and Geoscience departments (more chairs are welcome to join the committee if interested), a representative from finances, Dean of Student Affairs, two Skidmore students (the Sustainability liaison for SuCo, and an open position for internship credit), and a representative of the groundskeeping staff (elected by the staff). This committee would not only be responsible for decisions regarding the campus landscape and for implementing sustainable landscaping measures, but also for coordinating educational events and

Phase 3: (10 years+)

Since the landscape is dynamic and constantly changing, it is impossible to predict where it will be in 10 years. During Phase 3 of the Sustainable Landscaping Master Plan, the College should begin a comprehensive analysis of these programs and make decisions about how to move forward.

Integrated Pest Management

- Develop comprehensive, campus-wide IPM strategies that include new ideals of what species are considered "pests and weeds"

Planting Policy

- Implement 100% perennial, native and useful plantings on campus
- Expand no mow zones, campus gardens and edible landscaping features

Water Management Plan

- Implement rainwater collection off of buildings and recycle grey water for landscaping
- All impervious surfaces bordered with vegetated buffer zones

Waste Management Plan

- Expand campus-wide composting system to include all buildings

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Glossary:

Aesthetic: The subjective perceptions of a visual appearance by a given individual or group. That could elicit emotion.

Biomimicry: A principle of design that seeks to emulate the naturally occurring functions of ecosystems.

Developed (Development): An anthropocentric alteration to an environment (i.e. buildings).

Ecosystems: A biological community where organisms interact with each other and their physical environment.

Edible landscaping design: landscape designs that utilizes plants that can be consumed.

Environment: All external factors surrounding and affecting an organism at any time.

Green Space: any open piece of land that is vegetated and "undeveloped" (see definition of "developed").

Indigenous: Indigenous species are species that reside in the area from which they originated; "indigenous" is more specific than "native," which takes a broader view.

Invasive: Species that are not indigenous to an area in which they currently thrive and compete with plants that are.

Landscapes: Forman and Godron (1986) define "landscape" as a "heterogeneous land area composed of a cluster of ecosystems that is repeated in similar form throughout."

Landscaping: The alteration of the appearance and/or function of a landscape.

Monoculture: a type of cultivation that uses only one specific plant variety for a certain acreage; this method is susceptible to disease and climate changes, but is very popular in agriculture where it is used to produce high yields of a single crop.

Native: "Native species" is used when discussing indigenous on a broader, regional scale (i.e. the United States, or the Northeastern states) and can include hybrid varieties.

Nature: The concept of an environment completely without anthropogenic effects.

Organic: ecologically based practices such as cultural and biological pest management, exclusion of all synthetic chemicals, antibiotics, and hormones in crop and livestock production.

Permaculture: A design science that's rooted in the observation of natural systems and biomimicry, used to add the stability and resiliency of the natural ecosystem to all forms life and life cycles.

Stormwater management: a variety of landscaping methods designed to negate the harmful

