

Sustainable Grounds Management at Dalhousie University: A Community Approach

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“While the symbolic importance of the campus landscape is widely understood, and as often effectively nurtured, the possible role of that setting in the actual process of education is as neglected as it is in the process of healing. Only an occasional class meets in the springtime on the lawn – a special and somewhat awkward event. Might not the outdoors be shaped for teaching, just as indoor rooms are? Do not outdoor paths and focal points serve for spontaneous discussions, just as corridors do, and could they be designed with that in mind? Can the site be a biological laboratory, and the building and corridors display something of the immense variety of studies of which a university is comprised?”

Kevin Lynch and Gary Hack, 1984

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INTRODUCTION	4
Background and Setting:.....	4
Problem Statement:.....	4
Significance of Problem:.....	5
Objectives of Study:.....	6
Literature Review:	6
Literature Review Map	6
METHODS	8
Theoretical Background.....	8
Surveys.....	8
Interviews.....	9
Limitations And Delimitations	10
RESULTS	12
Theoretical Background.....	12
Surveys.....	13
Interviews.....	15
Plant species.....	16
DISCUSSION	17
Theoretical Background.....	18
Surveys.....	18
Interviews.....	18
Overall Recommendations.....	18
CONCLUSION.....	20
BIBLIOGRAPHY	21
Definitions of Terms:.....	23
Appendix A - Dalhousie Faculty: Interview Questions.....	24
Appendix B - Student Questionnaire	25
Appendix C -Results from Interviews	26
Appendix D – Talloires Declaration Action Items	29
Appendix E – Dalhousie University Context Map	30

ABSTRACT

There is a need for greater sustainability on Dalhousie University campuses. More specifically, the report expands on the need for sustainability in terms of the land indicators on campus. Dalhousie's current landscape management practices may not adequately address functional, aesthetic, ecological and social needs of the community. Interview results show the need for a more holistic and sustainable approach to Dalhousie's landscape management must be. The purpose of this study is to examine approaches to landscape management that would contribute to improving, firstly, campus sustainability and secondly student, staff, and faculty's campus experiences.

Firstly, the research examines landscape management and design approaches in theory and practice. Secondly, it seeks to discuss the applicability of these approaches on Dalhousie campuses by considering staff, faculty, and student opinions and visions and to discuss the relevance and benefits of sustainable landscape management for the Dalhousie community. We have acquired our information through questionnaires, interviews, and observations as well as from our studies of literature. The report concludes with recommendations for Dalhousie that offers increased maintainability while increasing aesthetic interest in the landscape among other social, ecological, and economic benefits.

INTRODUCTION

Background and Setting:

Both campus greening and a concern over campus sustainability have been the focus of scholars and activists for over twenty years. Dalhousie University's commitment to sustainability is evident in the endorsement of the Halifax Declaration on University Action for sustainable development (1991), among others, and, in its ongoing development, maintenance, and renovations. Furthermore, at the Association of University Leaders for Sustainable Future conference held in Halifax in 1999, Dalhousie University Senate committed to a sustainable future by becoming party to the Tallories Declaration, endorsing the declaration's ten action areas (see Appendix A).

This commitment will need to be further reflected in the campus design and landscaping. The need to achieve sustainable land indicators on campus and research into landscape management practices appropriate for the campus become necessary. Currently, Dalhousie's policies on this issue include, "...striving to manage its buildings and grounds in ways that are environmentally appropriate" (Dalhousie Senate 1990). Overall, the policy for the institution explains that, "Dalhousie University believes it should take a leadership role in regards to environmental management. It is the policy of Dalhousie University to strive to conduct its activities in ways that do not cause unacceptable degradation of the environment" (Dalhousie Senate 1990).

Recently, university students at Dalhousie University examined the possibilities for a revitalization of University Avenue as a car-free and greener space (Archibald et al, 2004). The ideas were also developed in 1991 with the help of a design firm but ultimately didn't see fruition. In 2005, a preliminary proposal was presented which is currently under consideration by Dalhousie (see Appendix B). The time is right to usher in a new system of grounds management. As such, this study has examined landscaping practices with the needs of a sustainable Dalhousie campus in mind

Problem Statement:

Our study will explore the need for greater sustainability on Dalhousie University campuses. Dalhousie's current landscape management practices do not adequately address functional, aesthetic, ecological and social needs, as the land indicators of the Campus Sustainability Assessment Framework (CSAF) recommend (Chown et al. 2006). As such, there is a need for a more holistic and sustainable approach to Dalhousie's landscape management. The purpose of this study is to examine approaches to landscape management that would contribute to improving, firstly, campus sustainability and secondly

student, staff, and faculty's campus experiences and enjoyment at Dalhousie. These areas are important contributors to campus sustainability both in terms of human and ecosystem well-being (Cole 2003 80).

Significance of Problem:

Human interaction with the environment threatens our own wellbeing. Most visible in this relationship is the kind of landscapes we propagate. An aesthetic can be deciphered from the adaptation and management of land: an aesthetic of domination. Ecosystem function is disturbed in the patterns of anthropogenic landscapes. The university in its capacity of community leader and center of knowledge can contribute, more than discussion, an example in the development of a re-integrative transition plan. The amount of actual benefit that could be realized through the development of sustainable campus landscape at Dalhousie is significant.

In the competitive Canadian scholastic environment, Dalhousie University would benefit from the promotion of a sustainable landscape in considering attracting students and faculty to an aesthetically pleasing and sustainable campus. Most importantly, there are potential environmental, social, and academic benefits. Our examination into the design of new, sustainable landscape management practices could benefit the Dalhousie University community as a contribution to the activities of Dalhousie Integrated Sustainability Initiative (DISI).

