Diversifying the Vegetation in the McCain Courtyard

A GREENING THE CAMPUS MOVEMENT PROJECT
ENVS 3502 Final Group Report
Instructor: Dr. Karen Harper
April 9th, 2008

Alizah Bright[1], Fraser Cameron[1], Crystal Deschambault[1,2], Danielle Horne[3], Alex Mifflin[2], Kendra Sauerteig[3]

1. Department of Environmental Science, 2. Department of International Development, 3. Department of Biology

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ABSTRACT

Dalhousie University is an institution which recognizes the importance of sustainability and environmental awareness - this is expressed through its signing of the Talloires Declaration, various student groups, and the recent hiring of a Sustainability Director. That being said, there is always room for improvement - especially with respect to Dalhousie's green spaces. This group project focuses on redesigning the natural interior of the open-air courtyard of the McCain so that it provides a space for interaction, learning, and inspiration. The McCain courtyard was chosen because it is a relatively blank canvas and also because it is a hub of student, faculty, and staff activity. Research methods such as questionnaires and face-to-face interviews were used to determine what the Dalhousie community would like to see incorporated into the space, and also how the area could be made as sustainable and low-maintenance as possible. Based on quantitative and qualitative results, it was determined that a space containing native plant species which promoted interaction and education was desired. The final proposed plan incorporates these suggestions, and hopefully can be used as a method of sparking other sustainable or green space initiatives, while promoting environmental awareness.

ACNKOWLEDGEMENTS

Our project would have not been possible without the involvement of many members of the Dalhousie community who graciously donated their time and expertise. We specifically wish to thank Dr. Deborah Buszard, Dr. Peter Duinker, Dr. Bill Freedman, Dr. Karen Harper, Jayme Melrose, Mike Murphy, Mike Wilkainson, Dr. Martin Willison, and Dr. Jill Grant.

INTRODUCTION

Universities can be places where student initiatives are able make monumental changes. Some examples of past events which were driven by student ambition include the 1848 revolutions in Austria and Germany, as well as numerous student demonstrations across the world in the 1960's in opposition to the Vietnam War (1). It makes sense that universities can be a catalyst for such action - both positive and sometimes negative - because of their inherent environment. They are often located in sizable communities, and are often well-connected with other educational institutions. Frequently they possess a variety of faculties, and therefore a diversity of students. Since students are investing their time, money, and energy in their academic pursuits, they are often concerned with university processes. These general observations lead to the conclusion that universities can provide a multidisciplinary setting with an often fervent student initiative. One such student initiative which is gaining notice in the academic

world of biology and environmental programmes is the "Greening the Campus" movement.

The core component of the Environmental Problem Solving class at Dalhousie University is a group project which encourages students to promote environmentally-based ideas on campus. This could include audits, educational projects, or environmental initiatives. For our group project, we decided to take the "Greening" part of the movement quite literally - our group decided to focus on Dalhousie's vegetation. Past group projects have addressed issues regarding Dalhousie's flora before, with Archibald et al. looking at indigenous flora on campus, for example. This group concluded that the inclusion of more indigenous plants could potentially lower maintenance demands and serves as a basis for educational purposes (2). Another student project, completed by Chown et al., focused on sustainable grounds management at Dalhousie. This project examined Dalhousie's landscape management approach, as well as sustainable landscaping practices (3). Finally, a project done by Copley et al., looked at the roadblocks inhibiting installation of a green roof on the Rowe Management Building on campus, and how these may be overcome (4). Although a review of past student projects was a necessary requirement of the course, it was also essential for our project since we wished not only to avoid reiterating past projects, but also we wished to gain inspiration and base information for our own endeavour.

For an urban-situated campus, Dalhousie University is quite fortunate to have the green spaces which it already possesses. On the Studley campus alone there is the Ocean Pond, a few small stands of trees, and several flower gardens and grassy areas. This being said, some areas of campus are not being used to their full potential. The focus area of our project is the open-air courtyard situated within the Marion McCain Arts and Social Sciences Building. This building was completed in 2001 and houses Dalhousie's Faculty of Arts and Social Sciences (FASS) - which includes ten departments. This building houses a large open-air space which currently is not being used to its best potential. While there is a large grassy area in the centre, as well as a planter housing an Oak tree and *Euonymus* sp., we feel much more could be done with this relatively blank canvas. We also feel that improving this green space could have potential beneficial impacts on campus life. The building not only hosts the extensive FASS, but the building's

classrooms and two auditoriums are used by numerous other faculties for teaching. The building is also located centrally on campus, directly across from the Student Union Building, so it is at the hub of student life.

Past research has suggested that the built environment - such as housing and office buildings - may affect those who are found in the vicinity, especially since we as a species spend 90% of our lifetime indoors (5). There has been research done on the effects of light on mood, which have shown that it can strongly affect psychological well-being. A specific example of this is seasonal affective disorder (SAD), where those who are exposed to shorter hours of daylight appear to be more fatigued, sad, and in some cases suffer clinical depression (5). It has also been suggested that proximity (such as office location) and focal points can affect the degree of social interaction and potentially the amount of social support that an individual experiences. Some elements of focal points include visual prospect (being able to see a space and its use before committing to participation), neutral territory, an activity generator, and an arrangement of furniture which promotes interaction (5). Other studies have found that cognitive energy can be positively affected by exposure to elements such as trees and natural landscapes. One study also demonstrated that patients who had views of natural elements from their hospital rooms had shorter stays in hospital than those which did not have such a view (6). Adding vegetation to an area can also have benefits which do not directly affect health, but can benefit university operating costs. A study completed at the National University of Singapore found that areas on campus - including buildings - which were surrounded by vegetation, had lower ambient temperatures. The same study suggested rooftop gardens could be used as a means to lower cooling costs (7).

Based on the suggested benefits of green spaces on an individual's well-being, we as a group believe that improvement of the McCain courtyard, which contains some - but not all of the afore-mentioned characteristics of a space which encourages social interaction - could benefit Dalhousie University greatly. Dalhousie University has recognized that campus sustainability is an important issue, through the signing of the Talloires Declaration in 1999, the presence of student-led sustainability groups on campus such as SustainDal, and the recent appointment of Rochelle Owen as the campus Sustainability Director. For these reasons, we acknowledge that our courtyard design

should also be as sustainable as possible. Furthermore, if our suggested plan is implemented, the space could also be used for educational purposes, as well as a springboard for other "Greening the Campus" initiatives.

It would be pointless to propose a greening initiative for a common space such as the open-air courtyard without first consulting Dalhousie students, staff and faculty. It is imperative to find out what the Dalhousie community would like to see incorporated into the space to ensure that this is truly a synergistic initiative. The research objectives of this project were to determine whether the Dalhousie community was in favour of such a project, and if so, what would be their preferences in a redesigned courtyard. The opinions of the community were determined by conducting a series of questionnaires involving students, faculty and staff. If met with a positive response, then interviews would be conducted with individuals possessing expertise in fields relating to our project which would help determine feasibility, design, and implementation issues. Finally, an extensive literary review would be conducted to develop the courtyard design, as well as a cost analysis which could be used for future implementation plans.

METHODS

For this project our group used five main research methods. These methods included interviews, student surveys, faculty surveys, a cost analysis investigation and a literary review.

In our interviews, our aim was to gather as much information as possible about the McCain courtyard, the types of vegetation we would be using as well as to identify all the possible obstacles we may encounter during our research. To do this we interviewed a wide variety of faculty and staff members from Dalhousie, as well as other people in the Halifax community possessing extensive knowledge of native plant species and landscaping projects similar to the one we are proposing.

At first we had only planned on conducting five interviews, however after conducting the first set of interviews we soon learned from our interviewees that there were several more people at Dalhousie who we could interview and who could help us develop a better project and more effective research. In effect, our sample size had snowballed and we ended up conducting eight face-to-face interviews in total. These

interviews were with Deborah Buszard, who is the acting director of Environmental Programmes at Dalhousie. Bill Freedman, a long-time professor at Dal who has extensive knowledge of environmental ecology and the native plant species of Nova Scotia. We also interviewed Jill Grant who is the director of the School of Planning here at Dalhousie. Mike Murphy, who is involved with planning as well as Facilities Management. Mike Wilkainson, who is Dalhousie's newly hired horticulturalist. Jayme Melrose, who is the coordinator for Garden Halifax and has a significant knowledge of permi-culture and organic farming, as well as both Peter Duinker and Martin Willison, both of whom work in the School for Resource and Environmental Studies at Dalhousie. In the end, our interviews ended up providing some of the most important and valid information for our project since it came from reliable sources. The members interviewed from the Dalhousie community had a good understanding of the space and the specific issues affecting it. Their knowledge and personal expertise provided us with the information we would need to address the issues surrounding the courtyard and work towards the development of a plan that would address these issues.

For our student research we conducted 100 student surveys in order to answer three major questions (see Appendix A for questionnaire). What level of student support would there be for our project? How often is the McCain courtyard being used now and how can we make it a more appealing place for students? These haphazard student surveys were conducted at the entrance to the McCain building on alternating days over a two-week period. We did this to ensure that we could get a wide variety of students from different areas of study responding to our survey since so many students attend classes in the two main McCain auditoriums. As well, this ensured that the respondents would have at least some knowledge of the space we were talking about since they could see the courtyard from where they were responding to the survey. A fact sheet (seen in Appendix C) was also provided in case students, faculty, or staff wanted additional information on our project.