impacts of stormwater runoff; some of these methods inc

Appendix A: Other Institutions

Figure 1: Green to Green Scale

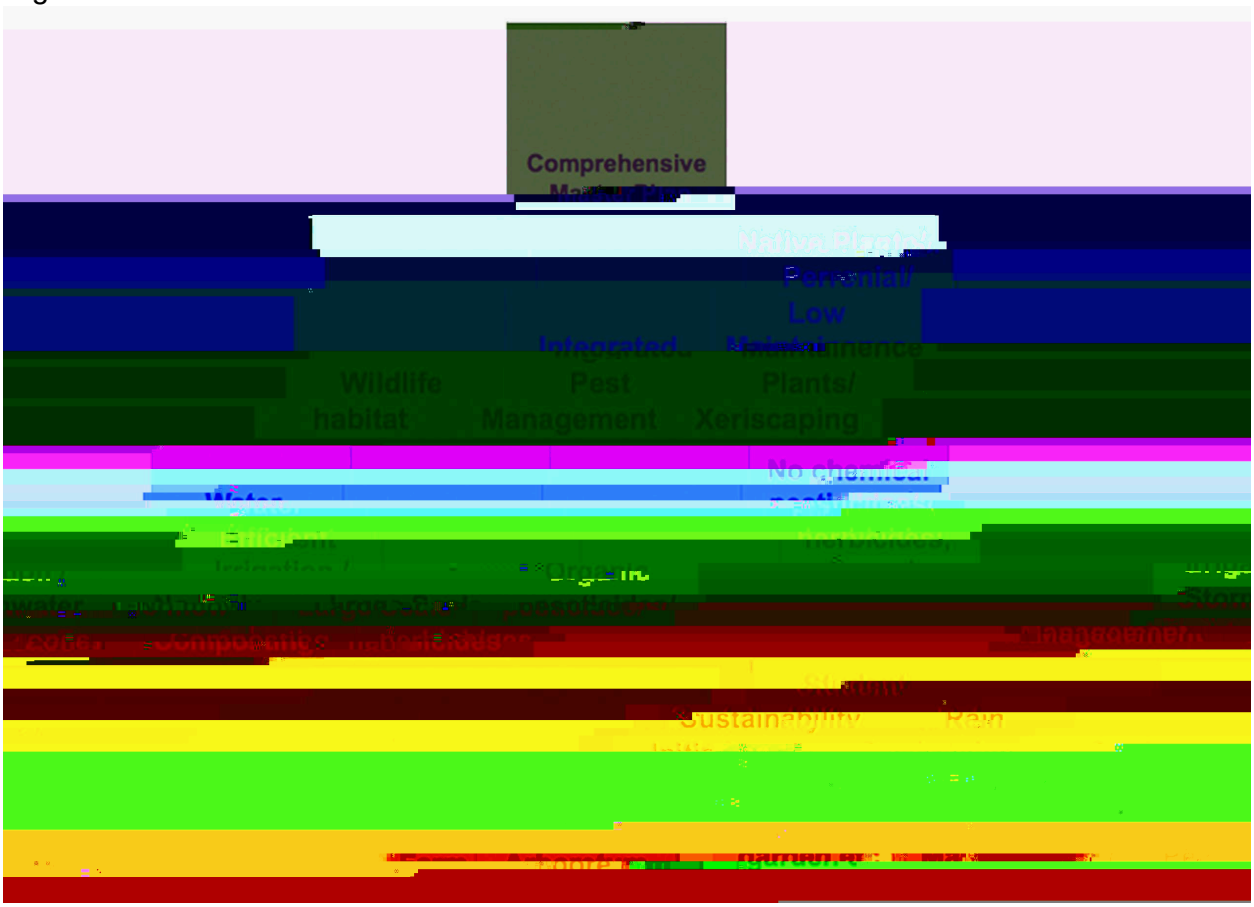


Table 1: Interview Questions for Other Institutions

1. What sustainable landscaping initiatives have been implemented at your institution?

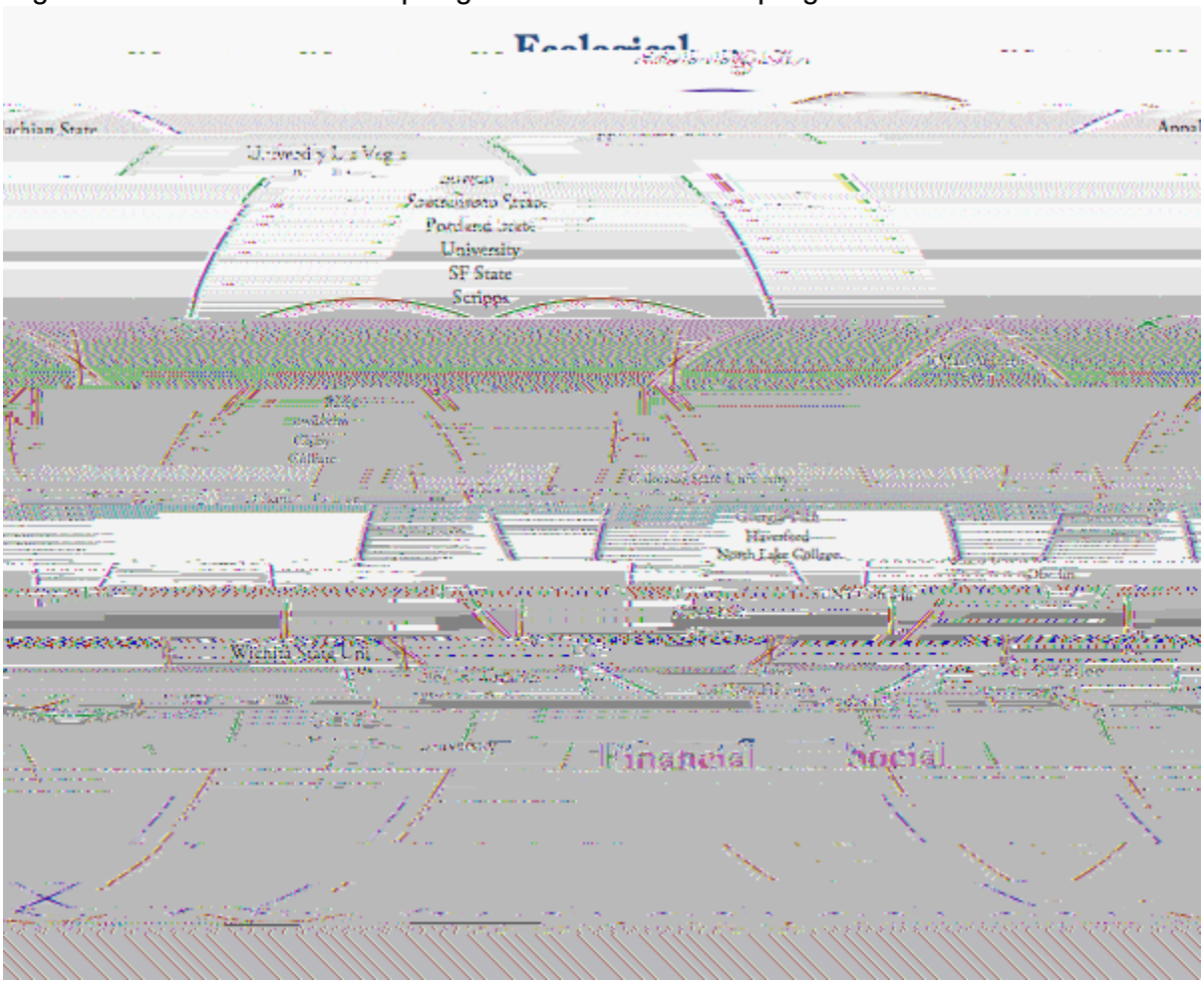
2. Which efforts have been the most successful? Have the efforts had a significant impact on the college? (in terms of economic, social and environmental effects) What initiatives have been most well received by the students? academic departments/professors? facilities/grounds/landscaping crews? the administration?