University campuses are being asked to take a proactive role in addressing the environmental problems facing the broader community. A first impression of Dalhousie University's commitment to sustainable practice, campus landscaping should reflect a sound environmental ethic. But admonishment of traditional landscape horticulture approaches will not help decision makers unless accompanied by an offering for direction as is done here. Therefore, our results will be relevant for actors with a variety of interests. For example, the administration should consider that simply integrating more native species into the campus landscape is a way to reduce the costs to the university (MacLeod 2005). Dalhousie University can choose a re-integrative grounds management approach that will allow its over seventy-five acres of peninsular Halifax land to be more enjoyable and productive, drawing less on shared resources and contributing more in a natural economy. Such an approach can offer increased maintainability while increasing aesthetic interest in the landscape.

Finally, the need for achievable landscape scale sustainability goals on campus is detailed and research into landscape management practices provides Dalhousie-appropriate landscaping approaches. A zoned approach, it is argued, matches maintenance activity to use, allowing infrastructure to better merge with the university and community landscapes.

Objectives of Study:

- 1) Identify management and design approaches.
- 2) Discuss the applicability of these approaches on Dalhousie campuses by considering staff, faculty, and student opinions and visions.
- 3) Discuss the relevance and benefits of sustainable landscape management for Dalhousie students, staff, and faculty.

Literature Review:

We conducted research into existing literature on the topic of natural landscape and landscape design in order to provide a context for our study. Firstly, we looked at the previous research conducted into Dalhousie's natural landscape. Secondly, we examined the approaches to landscape design and naturalization, which was broken down into landscape management and ecological design principles and case studies of campus landscape management in North America. Please see Literature Review Map for details.

Literature Review Map

- 1) Dalhousie's natural landscape:
 - a. Indigenous Flora on Campus (Archibald et al. 2004)
 - b. Dalhousie University Tree Inventory (Bhatia et al. 2005)
 - c. Feasibility of Making University Ave. Car-Free (MacLeod et al. 2005)

- 2) Approaches to landscape design and naturalization:
 - a. Landscape management:
 - i. Principles and Practices of Ecological Design (Cote et al. 2004)
 - ii. Changing Perspectives (Benzanson, 2005)
 - iii. Plant communities of selected urbanized areas of Halifax, Nova Scotia, Canada (Freedman et al. 2005)
 - iv. "Control of Chinch Bug without Pesticides and Other Ecological Lawncare Practices." (Patriquin 2006)
 - b. Campus sustainability and design precedents in North America:

- i. Brock University, Canada: Brock University Campus Plan
- ii. Berkeley University of California, USA: New Century Plan (2002)
- iii. University of Michigan, USA: Toward sustainable management (2002)
- iv. University of Minnesota, USA: Sustainable Urban Landscape Information Series (2003)

Three previous research projects were conducted on topics related to Dalhousie's landscape in the ENVS 3502 course in previous years. The reports that were available to us included topics such as its indigenous flora, a tree inventory, and the feasibility of a car-free University Avenue. In each case, recommendations were made that included more indigenous flora, trees, and natural landscapes. These recommendations were made in the context of benefits to the local natural environment as well as to the sustainability indicators of Dalhousie University.

To provide theoretical context for our research, we examined four scholars or businesses that have analyzed the benefits of naturalization and sustainable landscaping in general. This research provides a background to the field of these design principles which we have applied to a campus setting, Dalhousie University. The field is revealed, in this literature review, as a large field in which extensive research has been conducted into the relationship of landscape management to sustainability.

Four case studies provide a direct contextualization for our research. They demonstrated that other University campuses have achieved or are in the process of developing sustainable landscape management practices. Their successes and failures have been taken into account in designing our research.

METHODS

Due to the nature of our research, from a theoretical perspective, our knowledge claims are socially constructed. We have acquired our information through questionnaires, interviews, and observations as well as from our studies of literature. We interviewed different participants in order to obtain professional input into our research. In addition, we have surveyed Dalhousie university students about their perception of the campus landscape. We have incorporated our data from the participants views and their interaction with the landscape in order to develop a framework for changes to develop a more holistic and sustainable landscape on Dalhousie University campuses. From these methods we have interpreted participant responses as varied and multiple in order to look for the complexity of their view rather than narrowing the meanings.

Furthermore, our research has been approached with a grounded theory strategy based on qualitative data. The focus of this study has been the participant's collective views and thoughts about the landscaping and peoples everyday interaction with the current landscape. We compiled information from a variety of participants to maximize the similarities and the differences of data collected. The methods are discussed in detail below beginning with theoretical perspectives on sustainable landscape management, followed by surveys and interviews.

Theoretical Background

Our research was designed to incorporate the theories of landscape management and ecological design in the field of environmental management in an institutional setting. As such, research was conducted into the theoretical basis of landscape management and ecological design using a library-based approach. Academic journals and websites were consulted including the Dalhousie Environmental Programmes website. In addition, websites of certain universities across North America were searched for case studies of ecological landscape design.

Surveys

One methodology that we used in our research was survey research. We used questionnaires in order to obtain people's opinions on the campus landscape. This research was conducted on Dalhousie University campus. We randomly asked 150 students to take a short survey in order to discover the student population's likes and dislikes about the campus landscape. Our surveys were printed on one-side-good paper, and were distributed at random to students that were found on campus in areas such as the Killam library, the Student Union Building, and the Life Science Center. This study was intended to

determine participants' collective views and thoughts about, and the extent of their everyday interactions with the current campus landscape.