For this project we also conducted stratified random surveys among faculty in the nine different departments located within the McCain building in order to determine their overall support for developing the space and their general opinions of the courtyard (see Appendix B for questionnaire). Since many of these staff and faculty members have been

working in the McCain building almost everyday and in some cases for several years, it was important to survey as many of them as possible since they interact with the courtyard so often - whether it is to eat lunch or just to look at it from their office window. At first, we had planned on surveying 5 faculty and staff from each of the departments in the building, but soon found out that not all of the departments have 5 staff so we had to adjust our research plan accordingly in order to get as equal a representation as possible. We conducted these surveys by visiting each department and surveying as many staff and faculty in that department as possible. In the end we conducted 45 staff and faculty surveys from all of the 10 departments with at least two respondents from each department.

In our research, our group also conducted a literary review of past projects and various books related to our project. Reviewing these projects helped us acquire some valuable information about which staff members at Dalhousie we should interview, the ways in which similar projects have conducted their research and to see if the results they acquired showed that there had been previous support at Dalhousie for environmentally sustainable landscaping projects. The literary review was also an essential research tool in the design of our landscaping project and to determine which native plant species we should include in that design. In total, we used four books to acquire this information including *The Four Season Landscape: Easy-Care Plants and Plans for Year-Round Color* by Susan Roth, *Landscape Trees and Shrubs: Selection Use and Management* by Mary Forrest, *100 Easy to Grow Native Plants for Canadian Gardens* by Lorraine Johnson and *Making the Most of Shade: How to Plan, Plant and Grow a Fabulous Garden That Lightens Up the Shadows* by Larry Hodgson.

A basic cost analysis was also conducted for our research to determine primary information on what would be required in terms of an initial financial investment if our suggested landscaping plan was implemented. The methods used to produce the cost analysis for the space were as follows:

Prices were obtained for lumber and materials, to construct six 2x5 feet and two 6 feet long, L-shape planters. The quote was obtained over the phone from a Home Hardware employee in Dartmouth and the Home Depot website. It was assumed that once the supplies were obtained construction cost would be covered. The project has

decided to rely on volunteers from Garden Halifax to assemble the planters. The Home Depot website also provided the pricing for four 16'x 24' pre-made square planters for the courtyard.

The total volume of the planters was calculated and an estimate for the amount of soil for the center space was determined. A local garden centre was then contacted to obtain a rough estimate of the cost of soil and compost needed in the space.

Information regarding the price of the plants for the courtyard was obtained through the website of www.Grow-Wild.com; this component of the cost analysis was extended slightly to account for initial plant survival rate and took into consideration the number plants needed to fill the space. In the individual plots it was determined that initially three plants of each species would be required.

The price to implement an educational component into the space was determined by obtaining information on the cost of stakes and plates for signage (one for each plant within the space). This information was obtained from the Orion Garden Markers' website.

Although our research methods did produce a valid sample of the results we were aiming for, there were still several limitations to our research that prevented it from producing stronger, more reliable results. Obviously, if we had more time it would have been easier to acquire a larger sample of student survey responses from the McCain building and other buildings around campus. Nevertheless, a major delimitation that was initially placed on this project was to limit our survey locations to only the McCain building in order to ensure that we could get as many responses as possible from a sample population that already had some knowledge of the space and would be able to produce consistently valid and usable results. However, we feel that the faculty surveys reached enough of the faculty and staff in the McCain building to produce a valid and representative set of answers for our research questions. Also, more time in general would have allowed for the gathering of more specific interviews regarding practical implementation information.

RESULTS

QUANTITATIVE RESULTS

Faculty Survey

Question:

1) Where is the majority of your time on campus spent?

Table 1 – Percentage of Faculty that Spend the Majority of their time in the McCain Building

The Mc Cain Building	96%
Elsewhere	4%

2) During the warmer weather do you use the outdoor-courtyard?

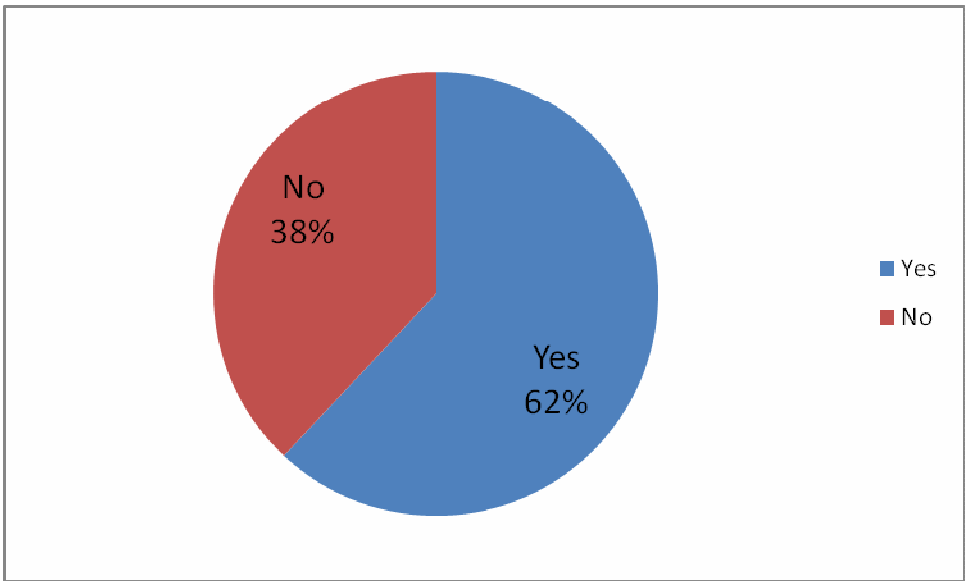


Figure 1 – Percentage of Faculty that use the outdoor-courtyard in its present state

2ii) and what is the primary reason you use the outdoor-courtyard?

a) Work / Study
b) Leisure
c) Eat
d) Other: _____

The majority of the Faculty used the outdoor-courtyard to eat their lunch or for leisure. It was also used for faculty meetings.

3) Would you like to see more vegetation and a greater diversity of plants in the courtyard?

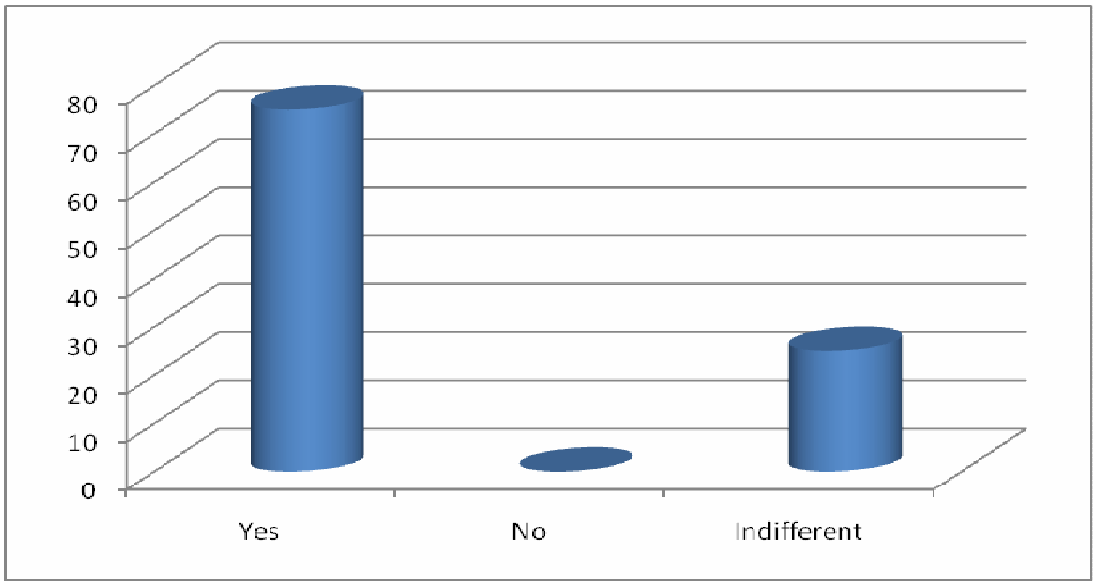


Figure 2 - Percentage of Faculty that would like to see more vegetation in the McCain courtyard

5) Would you be more likely to spend time in the quad if the space was diversified in terms of plants and vegetation?