3.What have been major obstacles or failures? Are there things that you would have liked to achieve that you didn't? What were the 2 biggest failures?

4. Who/what were the motivating factors for this change? Who implemented the changes? (students, administration, faculty, facilities?) Was there a particular deciding factor? (e.g. economics, or grounds crew getting on board etc.) How important were economic, social (educational), environmental factors?

5. Where did you learn the information you needed to make this happen? What outside resources/organizations were important? How important were outside consultants etc?

Figure 2: Motivations for Adopting Sustainable Landscaping Practices



Appendix B: Skidmore

Figure 1: Map of Land Coverage in Campus Proper

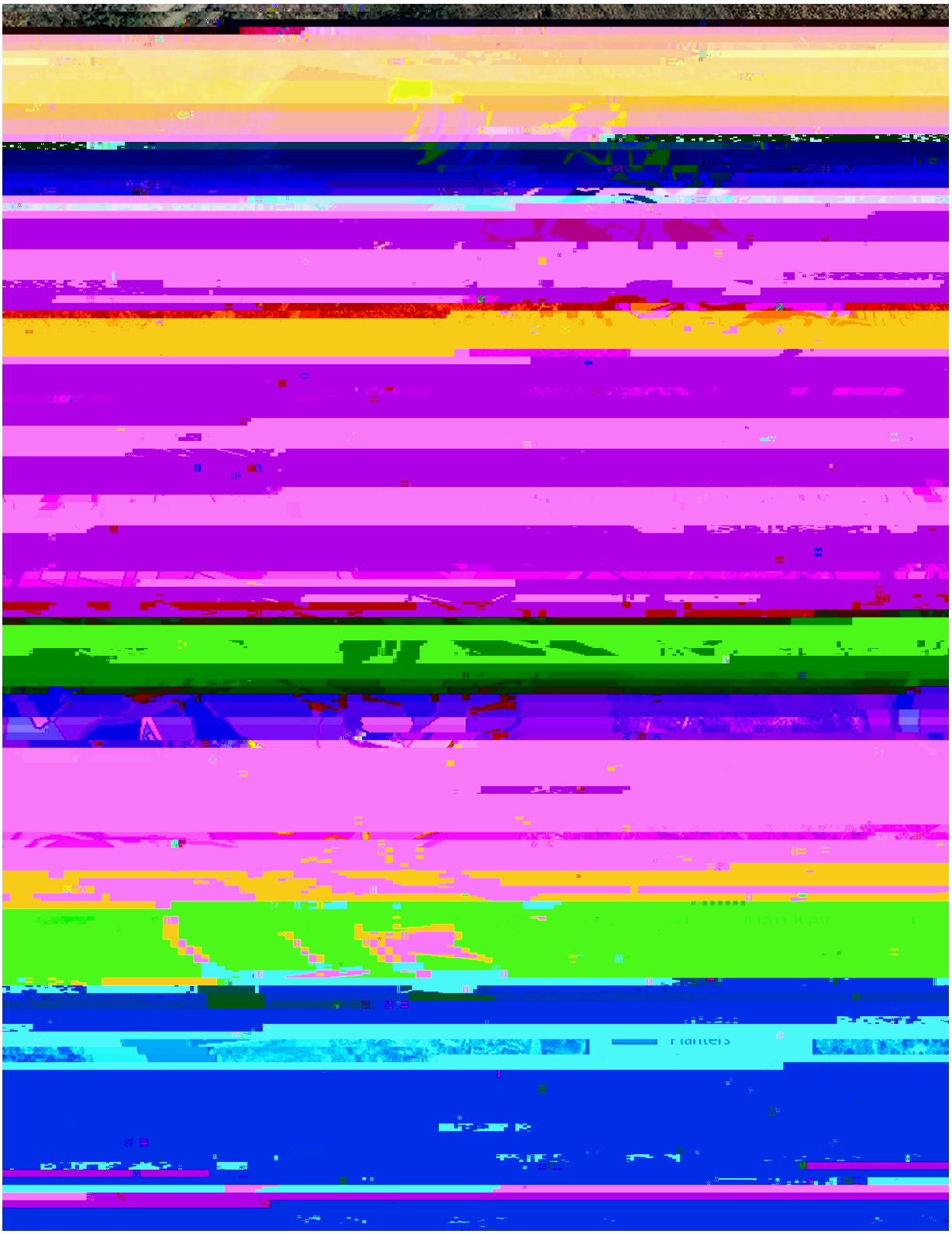


Table 1: Spreadsheet for Facilities

Table 2: Interview Questions for Dan Rodecker and Dave Nicholson

Find out who has responsibility for:
a. maintaining the landscape
b. designing the landscape

5. How much time is spent in plant care (i.e. tree, shrub, & bed maintenance)?
6. How many hours are dedicated to mowing per day? What kind of equipment do you use?
7. How many hours are dedicated to leaf removal? What kind of equipment do you use?
8. How much fuel is consumed per hour? Week?
9. What are your annual, bi-annual, monthly fuel costs?
10. How many hours are spent watering?
11. How much water is used?
12. Do you use fertilizers? What kind of fertilizer do you use? Why do you use fertilizers?
13. How much fertilizer is used and how many hours are spent applying it? Where are fertilizers used (use map)? How is it used (describe process)?
14. Do you use pesticides? What kinds? Why (what are the purposes)?
15. If you don't use pesticides, why not?
16. How much pesticide is used and how many hours are spent in application? Where are pesticides used on campus (use map)? How are pesticides used (describe process)?
17. (List waste byproducts?) What do you do with your waste byproducts like grass clippings and leaf litter?
18. At what height do you mow the grass?

Table 2: Questions for Groundskeeper Focus

1) On an average work day, how are your hours spent?

2) Where do you spend most of your time working on campus?

3) What are your favorite areas to work on?

4) What areas require the most amount of maintenance?

5) What areas are the least maintained?

6) What are the easiest areas to maintain? (may be the same answer as above or not)