Interviews

We chose to collect qualitative data to help answer our research problem. In selecting the interviewees, a non-probabilistic method was used. This method was chosen because we were interested in interviewing individuals with a knowledge base that related to our topic.

Two types of non-probabilistic sampling methods were used. Firstly, purposive sampling, which allowed us to contact individuals with education and knowledge relating to sustainable landscape management practices. Secondly, snowball sampling was used. This was done at the end of the interview. Key informants were asked if they knew of another individual that was knowledgeable in the field and would be willing to be interviewed.

The interviewees were contacted to schedule a meeting time. One interview was conducted via telephone. Interviews were conducted with more than one group member when possible. Recording the interview took place afterwards from notes taken during interview (appendix A)

Individuals interviewed for the project included:

- Gregor MacAskill – EAC program coordinator, and PhD Candidate and Dalhousie Instructor
- John Zuck - Landscape Architect, Dalhousie associate professor
- Dr. Bill Freedman - Chair of the Biology Department
- Peter Klynstra - Landscape Architect with Ekistics design firm
- Dr. Jill Grant - Director of School of Planning
- Peter Romkey - Executive Director, KC Irving Environmental Science Centre
- Jeff Lamb - Director, Facilities Management, Dalhousie University

Interviews were conducted in an informal manner with a minimum of one representative from the group asking the questions and recording the responses. While doing pilot studies we were happy to get the responses from the interviewees. These preliminary interviews gave us valuable information pertaining to the research question and have been included in the results. The interviews consisted of yes/no questions followed-up by open-ended questions which allowed the interviewee to share their knowledge and opinions. All interviewees were asked the same set of questions, in the same order. However, they were allowed to direct the conversation if it was seen to benefit the study.

Six questions were posed to each interviewee. The first question related to specific examples of sustainable landscape management and design at Dalhousie University. This was followed by a question

relating to the current Dalhousie University policy. The final three questions related to the redesign of the spine of the Studley campus. The list of interview questions asked can be found in Appendix (A) at the end of the document.

Limitations And Delimitations

The major limitation to this project was time. There was only one semester in which to complete research, interviews, and surveys from which to make conclusions and recommendations.

The season also posed a limitation to our study. It is difficult to do this type of study in the winter when people are spending little time outdoors enjoying the landscape. The survey we conducted was on what people thought was important in the landscape and how they thought Dalhousie's landscape compared to their ideal views. As many students are only on campus for a few months when the weather is suitable to spend time using the landscape they may not have very strong opinions on the current landscape.

The limits of our background research included the availability of certain documents. We were limited by the databases available to Dalhousie University Libraries. We relied on the work of others, much of which is in the form of unbound web resources. The confidence in the credibility of published journals is ideal, as other sources may not reflect accurately the true state of affairs. A consideration of these limitations took place on designing this section of the research.

Finding participants to complete the survey also posed a problem. On the first day conducting our survey research, we had the most success; however, because we had classes that day, we were limited to only to complete half of the final population. On the second day that we attempted to survey the student population, new complications arose. Students from other classes were also conducting surveys. This limited our volunteering participants significantly, because, like the other students that were surveying the student population, we were surveying students that were found on campus. The third day that we surveyed in the morning between 10 and 11a.m., and the students found on campus were sparse. The students that were found tended to be too busy to participate.

We found that the number of volunteer participants was lower every time we attempted to conduct our survey research. Upon repeated trials, we found that there were also some students that we recognized from surveying on previous days. Some also declined because we unknowingly asked them a second time on a different day. This was because we were surveying areas where we found a number of students, and this appeared to be the same students in some cases. It was difficult to obtain our original goal for participants, and we settled with 169 completed surveys. This did generate some visible trends, and provided us with information about the student populations' opinions.

A limitation encountered during the interviews was getting interviews with the desired interviewees. Some were not available for interview, while others directed us to a person they felt could give a response representative of their opinion and knowledge on the subject.

Time restrictions required us to set delimitations on the scope of our work. We limited the study and recommendations to Dalhousie University Campuses. We also limited the interviews conducted. Professors were chosen who we felt would be most knowledgeable in the area of landscape management and design while still acquiring different perspectives from people in different faculties.

RESULTS

Theoretical Background

Based on the research conducted into the theories of landscape management and ecological design principles, certain principles are revealed as the basis of these approaches. These include “any form of design that minimizes environmentally destructive impacts by emulating and integrating with natural ecosystems” (Cote et al 2004). To elaborate, Cote, Freedman and Shu-Yang present seven principles to eco-design, which include the following:

- 1) The need to meet the inherent needs of humans and their economy;
- 2) The requirement to sustain the integrity of the structure and function of both natural and managed ecosystems;
- 3) The appropriateness of emulating the inherent designs of nature in anthropogenic management systems;
- 4) The need to make progress to a sustainable economy through greater reliance on renewable resources and more focus on recycling, reusing, and efficient use of materials and energy;
- 5) The use of ecological economics (or full-cost accounting) to comprehensively take resource depletion and environmental damage into consideration and thereby address issues of natural debt;
- 6) The need to conserve natural ecosystems and indigenous biodiversity at viable levels;
- 7) The desirability of increasing environmental literacy to build social support for sustainable development, resource conservation, and protection of the natural world. (Cote et al 2004)

These principles are a good foundation upon which Dalhousie University should build sustainable practices.