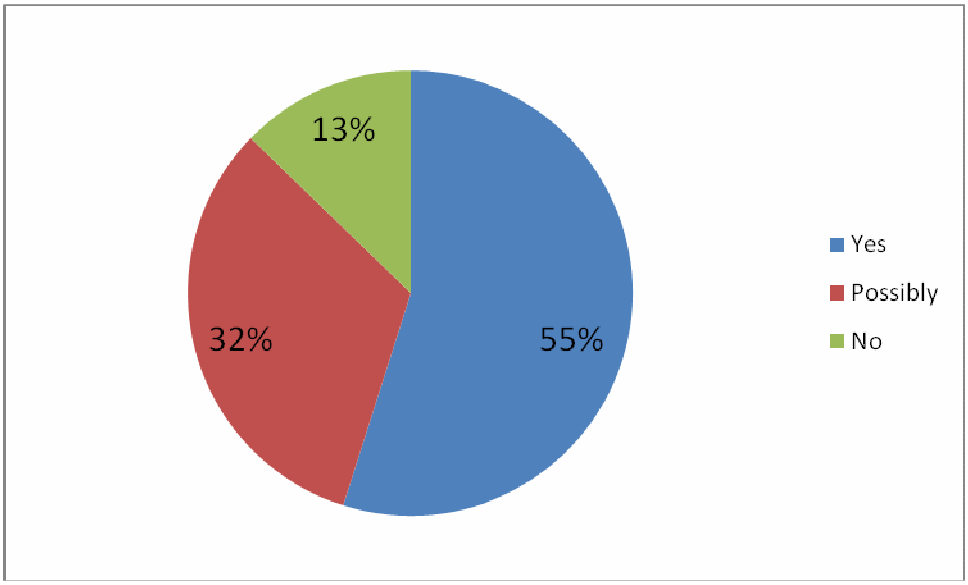


Figure 3 - Percentage of Faculty that would spend more time in the outdoor-courtyard if the space was diversified with vegetation

6) If plants were used to diversify the space would you have a preference as to which types were used?

Table 2 – Percentage of Faculty that have a preference as to which types of vegetation would be implemented into the outdoor-courtyard

Yes	56%
No	44%

7) If you responded **Yes** to question 6, list your preference below from 1 to 4 (1= most desirable choice, 4 = least desirable choice):

____ Ornamental plants suitable to the space
Examples: Marigolds, Hostas, Impatiens, Pansies and other flowers and plants typically found in local nurseries, on campus grounds and in campus flower beds

____ Native Species (Plants indigenous to Nova Scotia)
Examples: Wild Roses, Violets, Buttercups, Ferns, Lupines and other plants and wild flowers that are original to the Nova Scotian landscape.

____ 'Interactive' Native Species (i.e. Plants available for users of the space to consume and/or utilize while in the space. Examples may include but are not limited to fruit plants, herbs, vegetables, etc.)
Examples: Raspberry, Wild Strawberry, Wintergreen and other commonly used plants that are original to the Nova Scotian landscape

____ Well adapted 'Interactive' Species (i.e. Plants that can be consumed and/or used but are not necessarily native to Nova Scotia. This could include different varieties of well adapted garden plants.)
Examples: Cherry-Tomatoes plants, Strawberry Plants, Cucumbers, Mint and other plants commonly found growing throughout Nova Scotia

Table 3 – Overall Faculty Vegetation Preference (1= most desirable choice, 4 = least desirable choice)

Ornamental	2
Native Species	1
Interactive	3
Well Adapted	4

8) Do you feel that it would be beneficial to have an educational component present in the space regarding the plants (i.e. plant names, origins, uses, etc)?

Table 4 – Percentage of Faculty that believe it is beneficial to have an educational component in the space

Yes	84%
No	16%

9) Regarding the diversification of the in McCain courtyard, would you consider yourself:

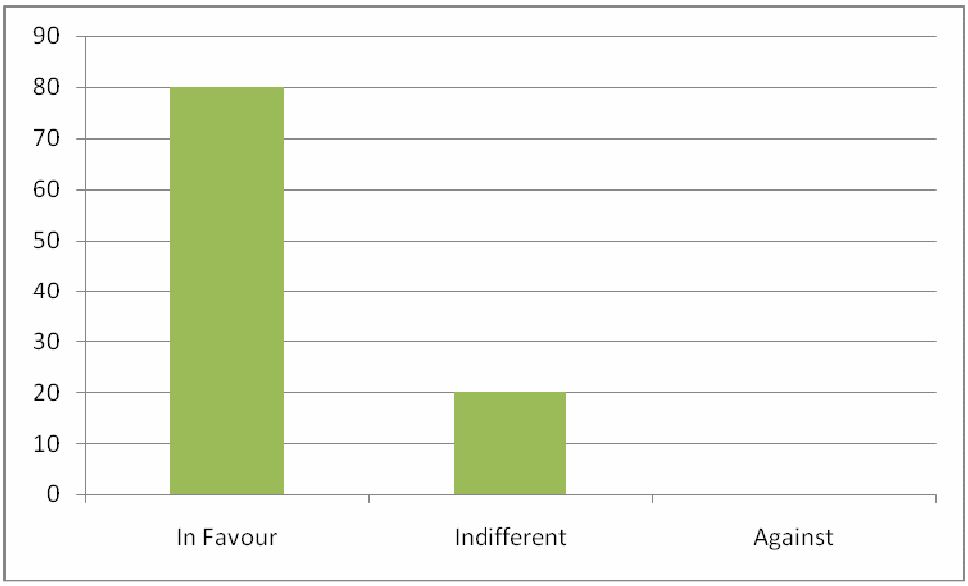


Figure 4 – Percentage of Faculty that are in favor of diversifying the vegetation in the McCain courtyard

10) Would you be interested in participating in the planning process of the Diversification of the McCain courtyard?

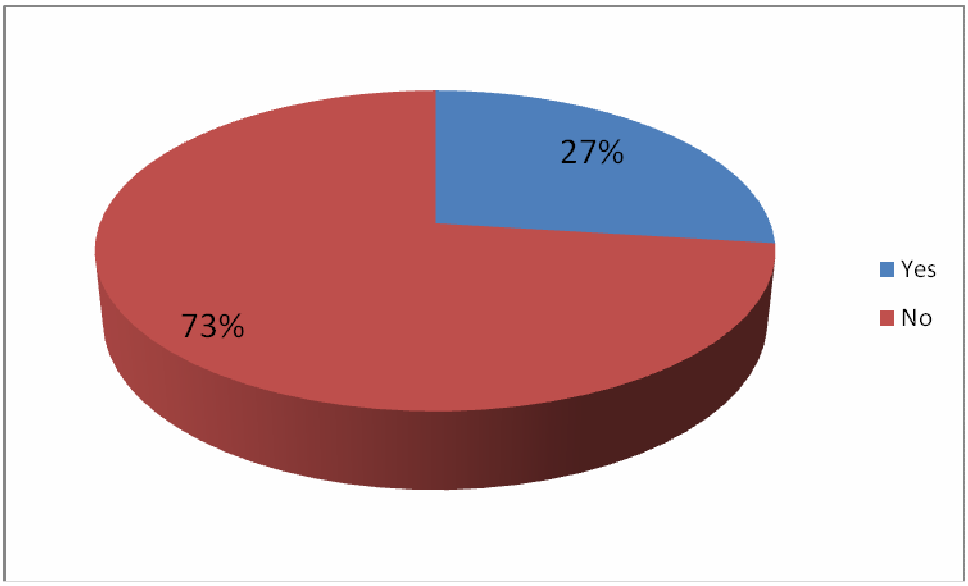


Figure 5 – Percentage of Faculty that are interested in helping with the planning process of this projec

Student Survey

1) During the school week, on average how often do you visit the McCain building?

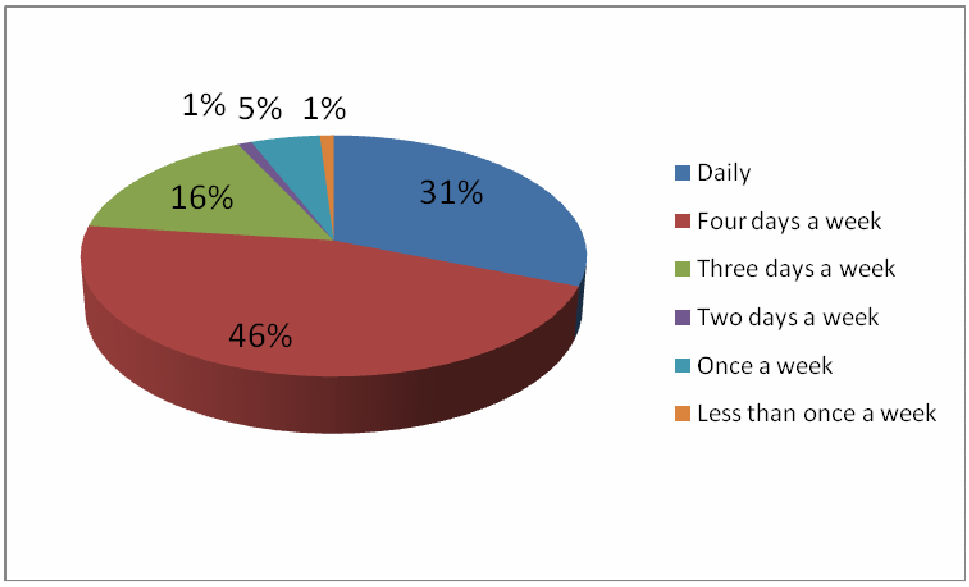


Figure 6 – How often the students utilize the McCain Building in a week

3) Have you ever used the outdoor-courtyard?