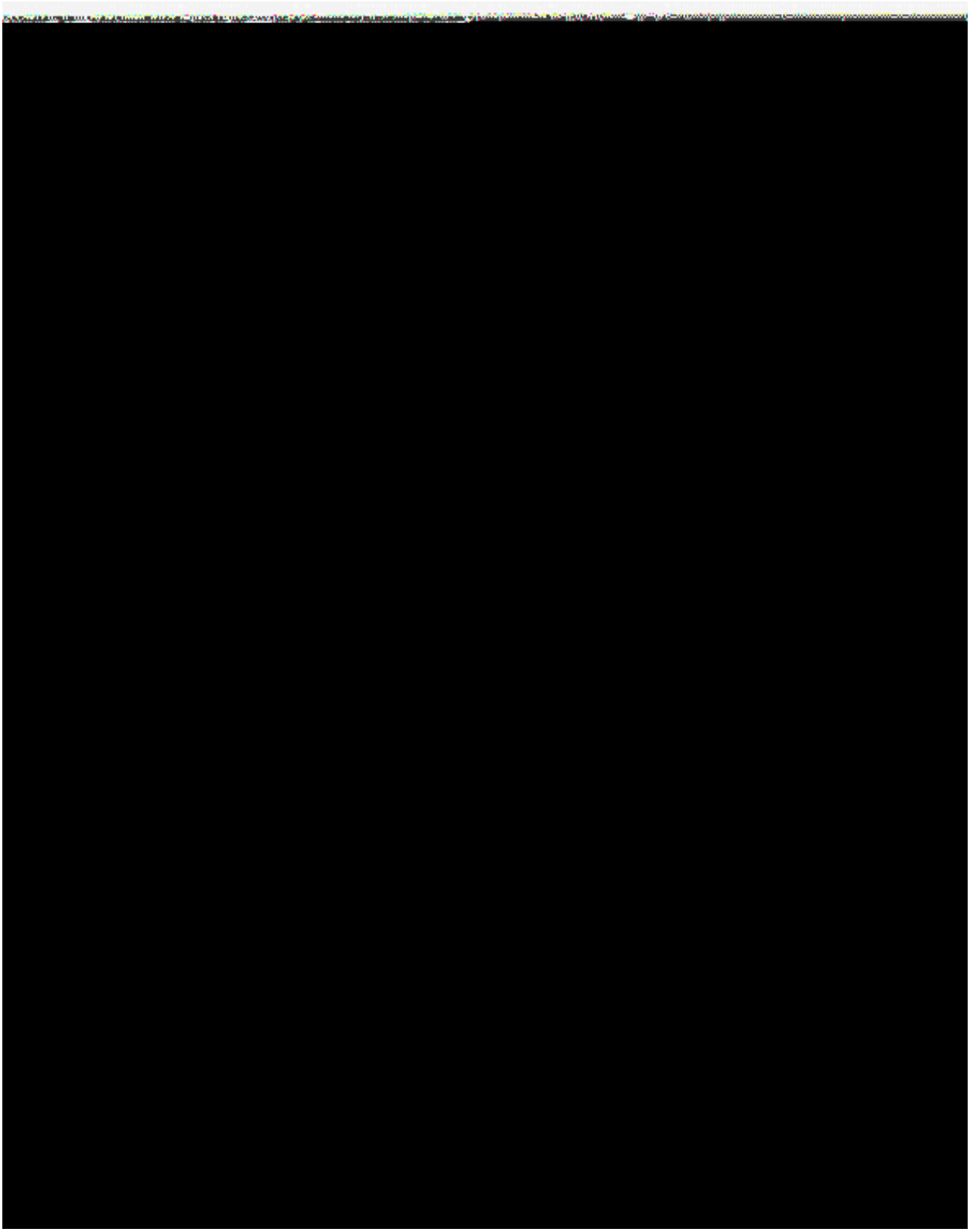


Table 6: Facilities Fertilizer Usage

Appendix C: Recommendations

Cornus racemosa	Gray dogwood
Cornus rugosa	

Acer pensylvanica	Striped maple
Acer rubrum	Red maple
Acer saccharinum	Silver maple
Acer saccarum	Sugar maple

Amelanchier arborea

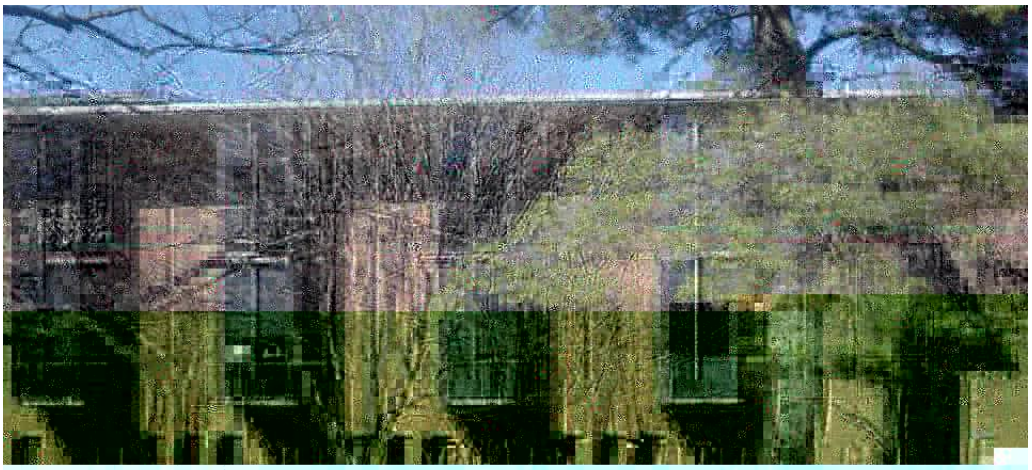
Sorbus decor	Showy mountain ash
Thuja occidentalis	Eastern arborvitae
Tilia americana	Basswood
Tsuga canadensis	Hemlock