For example, this indicates that Dalhousie University should incorporate native species into the campus natural landscape, when financially appropriate, as biodiversity and sustainability indicators will increase, according to the CSAF framework. However, native species are not always the most appropriate choice for landscaped urban species. In terms of sustainability, native species, and naturalization in general, can make a significant contribution, as “trees are capable of contributing greatly to sustainability initiatives, through improvements to ecological integrity, carbon sequestration, wildlife habitat, education, and energy savings” (Bhatia et al 2005).

Other benefits of improved sustainable management, according to eco-design principles, include, offsetting emissions of carbon dioxide (CO₂), increased carbon fixation, and reduced energy consumption

(Freedman et al). In addition, increasing urban natural capital can provide more than ecological benefits such as health and safety, social, aesthetic, economic and other benefits (MacLeod 2005).

Surveys

We were seeking intricacy of participants' stances from our survey research, not wanting to narrow meanings into specific groups or ideas, our first question had the potential of having a very broad, diverse outcome (See survey in appendix B). This allowed us to obtain a picture of students' model components of an ideal campus, assembled by the elements that they selected as most important. From the selection of twenty different elements, trees were selected most often, with 90% of the participants selecting this component. Benches were selected by 80% of students surveyed, 78% indicated sitting areas, followed by 65% support for safety and 64% for recreational areas. The element that had the least support was native species, with only 24%. This was followed by wildlife with 31% support, unpaved walking paths with 33% support, and manicured flower beds and wooded areas both with 41% support. All of the other elements from our survey were selected between the boundaries of these least and most selected components. These limits were, as noted above, 64% support and 41% support. Figure 1 indicates all of the choices of elements from the question, and the frequency in which they were selected as model components of an ideal campus.

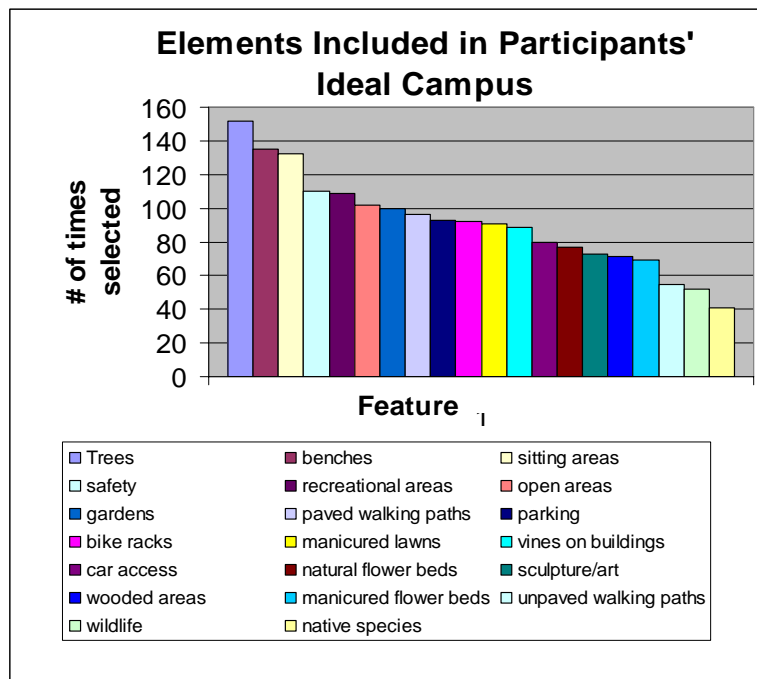


Figure 1: This graph portrays the results that were collected from question 1 of our questionnaire.

The second question was intended to generate a more sculpted depiction, based on an overall picture of the students' ideal campus. We incorporated the elements into a defined type of campus; we classified these selections as urban, manicured lawns and gardens, natural lawns and gardens, and natural. This question had a more obvious difference between the components. See Figure 2 for results obtained. The option of

manicured lawns and gardens was selected most often. The other options were also chosen, but there was a clear preference for manicured lawns and gardens.

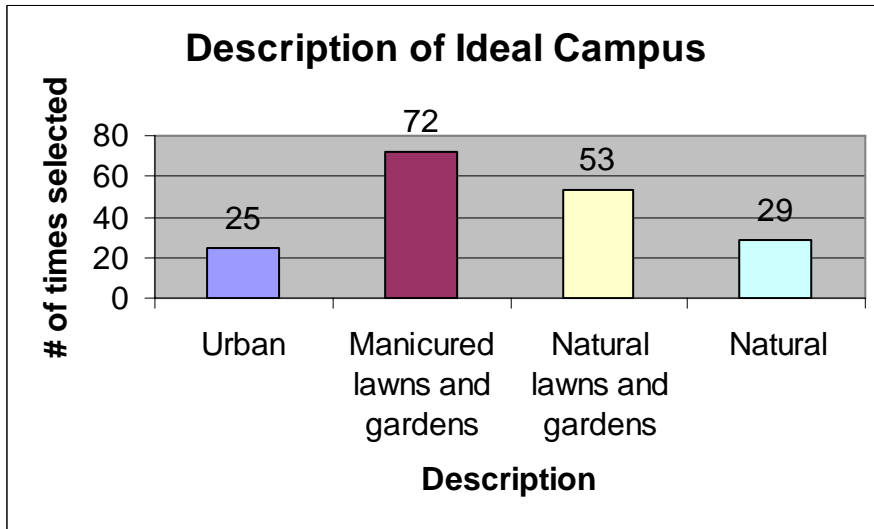


Figure 2: This graph indicates the preferred description of the participants' ideal campus.