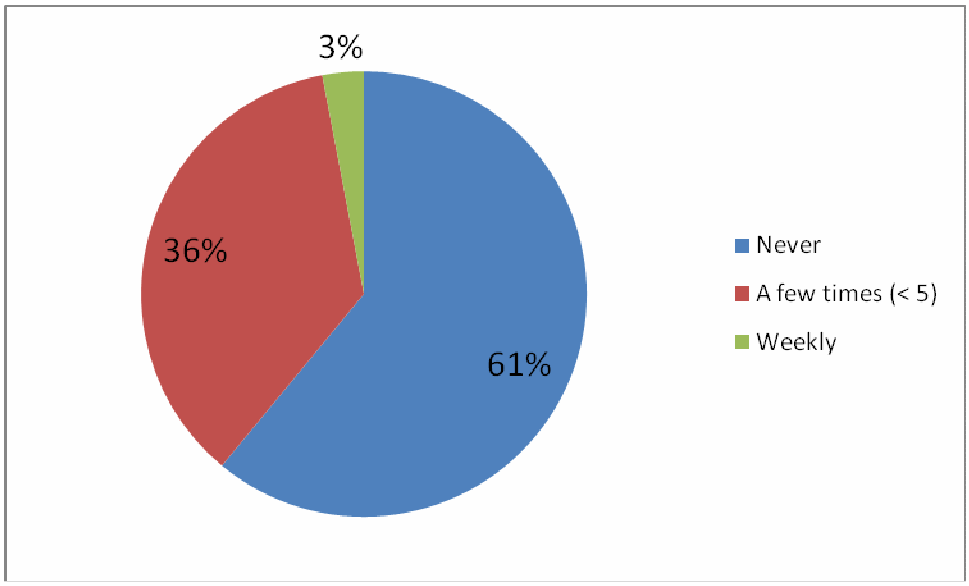


Figure 7 – Percentage of Students that have used the outdoor-courtyard

6) If the space was diversified in terms of plants and vegetation, would you be more likely to spend time in the courtyard?

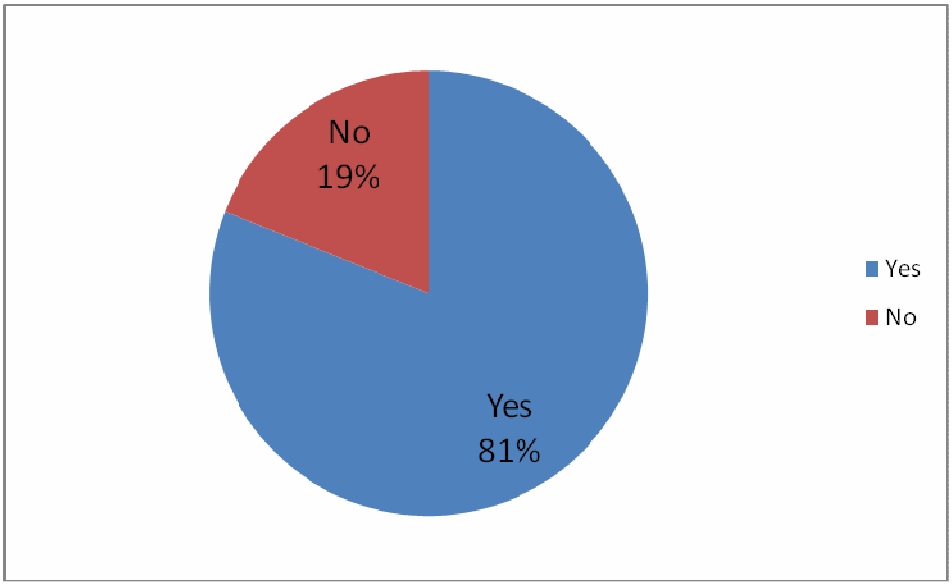


Figure 8 – Percentage of Students that would use the outdoor-courtyard more if it was diversified with vegetation

7) If plants were used to diversify the space would you have a preference?

Table 5 - Percentage of Students that has a preference as to which types of vegetation would be implemented into the outdoor-courtyard

Yes	47%
No	53%

8) If you responded **Yes** to question 7, list your preference below from 1 to 4 (1= most desirable choice, 4 = least desirable choice):

____ Ornamental plants suitable to the space

Examples: Marigolds, Hostas, Impatiens, Pansies and other flowers and plants typically found in local nurseries, on campus grounds and in campus flower beds

____ Native Species (Plants indigenous to Nova Scotia)

Examples: Wild Roses, Violets, Buttercups, Ferns, Lupines and other plants and wild flowers that are original to the Nova Scotian landscape.

____ 'Interactive' Native Species (i.e. Plants available for users of the space to consume and/or utilize while in the space. Examples may include but are not limited to fruit plants, herbs, vegetables, etc.)

Examples: Raspberry, Wild Strawberry, Wintergreen and other commonly used plants that are original to the Nova Scotian landscape

____ Well adapted 'Interactive' Species (i.e. Plants that can be consumed and/or used but are not necessarily native to Nova Scotia. This could include different varieties of well adapted garden plants.)

Examples: Cherry-Tomatoes plants, Strawberry Plants, Cucumbers, Mint and other plants commonly found growing throughout Nova Scotia

Table 6 – Overall Student Vegetation Preference (1= most desirable choice, 4 = least desirable choice)

Ornamental	3
Native Species	1
Interactive	2
Well Adapted	4

9) Do you feel that it would be beneficial to have an educational component present in the space regarding the plants (i.e. plant names, origins, uses, etc)?

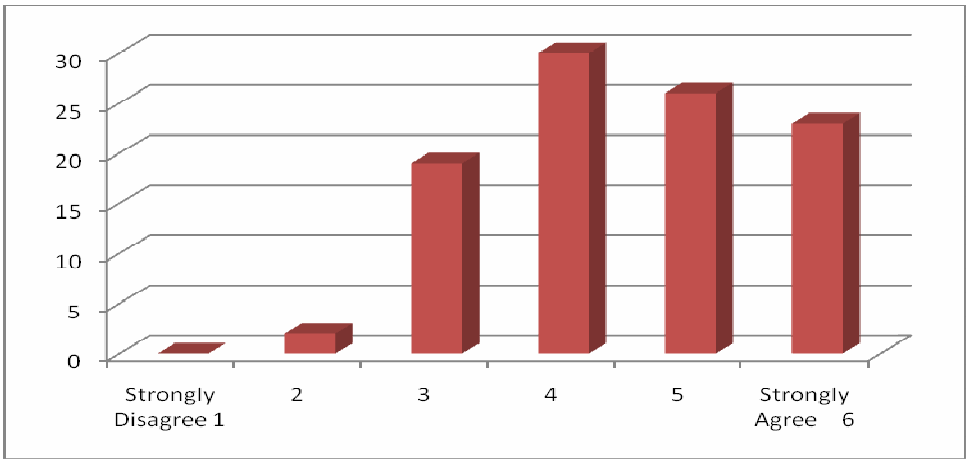


Figure 9 – Percentage of Students that believe an Educational compent would be beneficial in the space

11) Regarding the diversification of vegetation in McCain courtyard, would you consider yourself:

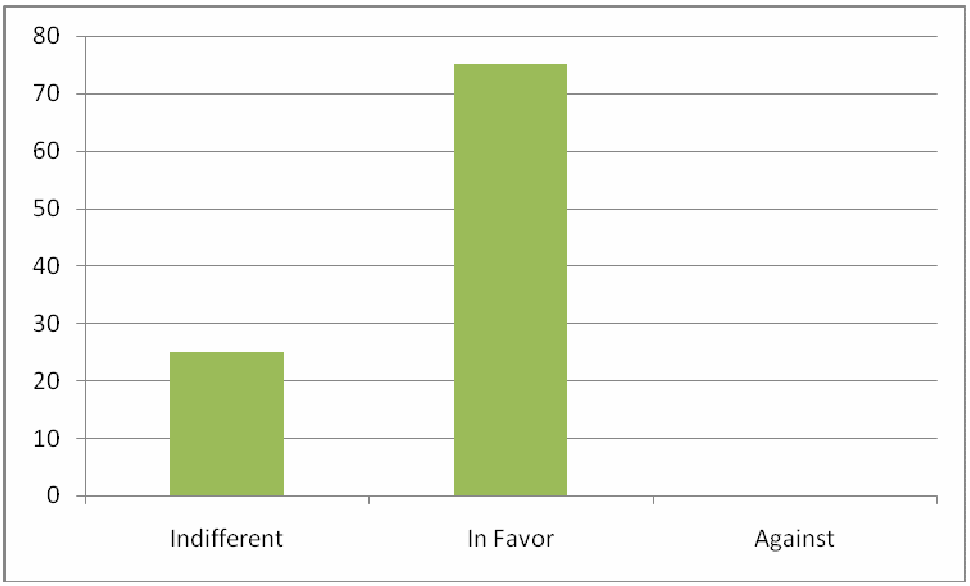


Figure 10 – Percentage of Students that are in favor of diversifying the vegetation in the McCain Courtyard

Our surveys set out to determine the support that we would have if this project were to be implemented. Both the faculty and the students shared similar interests and opinions regarding the questions we asked, as is evidently expressed in the figures and tables above. The results clearly indicate that the majority of the survey participants both faculty and students feel that diversifying the McCain courtyard with native type plants is

a good idea, which can be seen in Figures 3 and 8, as well as Tables 3 and 6. The space would be used much more than it is now and this garden would create an educational component. Without taking cost, labour, or maintenance into account this project is feasible to put into action. Figures 4 and 10 suggest that we have the support of our fellow students and that many professors seemed quite enthusiastic about the plan.