Table 2: List of Beneficial Non-Native Plant Qualities

Non-Native Plants Utilized in the Landscape should have one or more of these beneficial qualities:

- Accumulate Nutrients
- Fix Nitrogen
- Protect against Disease
- Attract Beneficial Insects such as Pollinators
- Provide Habitat for Wildlife
- Remediate Pollution
- Prevent Erosion
- Edible
- Medicinal
- Historical/Cultural Value

Figure 1: Bolton Lawn Before and After



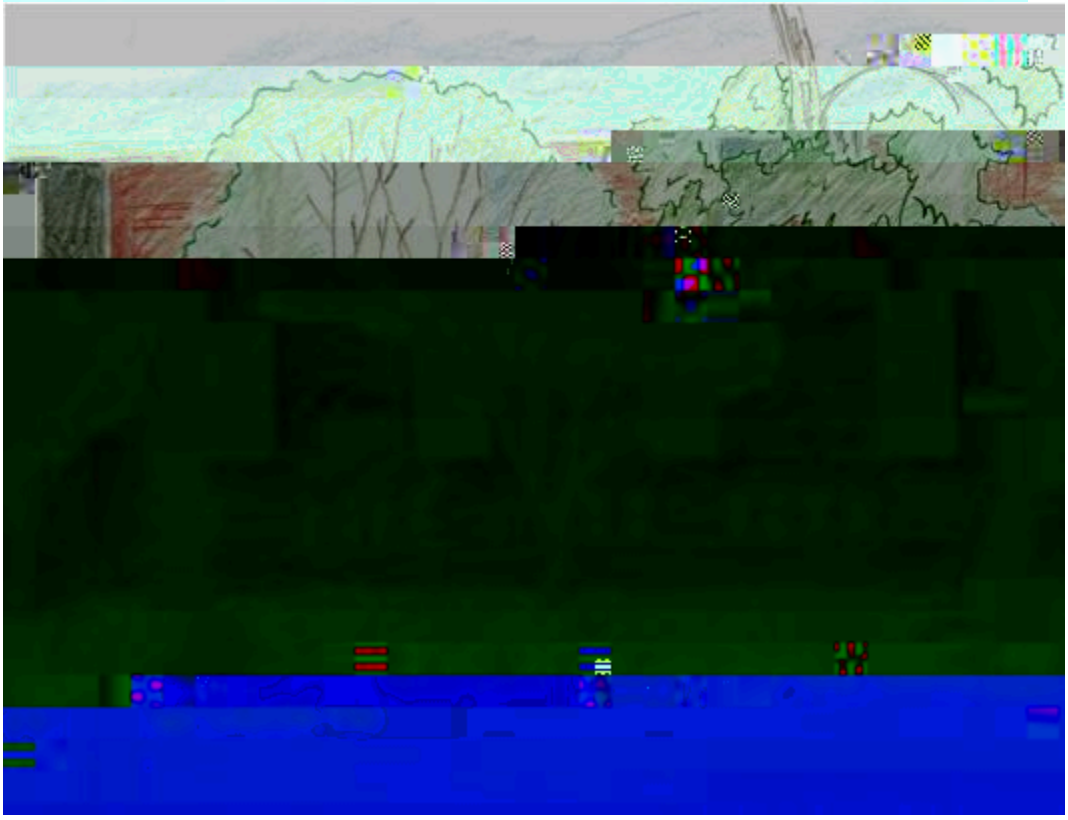


Figure 2: Case Walkway Before and After