The next question asked how students viewed the current state of Dalhousie campuses. In order to eliminate neutral decisions, we asked the students to rate the campus on a scale of 1 to 4. A perfect representation of their ideal campus was indicated

by 4 and 1 indicated that Dalhousie campus did not represent their ideal campus at all. There was a variety of results from this question, as with all of these survey questions, 59% of the surveyed population believed that Dalhousie's campus landscaping merited a rating of 3, 27% chose a rating of 2, and 10% felt that the campus only merited a 1. The least selected option, a rating of 4, depicting a perfect representation of their ideal campus was only selected by 4% of the participants, indicating that there are clearly some beneficial changes that could be made. These results correlated somewhat with the students' depictions of their ideal campus. Overall there appear to be no selections with unanimous support, only notable support for the majority of the components we were analyzing. Figure 3 represents the findings from this questionnaire enquiry.

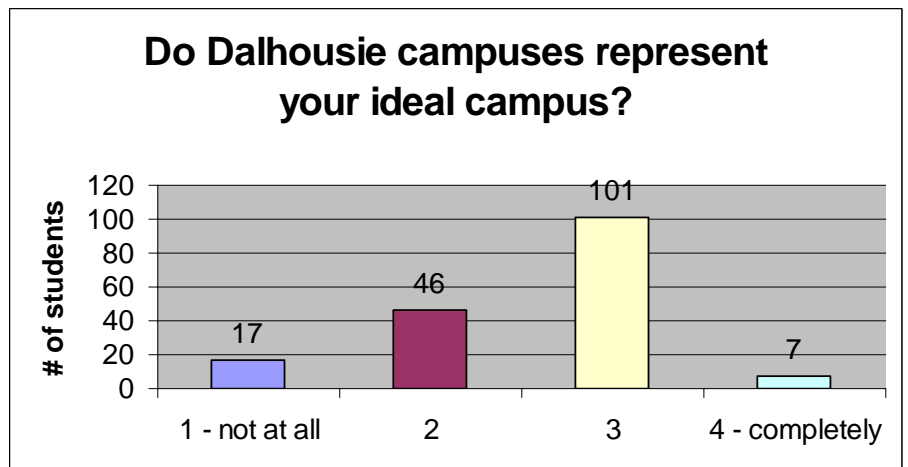


Figure 3: This graph represents the rating that participants gave Dalhousie Campus Landscaping. Selecting 1 indicated that the landscape did not reflect their ideal campus landscape. Selecting 4 indicated that the landscape was a precise depiction of their ideal landscape.

One question that we added to our survey after the pilot test, because of suggestions that it would be good to have an area for students to indicate what they believed was poorly landscaped turned out to be an ineffectual question. The majority of the students didn't indicate anything there. Some mentioned the

building architecture as a fault in the campus, the Life Science Center was particularly mentioned, but still only in very few of the completed questionnaires.

We asked students if they believed that the campus landscape had any effect on their choice of University and found that the majority believed that the landscape had absolutely no effect on their decision. A meagre 16% responded that the landscape may have been a factor taken into consideration when choosing a University, where 84% felt that landscape was not a determinant.

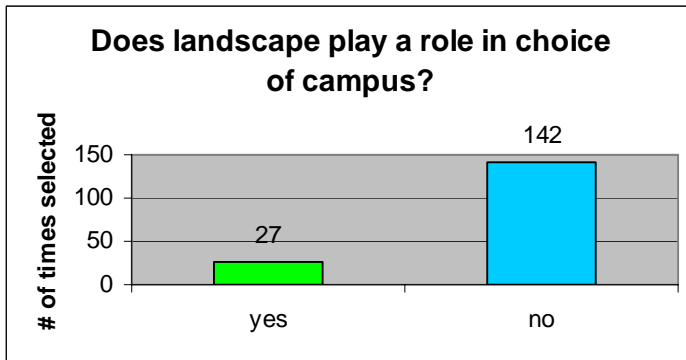


Figure 4 portrays these findings in a graph.

Figure 4: This graph represents the number of times that the responses were selected by the participants.

The last question that we posed was somewhat similar to the first two questions. We

were intending on putting a visual image with the students' perceptions of their ideal University campus. We asked them to indicate a university that they found attractive. This question had the potential to have countless different responses, and there was a large variety of campuses indicated, as presumed. There were some campuses that were selected repeatedly however. Acadia was mentioned most frequently, followed by University of British Columbia and McGill, and then Queens and St-Francis Xavier. In order to understand why these campuses were selected, a second part of this last question was added. The reasons given for the attraction to these campuses were somewhat categorized into a few selections. The main reasons given for the appeal of these campuses were a natural campus, many nice trees, and the appearance of the buildings. Other common responses indicated that maintained grounds were an important component, followed by open spaces. This question did give some support to the first two questions, as it did give an image of what the students are visualizing while they were responding to our questions.

Interviews

From the interviews we have taken valuable insights and gained further avenues in which to explore our research. Looking into grounds management guidelines that have been developed elsewhere, for possible precedents, was aided by the interviews. Many ideas were conveyed about the shortcomings and possible alternatives to Dalhousie University's present grounds management practices.

In questions one and two, we asked what examples of sustainable landscape management the interviewee was aware of. Three interviewees responded with examples of landscapes on Dalhousie

Campus which they felt were sustainable, these were; the ocean pond, and the space behind Risley Hall. All other interviewees felt there were no areas on Dalhousie campuses that represented sustainable landscape management. However, not all agreed that these were good examples. Dr. Freedman pointed out shortcomings of the Biology Department's Ocean Pond.