QUALITATIVE RESULTS

A series of eight interviews were conducted with various experts to gather information on the various project components which required consideration when examining the possibility of diversifying the McCain courtyard (see Appendix D for consent form and E for questions). Information was gathered in regard to four categories that were essential to the development of a proposal for the area. Three people were interviewed to gather information regarding the projects general implementation. One interview was conducted in regards to planning specifics. Two interviews were to gather basic and relevant biological and ecological information. An interview was also conducted to determine the considerations for overall feasibility and maintenance.

Qualitative information was needed to determine the feasibility of implementation and what specifically should be considered when looking at project implementation in this area. An interview with Jayme Melrose, the community garden coordinator with NSPIRG, suggested that the implementation of more diverse vegetation in this area was indeed possible. She noted that there was plenty of energy coming from student groups with regards to increasing campus sustainability. Melrose stated that the setting was ideal in terms of safety and security, due to the fact that to enter the space you must past through the building. She noted that this would be beneficial to any garden because it would allow for heights of shrubbery to be played with, eliminate any fears of dogs and cats urinating on the produce, as well as protect the garden from vandalism. She felt that through the implementation of various themed gardens and designs, the space could serve as a median to better connect the community with the natural world. She thought that this could be done by letting the plants in the garden have their stories told and allowing the garden to serve as a grounded space on campus, possibly a meditative space.

Dr. Martin Willison was a key figure in the implementation of the Ocean Pond at Dal and showed enthusiasm for diversifying the vegetation in the McCain courtyard. He established that in reality the courtyard is a green roof, due to the parkade located beneath it. He pointed out that one of the largest obstacles during the setup and implementation phases would be the issue of funding. He suggested involving the various faculties and attempt to have them aid in funding the project. He also emphasized the use of grass in the space should be avoided in order to keep the long-term maintenance of the space as feasible as possible. Willison further established that if interest in the space and the returns it could bring to the campus were to be maximized, the implementation of educational components needed to be ensured. He suggested the use of signs to help enhance peoples understanding of the space and the plants found within it.

Dr. Deborah Buszard is cross-appointed with the departments of Planning and Biology. She suggested the reason that more has not been done in the past in terms of landscaping is that, like many universities, Dal has not had extra funds for planning. She noted that this is beginning to change in recent years, especially with the hiring of a horticulturalist last year. She emphasized the importance of universities having vegetative components present and emphasized that components implemented should be integrated into the very structure of the university while being both socially and intellectually stimulating.

In discussing the components and design factors that should be taken into consideration, Dr. Buszard suggested that the courtyard is a beautiful historical idea. She emphasized that any design or implementation should be managed in a way that is beautiful, intellectually interesting (of societal value) and practical. She was firm on the point that any design for the space should tap into the interests of the various departments within the building.

Information with regards to planning was obtained from Dr. Jill Grant from Dalhousie's School of Planning. Similarly to other interviewees, Dr. Grant established that in the past the campus has been weak in landscaping. She also stated that often when different projects are carried out on campus, the university fails to involve their own architecture and planning departments. It was suggested that when designing the courtyard, the project could be used as an opportunity to change this and that the schools

of architecture and planning could help. Dr. Grant stated that the project was an interesting landscaping opportunity and that while creating a design for the space, two technicalities must be kept in mind: the bearable weight load of the space (due the parkade located underneath) and the actual soil depth.

Two interviews were conducted in hopes of gathering biological and ecological information on the space and potential designs. Dr. Bill Freedman emphasized that when sustainability is discussed in regards to the space that it is essential that ecological sustainability be understood to be different then mainstreamed sustainability. He pointed out that mainstreamed sustainability is based on no net consumption, whereas ecological sustainability is based on other factors. He stressed that if ecological integrity is to be maximized in the courtyard, only native plant species can be utilized. Freedman stated that naturalized plants forever degrade biodiversity and hence cannot be used to maximize it. Freedman commented that the space as is, is functional but completely lacking in the department of ecological integrity, and that there is very little (if any) natural habitat and naturalization. He concluded that the space offers a good microclimate because of the walls that surround it; however he was unsure of how this will affect the moisture within the space.

Information regarding practical biology and ecology was also provided by Dr. Peter Duinker. Like other interviewees Duinker suggested that when designing the space we could look to the native botanical gardens at Acadia University to serve as an example (Acadia has created formal European gardens using native plants. The gardens are aesthetically pleasing yet adapted to the Nova Scotian climate.). Duinker also commented that he would like to see an increase of native trees on campus, and an increase in trees that would be able to adapt to rapid climatic changes.

An interview was also conducted with Mike Murphy of Facilities Management and Mike Wilkainson, the newly hired horticulturalist, to determine the considerations that must be taken into account in terms of overall feasibility and maintenance of proposed projects. It was stated that diversifying the vegetation in the courtyard is a feasible possibility and that facilities has an interest in improving the campus to help meet the needs of the University. Murphy stated that maintaining the grounds of the campus plays an important role in maintaining the overall appearance of the university

and aids in attracting new students. Although, it was stressed that any project implemented would need to be fairly low maintenance due to the limited resources available to Facilities Management.

Following the interviews, individual thank you cards were written to each participant and signed by all group members.

DISCUSSION & PROPOSAL

The basis of the design for this courtyard is a sustainable landscape and also sustainable landscape practices. This is a public space used by faculty, staff and students with great potential for being used as a teaching tool. When designing this space the four things we wished to incorporate into the area and had to consider were native species, interest all year round, information, and the physical characteristics of the space. The latter is important when designing any space as the physical characteristics impact the plants and therefore the plant choices. We also took into consideration what the faculty, staff and students wanted to see in the space as we wished to continue to promote and hopefully increase the use of the space. What follows is a combined discussion and detailed look at our proposed plan, including all of the design aspects which were made evident to us through our quantitative and qualitative research. It should also be noted that even if implementation of this plan is not possible in the future, many aspects of the proposed plan could be adopted for much smaller-scale projects - such as adding planters with out designs on the balconies of the McCain.

Our group wanted to use only native plant species in the courtyard because one of the aspects of sustainable landscaping is using plants that are low maintenance. Native species are adapted to their climate and so do not need fertilizers or pesticides to grow and flourish. Native plants require less long term management, which tied into a secondary concern of ours, which was not to leave a high maintenance garden for the grounds staff of Dalhousie as they are already overworked.

Secondly, we wanted to create a garden that was interesting for all the months of the year. Although the courtyard is locked in the winter months, the area is surrounded by windows and so is viewed all months of the year. To create this effect, plants were chosen depending on their blooming period and their visual effects. The area would then

change over the course of the year with different blooms depending on the summer month and interesting shapes and evergreens for the winter.

Thirdly, because as it was brought to our attention several times during qualitative interviews, we wanted to incorporate some aspect into the garden that would convey information about the space and the plants. Universities are places of learning and students want to learn about a variety of issues and ideas. It is important for the university to provide an understanding of the spaces made available for use so students and faculty understand and continue to use the spaces. For this area we suggest using garden markers (stake and faceplate) for each plant and one for each area. This would provide the information of each plant, such as the common name, the Latin name, the uses of the plant and other interesting facts. It would also inform people about the theme of the area and why those specific plants are there.

Lastly, we had to take into consideration the physical characteristics of the space. This was essential in choosing the plants and how they could be planted. The courtyard has an interesting microclimate as it is completely surrounded by the building, which shelters it from the wind, and is surrounded by glass so there are no areas of deep shade as much of the light is reflected off the windows. This is a benefit for the plants as they will become established more quickly, are protected from salt damage, and are less likely to be damaged over the years. We almost had to treat the space as if it was a green roof because underneath the courtyard is a parking garage. This means that there is limited soil depth in the center area and none on the outer edges of the courtyard. Many of these implications became evident after conducting our interviews.

The first change was to put large planters in several of the door areas and two in front of the large glass window (Appendix F). There is a lot of room in these areas, enough for one large planter, without preventing the flow of people in and out of the space. The large planters will decrease the need for constant watering and decrease the chance of the plant roots freezing in the winter. We also added two trees on either side of the existing planter. These will be dwarf trees as they will be placed in their own planters. From Dr. Willison's suggestion, we have chosen to use Jack pine as our tree species as it is a very hardy species. This will give the space character, without decreasing the amount of natural light that filters into the offices and study spaces. The last change we made to

this space was to redesign the middle area, add in gardens, and reorganize the placement of the chairs and picnic tables. Redesigning the middle area decreased the "fishbowl effect"; this is the feeling that people get inside an enclosed space in which they can be seen from all angles, but cannot see the viewers. To decrease this effect we added six gardens, which would include taller plants and shrubs, and created nooks and pathways for continued use of the area. We did not want to take anything away from the space, so we made sure there was enough room for all of the chairs and picnic tables in the area.

The next step in redesigning the space was to choose which plants should be included (Appendix G). All of the species are native species, but we also took into consideration the second choice of the faculty, staff and students. Therefore many of the plant species are interactive, historically important and serve to aesthetically enhance the area. The areas are divided (2 planters each, except the center area) and have their own specific design scheme (Appendix F).