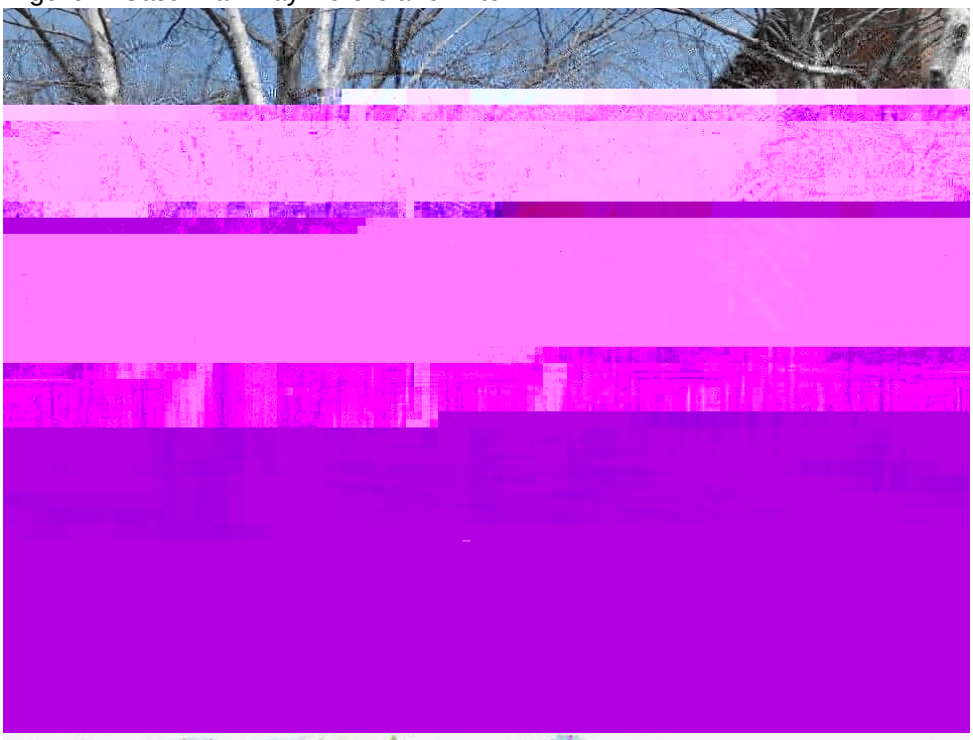


Figure 3: Case Parking Lot Before and After

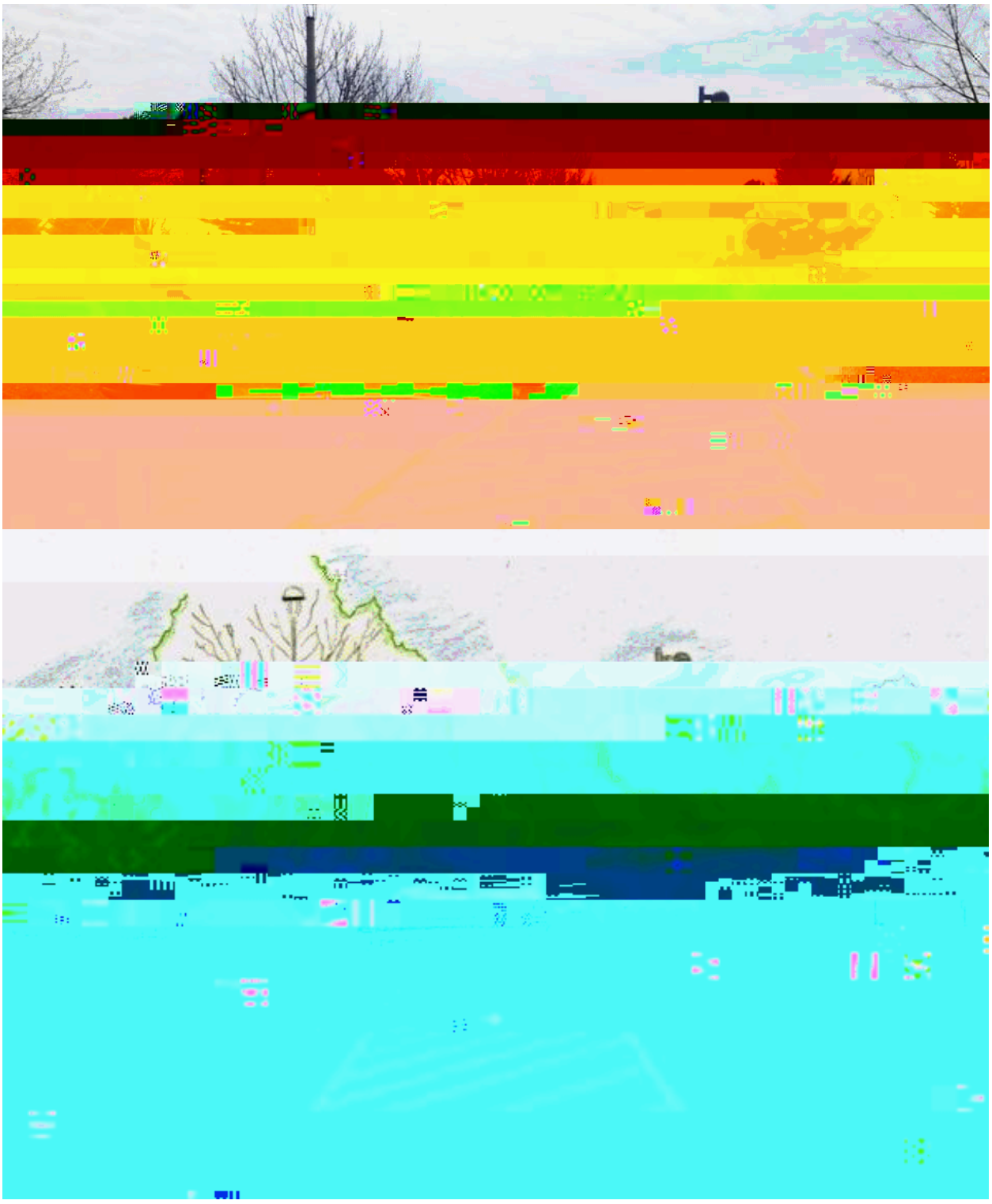
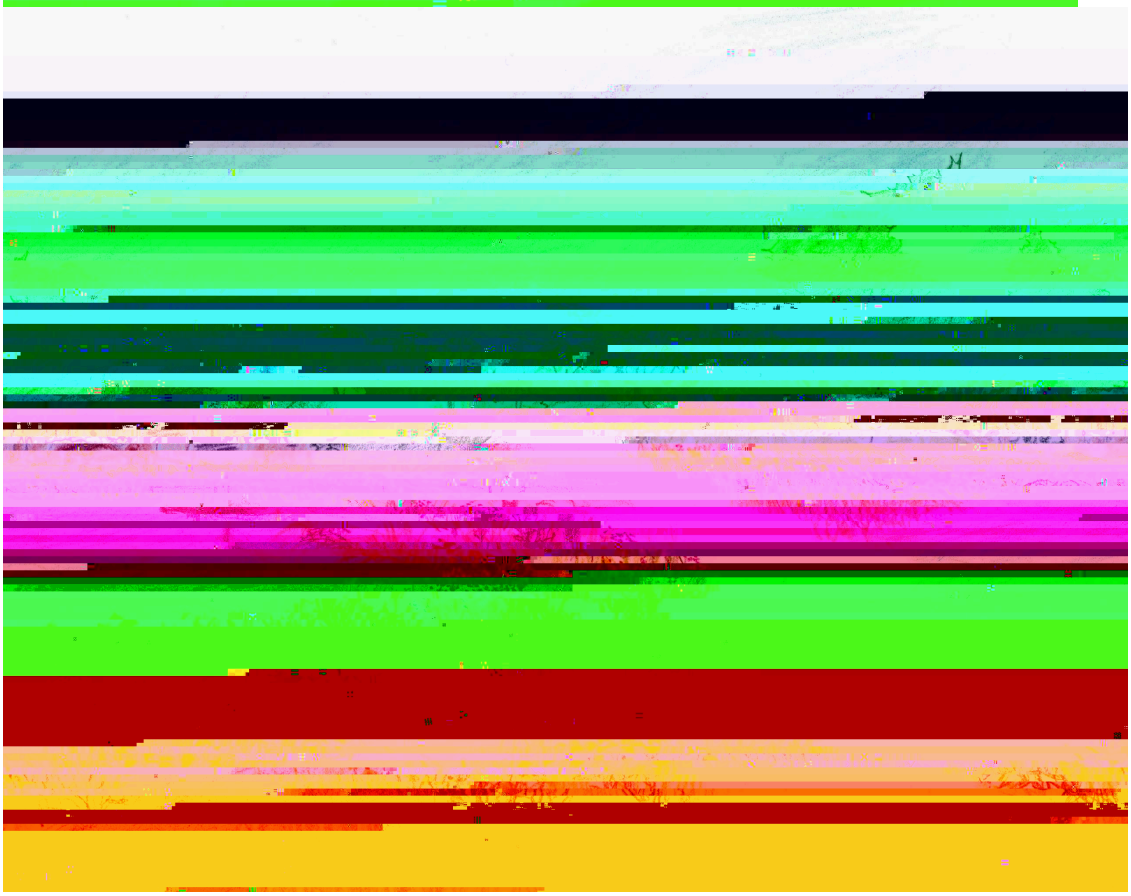


Figure 4: Haupt Pond Before and After



Further Reading:

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