This question was followed by a policy question. It became clear as the interviews proceeded, that the majority of the interviewees did not feel that the current Dalhousie policy supports sustainable landscape management practices. The responses received in the first questions indicated to us that, as we had suspected, much needs to be done to convert the current practices and policies to ones which support a sustainable system. It was our intention to interview individuals with knowledge and expertise in sustainability and landscapes. In order to gain some insight into what they felt would help Dalhousie University, we asked each interviewee to share what constituted sustainable landscape management practices. What follows is a summary of the key landscape management practices identified through the interview process. These will be used in combination with our survey results and research to create recommendations.

Increase Habitat potential -

The Peter Romkey, Bill Freedman and others provided personal experiences with naturalization methods. Where soil grafting is used for turf conversion to naturalized landscapes, plant material can be attained from the sites of greenfield development and from the sides of roads where mowing occurs infrequently. This speaks to the resourcefulness needed by those doing this kind of landscaping, and the lack of nurseries from where to acquire indigenous plant material. native species,

edibles - fruit and nut bearing plants,
addition of trees,
naturalization

Plant species

Native species where appropriate
Edibles (also under productivity)

Increased productivity –

Edibles gregor/john

biomass, carbon sinking,

reduce hardscape areas (permeable pavers for parking, reduce parking areas) – jill /gregor

Alternative Turf Management -

Top-dress turf with quality compost with locally generated sources See Patriquin, Reid, and Walsh, 1996 for a Halifax based study. See also MacAskill and Patriquin, 2003 for trail applications on athletic fields.

Short-term possibilities without major renovations to the landscape plan exist. For example, new approaches to turf management, it was discovered, may afford an increased level of sustainability via lesser inputs due to less frequent mowing. A healthy turf with longer blade height is likely to have a more robust root system, diminishing the need for chemical additives for fertilization and insect control (MacAskill interview 2006).

Reduction of resource use was a common theme in the responses collected from the interview process. There were many ways in which this could be accomplished. New approaches to turf management, it was discovered, may afford an increased level of sustainability via less frequent mowing and use of non-fuel dependent options such as reel mowers and scythes. A healthy turf with longer blade height is likely to have a more robust root system, diminishing the need for chemical additives for fertilization and insect control (MacAskill interview 2006). In addition re-use of current organic waste as compost would recycle nutrients back to the system, taking a step toward closing the resource loop.

From what we have gathered, the single largest impediment to sustainability is that of a fossil fuel dependent landscape management approach. This may be considered the present norm, or, ‘status quo’.

There appears to be no shortage of precedents and alternative, more sustainable management options. The challenges faced in the Dalhousie University context are substantial. This has been part of the discussion with the interviewees who are university affiliated. Jeff Lamb, Facilities management director, shared his understanding of policy process at the institution. He believes that the upper management structure is a problematic piece of the pie, as are a deficit of funds.

DISCUSSION

Dalhousie University is in need of updated and more sustainable management practices with respect to its campuses. This study aims to present options for a changed approach that may be

implemented by the university. This research has the potential to improve campus sustainability and the overall enjoyment and well-being of those using the campus. It can do so by providing information for decision makers to explore further. In turn, this may increase natural capital, reinforce ecosystem services, and environmental health on campus. A holistic study of Dalhousie's campuses from this approach has yet to be taken and is likely overdue, as its implications to the university are widespread and potentially very beneficial.

Theoretical Background

Sustainable landscape design dictates certain principles that should be applied in management to achieve sustainability. These should be incorporated into the current landscape management objectives of Dalhousie University to achieve more sustainable campus landscapes. These principles contain recognition of each of the social, economic and ecological needs of the community. Increased use of these principles and resultant practices would be beneficial to the Dalhousie community as a whole.

Surveys

Although the surveyed students did not indicate a preference for a change in the landscape methodology, a high frequency of participant selection of 'benches' would suggest that there is a want to spend time in the out-of-doors. Successful design and management could take this into consideration.

Interviews

The interview process revealed a clear motivation for the increased use of integrated approaches to landscaping. The reoccurring criticisms and suggestions show a clear interest, if not need, for further pursuit of a Dalhousie University specific approach to land management.

Overall Recommendations

- 1) Dalhousie should enforce it's commitment to sustainability in landscape management.
- 2) Dalhousie should develop environmental policies that align with eco-design principles. Practices developed according to these principles would have environmental, social, and economic benefits in relation to landscape management and its sustainability.
- 3) Dalhousie is recommended to consider student and faculty needs for outdoor spaces.
- 4) Based on the interviews the following recommendations are proposed:

Reduce energy inputs:

- Mow less often (taller grass)
- Mow with hand equipment (reel mowers, Scythe)
- No more leave blowers

Naturalize or leave “unkempt”

Utilize Permeable surfaces for ground cover and tread:

- Reduce paved area (i.e. conversion)
- Permeable paving surfaces
- Soft-Scapes

Conversion:

Turf can be converted to alternate ground covers in order to minimize fossil-fuel dependence and to increase productivity such as tall grass species for a field or prairie effect. Lynch and Hack write: “Self-maintaining surfaces, such as rough grass, a natural woodland floor, or mixed stand of native shrubs and herbs (“weeds”) could be employed more often..... The grass is mown late in the summer to allow spring flowers to mature....”

From Turf to low maintenance groundcover/vegetation

Bark mulch method of sod conversion

Hard-Scape to soft-scape – Tread and paving materials can integrate vegetation between load bearing columns.

Vertical greening – Building clad with vines also reduces heating and air conditioning demand.