When planting, it is suggested that mycorrhizal fungi be added to the plant roots. These are microscopic mushrooms found in the wild that attach to plant roots and take some carbohydrates and sugars, but absorb water and nutrients and transfer them to the plant. This will help the plants become established, be less susceptible to disease, and become more drought resistant. Another essential point in setting up the garden is for drainage holes to be placed on the sides of the planters near the bottom. This will ensure proper drainage, but the number of holes will depend on the plant preferences.

Soil depth and the weight load of the courtyard need to be addressed before planting begins. Due to time constraints our group did not have time to address these issues; however they are essential to the implementation of this project.

CONCLUSION

The large positive response toward this project indicates that the social environment on the Dalhousie campus is ideal for this type of project. We have determined that our project is feasible given the space, native species selection and landscaping plan, yet there are some barriers to implementation beyond the scope and time restraints of our project.

Limitations and barriers to implementation seem possible to overcome with planning and collaboration between departments and Dalhousie community members. Mike Murphy and Mike Wilkainson of Facilities Management mentioned the budget as being a concern and limitation in addition to the few available grounds keeping staff. Suggestions and ideas for overcoming have generally included the incorporation of existing groups or societies at Dal, various science departments and student volunteers. This approach would ensure that it truly remains a campus project for the Dalhousie community.

To further the development of our project we recognize the need to consult with Dalhousie Science and Planning faculties and for our proposal to be evaluated by landscapers for review and recommendations. The blueprints for the McCain building are necessary to provide assurance of structural conditions and the potential for change in weight and water absorption on what is essentially the parkade roof. We also recommend further research for a detailed analysis of the current condition of the courtyard including soil testing and the soil temperature during the winter months factoring in the cement and parkade underneath the soil.

Approaching this project from another angle, it has also been recommended that we initially use the space experimentally to discover which species thrive and compliment each other as well as meeting the needs and preferences of the space users. We think this is an excellent idea because the space within the McCain is surrounded in a way that could change the climate beyond the range of the Nova Scotia climate for the native species selected.

Because 81% of students and a large portion of faculty surveyed said they would spend more time in the space if it were diversified, it seems that our project has the potential to add a valued feature to the Dalhousie campus. Current Dalhousie students would benefit from an enhanced, more enjoyable space and new students touring the campus would be in for a pleasant, oasis-like surprise upon entering the McCain building. Greening the McCain courtyard would not only contribute to the Greening the Campus movement, but provide students with a natural, peaceful retreat from the rigors of university life, and continue to attract new students to one of Canada's most beautiful campuses.

REFERENCES

1. M'Gonigle, Michael and Justine Starke. *Planet U - Sustaining the World, Reinventing the University.* Gabriola Island, BC: New Society Publishers. 7-8 (2006)

2. Archibald, Carl, et al. 2004. Indigenous Flora on Campus: A Feasibility Study. Retrieved from: http://environmental.science.dal.ca/Files/Environmental%20Programs/indigenous.pdf

3. Chown, Marnie, et al. 2006. Sustainable Grounds Management at Dalhousie University: A Community Approach. Retrieved from: http://environmental.science.dal.ca/Files/Environmental%20Programs/LandProject.pdf

4. Copley, Kevin, et al. 2007. Higher Learning - Greening the Kenneth Rowe Roof. Retrieved from: http://environmental.science.dal.ca/Files/Environmental%20Programs/greenroofproject.pdf

5. Evans, Gary W. *The Built Environment and Mental Health* Journal of Urban Health: Bulletin of the New York Academy of Medicine Vol. 80, No. 4, December 2003, p. 536, 541, 545.

6. Frumkin, Howard. *Healthy places: Exploring the evidence*. American Journal of Public Health; Sep 2003;93,9; ABI/INFORM Global. p.1452

7. Wong, N.H. and Steve Kardinal Jusuf, Aung Aung La Win, Htun Kyaw Thu, To Syatia Negara, Wu Xuchao. *Environmental study of the impact of greenery in an institutional campus in the tropics* Building and Environment 42 (2007) 2949-2970

8. *Wikipedia*. Report cover columbine image retrieved from: www.wikipedia.org.

PROPOSAL REFERENCES

Forrest, Mary. *Landscape Trees and Shrubs: Selection Use and Management.* Massachusetts, USA. CABI (2006).

Hodgson, Larry. *Making the Most of Shade: How to Plan, Plant and Grow a Fabulous Garden That Lightens Up the Shadows.* USA: Holtzbrinck Publishers (2005).

Johnson, Lorraine. *100 Easy to Grow Native Plants for Canadian Gardens*. Vancouver, Toronto: Whitecap (2005).

Roth, Susan. *The Four Season Landscape: Easy-Care Plants and Plans for Year-Round Color.* Pennsylvania, USA: Rodale Press (1994).

Connecticut Botanical Society. *Gallery of Connecticut Wildflowers*. Retrieved from: http://www.ct-botanical-society.org/galleries/galleryindex.html

Native Plants. *Lowbush Blueberry.* American Beauties. Retrieved from: http://www.abnativeplants.com/index.cfm?fuseaction=plants.plantDetail&plant_id=17

Natural Resources Conservation Service. *Plants Database.* USDA. Updated: 2008. Retrieved from http://plants.usda.gov/index.html

Plant of the Week: Christmas Fern. University of Arkansas: Division of Agriculture. Updated: 02/28/2006. Retrieved from: http://www.arhomeandgarden.org/plantoftheweek/articles/Christmas_Fern.htm

PlantWatch new Brunswick Species. PlantWatch. Retrieved from: http://ca.geocities.com/nbwilderness/species.html

Wikipedia. Retrieved from: www.wikipedia.org.

Wild about Gardening: Plant Encyclopedia. Canadian Wildlife Federation (2007). Retrieved from: http://www.wildaboutgardening.org/

APPENDICES

Appendix A: Copy of questionnaire delivered to students.

Student Questionnaire

Program and Program Year: _____

2) During the school week, on average how often do you frequent the McCain building?

a) Daily
b) 4 days a week
b) 3 days a week
c) 2 days a week
d) Once a week
e) Less then once a week

3) What is your primary purpose for being in the Mc Cain building?

a) Classes
b) Office work
c) homework / Study space
d) Leisure activities
e) Other: _____

4) Have you ever used the outdoor-courtyard?

a) never
b) a few times (less than 5)
c) weekly

5) If you do use the courtyard, what is the primary reason you use that space?

a) Work / Study
b) Leisure
c) Eat
d) Other: _____

5) If you don't use the courtyard, why not?

a) Only on campus for classes
b) The space is unappealing
c) Have a preferred spot to spend time
d) Other: _____

6) If the space was diversified in terms of plants and vegetation, would you be more likely to spend time in the courtyard

a) Yes b) No

7) If plants were used to diversify the space would you have a preference?

a) Yes b) No

8) If you responded **Yes** to question 7, list your preference below from 1 to 4 (1= most desirable choice, 4 = least desirable choice):

____ Ornamental plants suitable to the space

Examples: Marigolds, Hostas, Impatiens, Pansies and other flowers and plants typically found in local nurseries, on campus grounds and in campus flower beds

____ Native Species (Plants Indigenous to Nova Scotia)

Examples: Wild Roses, Violets, Buttercups, Ferns, Lupines and other plants and wild flowers that are original to the Nova Scotian landscape.

____ 'Interactive' Native Species (i.e. Plants available for users of the space to consume and/or utilize while in the space. Examples may include but are not limited to fruit plants, herbs, vegetables, etc.)

Examples: Raspberry, Wild Strawberry, Wintergreen and other commonly used plants that are original to the Nova Scotian landscape

____ Well adapted 'Interactive' Species (i.e. Plants that can be consumed and/or utilized but are not necessarily native to Nova Scotia. This could include different varieties of well adapted garden plants.)

Examples: Cherry-Tomatoes plants, Strawberry Plants, Cucumbers, Mint and other plants commonly found growing throughout Nova Scotia

9) Do you feel that it would be beneficial to have an educational component present in the space regarding the plants (i.e. plant names, origins, uses, etc)?

1 - 2 – 3 – 4 – 5 - 6

Strongly disagree Strongly agree

10) Regarding the diversification of vegetation in Mc Cain courtyard, would you consider yourself:

a) Indifferent
b) In favour
c) Against

Appendix B: Copy of questionnaire delivered to faculty and staff.

Faculty: _____

Years spent in the McCain Building: _____

1) Where is the majority of your time on campus spent?

   a) The Mc Cain Building
   b) Elsewhere

2) During the warmer weather do you use the outdoor-courtyard?

   a) Yes b) No

   i) if yes, on average how many times a week do you use the courtyard?

   ---

   ii) and what is the primary reason you use the outdoor-courtyard?

   a) Work / Study
   b) Leisure
   c) Eat
   d) Other: _____

3) If you responded **No** in question 2, what is the primary reason why you don't use the courtyard?

   a) on campus for short period of time
   b) The space is unappealing
   c) Have a preferred place to spend time
   d) Other: _____

4) Would you like to see more vegetation and a greater diversity of plants in the courtyard?

   a) Yes
   b) No
   c) Indifferent

5) Would you be more likely to spend time in the quad if the space was diversified in terms of plants and vegetation?

   a) Yes
   b) Possibly
   c) No

6) If plants were used to diversify the space would you have a preference as to which types were used?