Increased Productivity:

Increase Habitat

Table 1 Recommended local plant species for attracting birds (Idziak and Rusak, 1997)

CONIFERS	DECIDUOUS TREES	DECIDUOUS SHRUBS
Pines	Maple (acer saccharum)	Elderberry
Larch	Birches	Canada Holly
Fir	Oaks	Honeysuckles
Spruce	Hazelnut	Sweet gale
Hemlock	Beech (fagus Grandfolia)	Bayberry
Juniper	Mountain Ash	Highbush cranberry
	Chokecherry	Multiflora roses
	Pin cherry	Barberry
	Hawthornes	Raspberry
	Alders	Blackberry
		Blueberry
		Huckle-berry
		Sumac

Increase campus biomass and structure

Increase vegetative volume by planting/encouraging understory and shade tolerant species

Edibles landscapes

Legumes

Native edible species

Appropriate Trees and shrubs

Providing Colour in the landscape

Trees (good urban species)

CONCLUSION

While this research examined the theories and principles of landscape management as applicable to Dalhousie, more research is necessary. A feasibility or case study could be taken on to examine how these principles may apply to specific areas on Dalhousie campus. Especially as the University is currently re-designing University Avenue, a feasibility study into how to incorporate ecological principles would be very relevant in the immediate future.

University campuses are being asked to take a proactive role in addressing the environmental problems facing the broader community. This report addresses the need for greater sustainability on Dalhousie University campuses. More specifically, the report focuses on the need for sustainability in terms of the land indicators on campus. Admonishment of traditional landscape horticulture approaches will not help decision makers unless accompanied by an offering for direction, as is done here. Dalhousie University can chose a re-integrative grounds management approach that will allow its over seventy-five acres of peninsular Halifax land to be more enjoyable and productive, drawing less on shared resources and contributing more in a natural economy.

Our research examines landscape management theories and practices in order to provide recommendations for Dalhousie-appropriate landscaping approaches. We have surveyed Dalhousie university students about their perception of the campus landscape. In addition, we interviewed different participants in order to obtain professional input into our research. We have concluded that Dalhousie's current landscape management practices do not adequately address functional, aesthetic, ecological and social needs of the community. As such, there is a need for a more holistic and sustainable approach to Dalhousie's landscape management. Hopefully, our recommendations for Dalhousie would offer increased maintainability while increasing aesthetic interest in the landscape among other social, ecological, and economic benefits.

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Definitions of Terms:

- 1) Campus: physical buildings and grounds where educational activities and associated infrastructure are housed
- 2) Ecological design: “any form of design that minimizes environmentally destructive impacts by emulating and integrating with natural ecosystems . . . [and] seeks to provide a framework for an environmentally appropriate system of design and management by incorporating both anthropogenic and ecological values” (Freedman et al. 2005, 102).
- 3) Grounds: Outdoor space part or the part of the entire premises excluding buildings to which they belong.
- 4) Landscape management: Measures aiming at preserving landscape or controlling its transformations caused by anthropic activities or natural events. (Source: DIFID)
- 5) Landscaping: Alteration of and intervention in landscape design and function.
- 6) Naturalize: To employ naturalization in land management landscaping and ecosystem interventions.
- 7) Naturalization: (1) To restore, or to allow for the restoration of, an anthropogenic environment to a degree of typical or proximate local ecosystems; (2) to utilize elements of natural environments in landscaping or the recreation of species associations and communities based on an ecotype.
- 8) Sustainability: meeting the needs of the present without compromising the ability of future generations to meet their own needs (Bruntland Commission)

Appendix A - Dalhousie Faculty: Interview Questions

Name

Department

Campus location

Number of years at Dalhousie

1. Can you provide examples of sustainable landscape design and/or management on Dalhousie University campuses? What are they?
 - a. What in your opinion makes these sustainable?
2. Are there areas on campus you feel are not well managed? Why?
3. Are you aware of Dalhousie policy as it pertains to landscape management? And, Do you think Dalhousie University policy currently supports sustainable landscape management?
4. Are you aware of an initiative to redesign the Studley Campus corridor starting at Robie St. and ending at the Henry Hicks building?
5. Given a chance to provide input, what would you suggest?
6. What do you think could be contributed to enhance a redesign?

Appendix B - Student Questionnaire

Department: _____

Campus: Studley Carleton Sexton

Campus year: _____

Age: _____

Gender: M F

1. Circle the elements that you would include in your ideal campus.

Trees	Car access	Manicured lawns	Benches
Manicured flower beds	Bike racks	Recreational areas	Sculpture/art
Natural flower beds	Native species	Paved walking paths	Sitting areas
Wooded areas	Wildlife	Unpaved walking paths	Vines on buildings
Gardens	Open area	Parking	Safety

2. Can you think of any elements not included in this list?

3. Which of the following best describes your ideal campus?

- a. urban
- b. manicured lawns and gardens
- c. natural lawns and gardens
- d. natural

4. Do Dalhousie University campuses represent your ideal University campus?

no, not at all > 1 2 3 4 <yes, completely

5. Are there areas on campus that you feel are not well landscaped? Why?

6. When choosing a University, was landscape a factor influencing your decision?

- a. yes
- b. no

7. Can you name another University that you find attractive?

Why?

Appendix C -Results from Interviews

1. Gregor MacAskill - Instructor in the Faculty of Environmental Science

Interview date: Wednesday, March 22nd, 2006

Present were: Natalie Seniuk and Vernon Woolsey

- a. Examples of sustainable landscapes on campus include the two naturalized areas

Practices that make landscape management unsustainable:

- b. Practices that depend on fossil fuels are not sustainable in landscape management. (Divorce people from mowers, leaf blowers, lawn tractors, edgers, whipper-snippers)

Practices that encourage sustainable landscape management:

- c. The use of organic fertilizers, compost, and brewery remnants
- d. Plant material – native species, edible plants
- e. Closed loop system
- f. Hardscapes have no ecological value, therefore existing paving could be replaced with permeable pavers

Further references

- g. Sustainable turf management guidelines
- h. The Oaks Experiment on Organic management of Turf
- i. Exemplary companies, individuals

2. John Zuck – Instructor in the Faculty of Planning

Interview date: Friday March 3, 2006

Present were: Natalie Seniuk

- a. There are no examples of sustainable landscapes or landscape management practices on Dalhousie campus

Practices that encourage sustainable landscape management:

- b. Increase the productivity of the existing landscape.
- c. The conversion of turf to plant material that requires the use of less resources.

- d. Plant material – Edible plants, such as blueberries and fruit trees, will increase the productivity of the landscape. Planting of native plant species also important

Other notes

- e. Sustainability also involves the social and economic perspectives

3. Bill Freedman - Chair of Dalhousie Biology Department

Interview date: Friday February 24, 2006

Present were: Vernon Woolsey and Natalie Seniuk

- a. There are no examples of sustainable landscape management practices on campus

Practices that encourage sustainable landscape management:

- b. Restoration of native ecosystems
- c. Increase the biomass by adding trees to the campus. This will in turn increase the carbon sinks on campus.
- d. Increase the habitat potential for animals. This can be done through naturalization of areas on campus.

Other notes

- e. There is a need for outdoor classrooms on campus. The naturalization of the Dalhousie campus would allow professors including him to use the university campus as a laboratory.
- f. Encouraged us to suggest that the redesign of University Avenue include the above landscape management practices.
- g. Our society's current landscape aesthetic comes from an old-english garden style with large expanses of manicured lawns. In order to create a change in landscape management practices, there must be a paradigm shift in the current landscape aesthetic and values.

4. Peter Klynstra – Instructor with the Planning Department at Dalhousie

Interview date: Wednesday March 3, 2006.

Present were: Vernon Woolsey

Practices that encourage sustainable landscape management:

- a. When selecting plant material for a site, if a native plants meets the design requirements, it should be selected.

5. Jill Grant - Director of Dalhousie School of Planning

Interview date: Friday March 3, 2006

Present were: Vernon Woolsey

- a. There are no examples of sustainable landscape management practices on Dalhousie University campuses.

Practices that encourage sustainable landscape management:

- b. Reduce area allotted to parking on campus.

6. Peter Romkey – Director of the KC Irving Environmental Science Centre

Interview date: Tuesday March 14, 2006

Present were: Vernon Woolsey

Practices that encourage sustainable landscape management:

- a. Increase the habitat potential on campus
- b. The use of organic practices in relation to lawn care.
- c. Naturalization of landscape with soil grafting as the method of choice.

Other notes:

- d. Peter was surprised to learn that Dalhousie uses organic fertilizers.
- e. Pesticide free experience at Acadia University

7. Jeff Lamb – Director, Facilities Management, Dalhousie University

Interview date: Tuesday February 21, 2006

Present were: Vernon Woolsey and Marnie Chown

- a. There are two examples of sustainable landscapes on campus, Risley Hall and Ocean Pond.

Other notes:

- b. The structure of Dalhousie University is an impediment to change.

Appendix D – Talloires Declaration Action Items

http://www.ulsf.org/programs_talloires_td.html

1. Increase Awareness of Environmentally Sustainable Development

Use every opportunity to raise public, government, industry, foundation, and university awareness by openly addressing the urgent need to move toward an environmentally sustainable future.

2. Create an Institutional Culture of Sustainability

Encourage all universities to engage in education, research, policy formation, and information exchange on population, environment, and development to move toward global sustainability.

3. Educate for Environmentally Responsible Citizenship

Establish programs to produce expertise in environmental management, sustainable economic development, population, and related fields to ensure that all university graduates are environmentally literate and have the awareness and understanding to be ecologically responsible citizens.

4. Foster Environmental Literacy For All

Create programs to develop the capability of university faculty to teach environmental literacy to all undergraduate, graduate, and professional students.

5. Practice Institutional Ecology

Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.

6. Involve All Stakeholders

Encourage involvement of government, foundations, and industry in supporting interdisciplinary research, education, policy formation, and information exchange in environmentally sustainable development. Expand work with community and nongovernmental organizations to assist in finding solutions to environmental problems.

7. Collaborate for Interdisciplinary Approaches

Convene university faculty and administrators with environmental practitioners to develop interdisciplinary approaches to curricula, research initiatives, operations, and outreach activities that support an environmentally sustainable future.

8. Enhance Capacity of Primary and Secondary Schools

Establish partnerships with primary and secondary schools to help develop the capacity for interdisciplinary teaching about population, environment, and sustainable development.

9. Broaden Service and Outreach Nationally and Internationally

Work with national and international organizations to promote a worldwide university effort toward a sustainable future.

10. Maintain the Movement

Establish a Secretariat and a steering committee to continue this momentum, and to inform and support each other's efforts in carrying out this declaration.

Appendix E – Dalhousie University Context Map



Dalhousie University Context:

Peninsular Halifax, NS



Sexton Campus



Studley and
Carleton Campus

0 75 150 300 450 600 Meters

Scale 1:15,000