   Yes / No

7) If you responded **Yes** to question 6, list your preference below from 1 to 4 (1= most desirable choice, 4 = least desirable choice):

____ Ornamental plants suitable to the space
Examples: Marigolds, Hostas, Impatiens, Pansies and other flowers and plants typically found in local nurseries, on campus grounds and in campus flower beds

____ Native Species (Plants Indigenous to Nova Scotia)
Examples: Wild Roses, Violets, Buttercups, Ferns, Lupines and other plants and wild flowers that are original to the Nova Scotian landscape.

____ 'Interactive' Native Species (i.e. Plants available for users of the space to consume and/or utilize while in the space. Examples may include but are not limited to fruit plants, herbs, vegetables, etc.)
Examples: Raspberry, Wild Strawberry, Wintergreen and other commonly used plants that are original to the Nova Scotian landscape

____ Well adapted 'Interactive' Species (i.e. Plants that can be consumed and/or used but are not necessarily native to Nova Scotia. This could include different varieties of well adapted garden plants.)
Examples: Cherry-Tomatoes plants, Strawberry Plants, Cucumbers, Mint and other plants commonly found growing throughout Nova Scotia

8) Do you feel that it would be beneficial to have an educational component present in the space regarding the plants (i.e. plant names, origins, uses, etc)?

a) Yes b) No

9) Regarding the diversification of the in Mc Cain courtyard, would you consider yourself:

a) In favour
b) Indifferent
c) Against

10) Would you be interested in participating in the planning process of the Diversification of the McCain courtyard?

a) Yes b) No

11) Do you think your faculty would be interested in helping to increase and diversify the vegetation found within the McCain outdoor-courtyard?

a) Possibly b) Completely Unsure c) Not likely

Appendix C: Supplementary information on project provided to students, faculty, and/or staff upon request, following completion of questionnaire.

Diversifying the McCain Open-Air Courtyard

The purpose of this project is to work on greening some aspect of Dalhousie and our group has taken this very literally. We propose to diversify the vegetation in the McCain courtyard, so as to promote interaction by faculty and staff; this diversification will focus on integrating native species into the campus. One reason why we chose the McCain building is because even though it is primarily an arts building, other departments use the two lecture halls on the ground floor, and various classrooms. Another reason we chose the McCain courtyard is that it has specific boundaries and the space is not too large.

Universities are places for discovery and discussion about many issues, which can lead to novel and innovative solutions. In ENVS 3502, the class project is to assemble data about some aspect of the university related to sustainability and create novel solutions. Many of these projects are information gathering, as the class is only one term, but this information and any practical solutions should be attempted with the help of the university, if they are feasible. Our goal for this project is to incorporate the data from the interviews and the questionnaires into a plan for the McCain courtyard. This plan will focus on an integrated natural landscape.

The results of our project can be found at the following website, after April 8th, 2008:

http://environmental.science.dal.ca/Research/ENVS%203502%20-%20Past%20projects/index.php

Appendix D: Copy of consent form presented to those participating in face-to-face interviews with student researchers.

_____, 2008

To Whom It May Concern,

My name is _____ and this term I am taking Environmental Problem Solving II. Part of the curriculum includes a group research project. My group's project pertains to diversifying the vegetation found in the open-air courtyard of the McCain building. We are distributing questionnaires and completing interviews to see what is feasible for the area, and to find out what students and faculty would like to see incorporated into the space. The information we gather will be used to produce a detailed plan for the courtyard. Anonymity cannot be guaranteed for interview participants, but if you wish, we can send you a copy of our final report for your approval - prior to submission. Hopefully our project will aid in educating the Dalhousie community and increasing environmental awareness.

Sincerely,

_____

I have read the above document, and agree to participate in an interview for research purposes.

_____ _____

Signature Date

Appendix E: List of general questions used during face-to-face interviews
Interview location - McCain common area
* Remember to thank the interviewee for participation.

1. Do I have your permission to record this interview for later use in data analysis?

2. What is your affiliation with Dalhousie University? How long have you been affiliated with the university?

3. Do you sense an increase in a sustainable initiative on campus? This could pertain to student groups, purchasing choices, landscaping choices.

4. Are you familiar with the open-air quad in the McCain Building?

5. What is your opinion of this common area?

6. At present do you believe that the space is being used to its best potential?

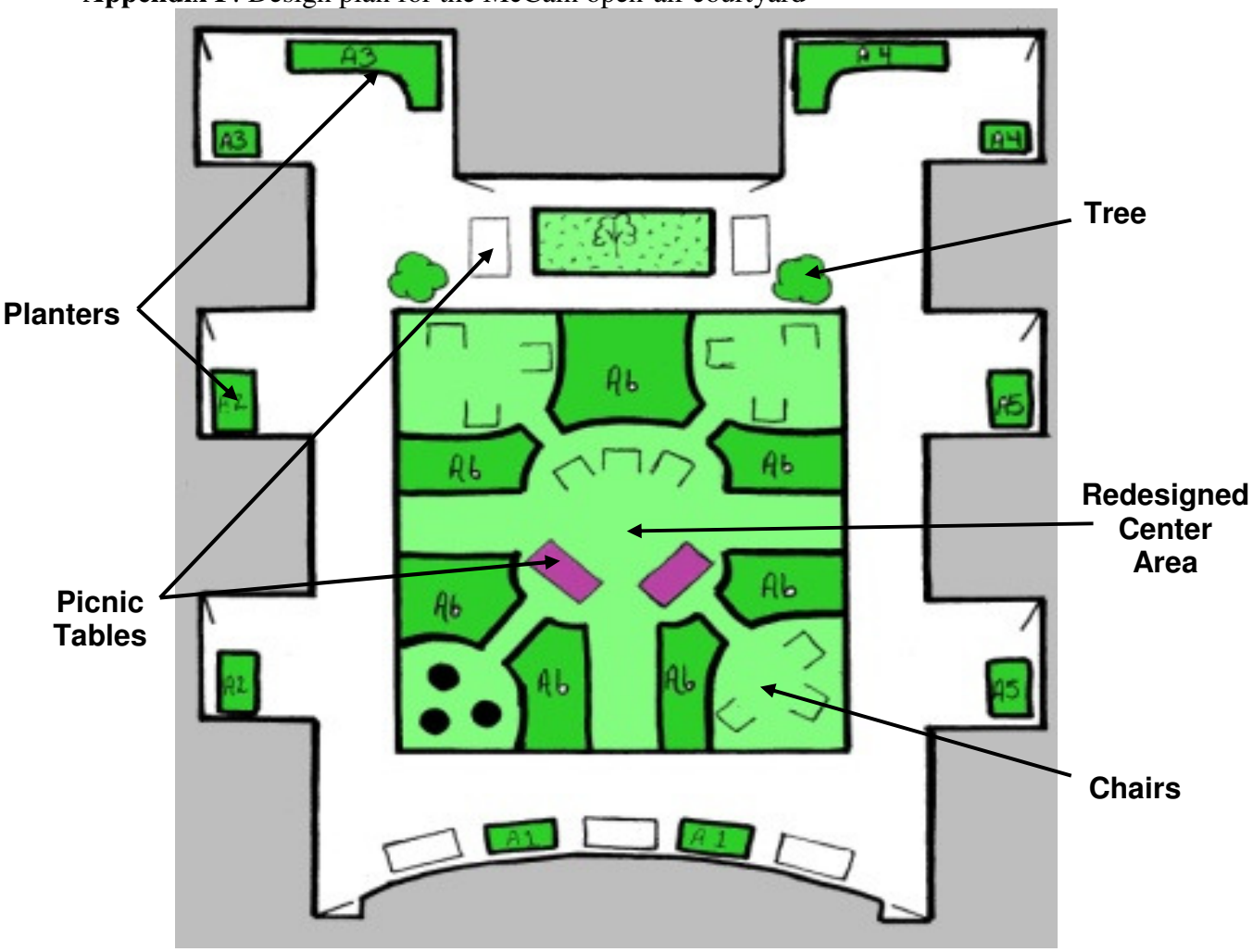
7. How important do you think it is for campus spaces to have vegetative elements? This could include potted plants, planters and landscaping.

8. Do you think that the McCain quad is landscaped to its full potential?

9. What do think members of the Dalhousie community would like to see added to the McCain quad? Would it be beneficial to add native plants that tend to be less water-depletive? Would it be beneficial to include plants that people could interact with - such as herbs and tomato plants?

10. Do you have any other comments on Dalhousie University's landscaping?

Appendix F: Design plan for the McCain open-air courtyard



Appendix G: Suggested Native Plants for the McCain Courtyard

Full Shade	Plant	BP	Write Up
Area 1 (Nightshade garden)	Bunchberry (*Cornus canadenis*)	sp to sum	Low growing plant with small white flowers and red berries (fall); Can be eaten, also food for birds and mammals, butterfly larval plant; moist soil preference; 15cm; plants are self-sterile so do not use clones
	Starflower (*Trientalis borealis*)	sp	Low growing plant with small white/pink flowers; sun to p. shade preference; 10 to 20cm; dry to moist soil preference
	Dutchman's breeches (*Dicentra cucullaria*)	sp	Attracts pollinators; partial shade; 15 - 25 cm; moist soil preference; ensure not wild collected
	Christmas fern (*Polystichum acrostichoides*)	N/A	Evergreen, medium height (30-45am), full shade preference and non-flowering; moist, though drought resistant once established

Partial Shade	Plant	BP	Write Up
Area 2 (Herb /medicinal garden)	Wild ginger (*Asarum canadense*)	late sp	Ground cover with maroon flower; attracts pollinators; drought tolerant, but prefers moist soil; deciduous; susceptible to slugs and snails; ensure not wild collected
	Chives (*Allium schoenoprasum*)	sp	Commonly used for food; attracts pollinators; prefers well drained soil; 30 - 60 cm
	Sweet cicely (*Osmorhiza claytonia*)	sp to su	Sun; moist, well drained areas; strong licorice odour and flavour, root can be used as a sweetener
	Yarrow (*Achillea millefolium*)	su	White flowers; well-drained soil; drought tolerant; Uses: (flowers/infusion) various allergic mucus problems (eg. Hay fever), helps circulatory, digestive, and urinary systems
Partial Shade	Plant	BP	Write Up
Area 3 (Wild berry garden)	low bush blueberry (*Vaccinium angustifolium*)	sp	Food for birds and mammals; sun or shade; prefers moist to well drained soils; 60cm
	Blackberry (*Rubus allegheniensis*)	sp	Food and shelter for birds and mammals; winter food source; attracts pollinators; sun; prefers dry soils; 1 to 2 meters; Use: edible
	Strawberry (*Fragaria virginiana*)	sp to su	Food for birds and mammals; attracts pollinators; sun to partial shade; dry or moist soils; 7 to 15 cm; aggressive spreader
Partial Shade	Plant	BP	Write Up
Area 4 (Cutting garden)	Columbine (*Aquilegia canadensis*)	sp to su	Red/yellow flowers; attracts hummingbirds and pollinators; 30 cm; sun to p. shade; do not eat (can be toxic); no soil preference
	Blue eyed grass (*Sisyrinchium angustifolium*)	sp to su	Blue flowers; attracts pollinators; prefers moist soils, but resistant to drought; sun; 20-30 cm
	Violets (*Viola spp*)	sp to su	Purple/blue flowers; Food for birds and mammals; requirements vary with species: suggest *Viola labradorica* (p. shade, dry/ moist); Uses: leaves and petals can be eaten, suitable for teas and medicinal purposes
	Blue bead lily (*Clintonia borealis*)	sp to su	Food for mammals (young leaves); prominent blue berries (mildly toxic to humans); p. shade; moist soils

Full Sun	Plant	BP	Write Up
Area 5 (center garden)	Indian pear (*Amelanchier canadensis*)	sp	Food for birds and mammals (dark purple/ black berries); showy white flowers; fall colour yellow/red; sun or shade; moist
	Rhodora (*Rhododendron canadense*)	sp	Attracts pollinators; pink flowers; sun to p. shade; can be toxic
	Bayberry (*Myrica pennsylvanica*)	sp	Food for birds and mammals; sun to p. shade; dry soil; Uses: leaves as condiment/spice/tea; evergreen; 1.5m
	Sundrops (*Oenothera fruticosa*)	sp to su	Yellow flowers; long blooming; attracts pollinators; sun; dry or moist soil; drought tolerant; 30 to 90cm
	Blue flag iris (*Iris versicolor*)	sp to su	Blue/purple flower; bulb; attracts pollinators and hummingbirds; sun to p. shade; can be toxic; ensure not wild collected
	Red osier dogwood (*Cornus sericea*)	sp to su	White flowers; food for birds, mammals, winter food source and attracts pollinators; sun or shade; moist soil
	Witherod (*Viburnum cassinoides*)	sum	Shrub; food for birds and mammals; sun or p. shade; dry or moist soil; 2m
	Bellflower (*Campanula rotundifolia*)	su to fl	Blue flowers; attracts hummingbirds and pollinators; sun or p. shade; dry to moist soil; 15-45cm
	Turtlehead (*Chelone glabra*)	su to fl	Attracts pollinators, butterfly larval plant; white flowers; sun to p .shade; moist to wet soil; 60-120cm
	Joe Pye weed (*Eupatorium maculatum*)	su to fl	Pink flowers; attracts pollinators; sun; moist soil; aggressive spreader; 1 to 2m
Trees	Jack Pine (*Pinus banksiana*) or	N/A	Evergreen; very hardy and resistant to drought; sun; dry soil; interesting life cycle; important in literary and artwork
	White pine (*Pinus strobus*)	N/A	Evergreen; sun; dry to moist soil; attracts bats; aesthetically pleasing in winter; Native American history; needles high in vitamin C

*BP = blooming period su = summer sp = spring fl = fall

Extra Plants:

Sun to partial shade areas:

- *Canada anemone (*Anemone canadensis*, full sun/partial shade, BP: late sp – su, poisonous, once established are hardy, moist or average soil, white flowers, 30-60cm, plant with Blue flag iris)
- Cranberry (*Viburnum trilobum*, sun, acidic soil, BP: spring)
- Wild onion (*Allium cernuum* or *canadense*, full sun to p. shade, moist/dry soil, drought tolerant, 30-60cm, BP: mid-summer, Use: edible bulbs)
- Twinflower (*Linnaea borealis*, groundcover, white/pinkish flowers, sun to p. shade, moist/average soil, BP: sp to su, 10cm, attracts hummingbirds)
- Labrador tea (*Ledum groenlandicum*, low evergreen shrub; sun; wet soil; Use: steep leaves in water for tea; found in *peaty habitats*, BP: summer, 60- 120cm)
- Canada lily (*Lilium canadense*, bulb, orange – yellow flowers, attaracts pollinators and hummingbirds, partial shade, moist, BP: summer, 60 - 150cm)
- Obedient plant (*Physostegia virginiana,* pink flowers, attracts hummingbirds and pollinators, sun - partial shade, moist soil, BP: summer to fall, 30 - 120 cm)
- Winterberry (*Ilex verticillata*, deciduous, sun - partial shade, moist soil, 1.8 m, gorgeous red berries in the winter)
- Canada wild rye (*Elymus Canadensis*, grass, food for birds and mammals, shelter, sun, dry – moist, drought tolerant, BP: summer, 90 - 150 cm)
- Summersweet (*Clethra alnifolia*, shrub, pink or white flowers, yellow fall foliage, sun or shade, moist soil, BP: late summer, 2-3m, **species at risk**)

Partial to full shade areas:

- Spring beauty (*Claytonia virginica*, white/pink flowers, p. shade, moist, BP: early spring, 15cm; plant with violets and anemone)
- Wood poppy (*Stylophorum diphyllum*, yellow flowers, shade to p. shade, average to moist soil, BP: spring, 30-45cm)
- Zig Zag Goldenrod (*Solidago flexicaulis*, small yellow flowers, average to dry soil, full shade, BP: late su to fl, 30-90cm)
- Wintergreen (*Gaultheria procumbens,* shade, BP: sp-su)
- Touch me nots (*Impatiens capensis*, partial shade, BP: su to fl)
- False Solomon's seal (*Smilacina racemosa*, p. shade to full shade, dry to moist, acidic to neutral soils, white flowers, red berries, BP: sp)
- Witch hazel *(Hamamelis virginiana*)- shrub, autumn foliage, flowers (yellow) in fall, spring, partial to full shade , moist soil, 5m
- Canada yew (*Taxus Canadensis*, evergreen, partial shade to full shade, moist soils, 1' to 3' tall)

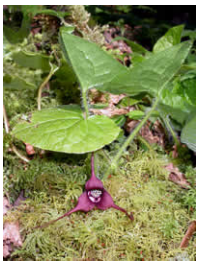
Appendix H: Photographic selection of plant species suggested in the proposed design


Bunchberry

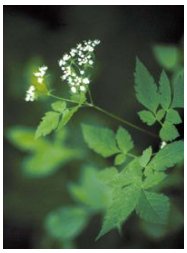

Starflower


Christmas fern


Dutchman's Breeches


Wild Ginger


Yarrow


Sweet Cicely


Chives

Woodland Strawberry


Lowbush blueberry


Blackberry


Blue-bead Lily


Blue-eyed Grass


Wild Columbine


Labrador Violet


Rhodora


Turtlehead


Blue flag iris


Red Osier Dogwood


Indian Pear


Bellflower


Bayberry


Sundrops

Appendix I: Rough cost analysis for material costs of plan implementation

Large Planters:	Construction materials for six 5”x2”x2” planters and two 6”x1.5”x4”x2”x2” L-shape planters	$679.35
Square Pots/Planters:	Four 16in x24in Pine Terrace Planters (Orosz outdoors)	$206.98
Soil:	Rough estimate based on last year’s pricing	$270.00
Compost:	Rough estimate based on last year’s pricing	$117.00
Plants:	Maximum price while accounting for initial survival rate	$500.00
Markers (signage)	Twenty two stakes and plates	$331.98

Total Materials Cost ≈ **$ 2105.31**

***N.B.:** This cost analysis was adapted to increase accuracy from what was presented on April 1, 2008 and does not include shipping costs or taxes.