

**Dalhousie University Green Map:  
Improving Ecological Literacy through Community Mapping**  
Alana-Dawn Eirikson <sup>a</sup>, Aaron Wood <sup>b</sup>, Rajitha (Ebony) Wickramanayake <sup>c</sup>

<sup>a</sup> International Development Studies, Dalhousie University

<sup>b</sup> Environmental Science, Dalhousie University

<sup>c</sup> Marine Biology, Dalhousie University (*corresponding author*: ebonywicks@dal.ca)

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## ABSTRACT

Improving ecological literacy may be the only method by which one can empower a community and allow a society to create a deeper connection with the environment. Green maps, or community maps, have developed in the past decade as a tool to inform and educate, and improve community spirit. Consequently, there are now 225 green map projects in 38 countries under the Green Map System, an international organization committed to increasing awareness of natural and cultural phenomena in one's community. Based on the success of these global projects, an exploratory study was designed to collect data concerning green initiatives and sustainable practices on Dalhousie's Studley Campus in order to develop a green map. The use of Geographic Information Systems (GIS) technology was used to create a map that could be easily updated or replicated. The map was created from planometric data of Halifax provided by the Killam Map Library as well as a CAD drawing developed by Facilities Management. Standard icons from the Green Map System were used to represent the phenomena discovered through interactive interviews and walk-throughs of buildings and campus pathways. GPS units were also used to collect geographically referenced data points for recycling bins and bike racks. The map was finally published using Adobe Illustrator CS and presented in a brochure format.

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## INTRODUCTION

The unavailability of clear and accessible information regarding environmental initiatives and sustainable practices at Dalhousie University contributes to an ecologically illiterate community. This deficit in community information fails to promote the importance of understanding environmental issues and how human actions impact the environment. People are therefore unable to learn about the natural community that surrounds them and about environmental issues that inherently affect their lives. Ecological literacy is also fundamental in order for people partaking in green initiatives and sustainable practices to gain support and recognition for their efforts.

In order to rise above apathy towards environmental issues, it is necessary to educate the public and allow them to realize the impacts their individual actions have. The understanding of causes and effects can alter how people perceive environmental problems in the context of their lives and consequently initiate change of behavior (Hsu, 2004). Thus, community mapping was born as a teaching tool for sustainable development.

The process of mapmaking has been one of the most powerful visual tools in recorded human history. Not only do maps provide aids to navigation, they chart natural resources that are capable of being exploited (Lydon, 2000). However, in the past decade or so, a grassroots movement has risen across the globe to use maps as the Aborigines originally did, to plot a kinship to the land itself and realize the symbiotic relationship we have with the natural community (Aberley, 1993; Warhus, 1997). A visual depiction of one's natural community assets and features that are to be protected and fostered empowers the community members, and creates a commitment to socio-economic and ecological sustainability (Lydon, 2000). Green maps also mark progress, involve the community, get youth involved, and promote green tourism (Wortman, 2002a). A map that is created by locals, for locals, may be the most effective method of education for sustainable living there exists.

The development of a "green" map of Dalhousie's main campus (Studley) provides the opportunity for the university community, as well as the general public, to learn more about the campus, appreciate green initiatives that are currently in place or in the process of being developed, and become aware of environmental issues. With increased awareness of the current activities and movements towards sustainable change, the opportunity arises to contribute to the environmental community at any level, be it the role of supporter, advocate, activist or conscious

environmental decision maker. The Green Map of Dalhousie campus can be used by everyone – the Dalhousie community, Halifax citizens, and visitors – all those who wish to learn more about Dalhousie University’s role in sustainable development.

Dalhousie University signed the Halifax Declaration in 1991 and the Talloires Declaration in 1999, committing the university to a steady progression towards campus sustainability. The Talloires Declaration 10 Point Action Plan contains several goals pertinent to this project, that being<sup>1</sup>:

1. Increasing awareness of environmentally sustainable development.
2. Creating an institutional culture of sustainability.
3. Educating for environmentally responsible citizenship.
4. Fostering environmental literacy for all.

The Green Map documents Dalhousie’s progression towards fulfilling each of these goals and is a starting point where people can easily and accurately view green initiatives and sustainable practices undertaken at Dalhousie University. This report will fully elaborate on the various stages of development of this map, specifically the identification and cataloguing of data pertaining to this project to the technical aspects of creating a successful cartographic representation for distribution.

*Definition of terms:*

**Green map:** a representation of sustainable activities and green initiatives based on geographic location.

**Dalhousie (Studley) campus:** limited to buildings that are owned by Dalhousie University and bounded by Coburg Road, Robie Street, South Street, and Oxford Street, including the area containing Dalplex (see Appendix C).

**Green initiatives:** any activity that works towards positive environmental change as outlined in the Talloires Declaration 10 Point Action Plan (see Appendix A).

**Sustainable activities:** projects that promote long-term environmentally-friendly services as outlined in the Action Plan for Universities of the Halifax Declaration, signed in 1991<sup>2</sup> (see Appendix B).

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<sup>1</sup> The Tallories Declaration: <http://www.ulsf.org/pdf/TD.pdf>; see Appendix B for full document.

<sup>2</sup> The Halifax Declaration: [http://www.senate.dal.ca/policy\\_d.cfm?id=1546](http://www.senate.dal.ca/policy_d.cfm?id=1546); Action Plan, see Appendix B.

**Ecological literacy:** “a profound understanding of the natural world, grounded in direct experience, that leads to sustainable patterns of living.”<sup>3</sup> This will be measured by awareness and knowledge of the previously defined green initiatives and sustainable activities on the Studley campus.

## METHODOLOGY

An exploratory study was conducted to fulfill two objectives: (a) to determine what previous work was done on a global level by reviewing literature and exploring different project methodologies, as well as (b) to carry out several modes of data collection to compile information pertaining to green initiatives and sustainable activities on Studley campus as defined for this project. The collection of these data involved using interview procedures and carrying out inventory of publicly displayed phenomena.

The limitations of this study included the lack of time to carry out this project, the small number of people in the group, the inability to interview every single person who may have some knowledge of the phenomena of interest and being unable to fully explore the capabilities of the selected GIS software within the time frame. This project was delimited by choosing to selectively cover only Studley campus, and to portray only the green initiatives and sustainable practices that have an official icon designated by the Green Map System.

### *Literature Review*

The first Green Map to be officially produced was that of New York City, now called the “Green Apple Map”, in 1992 (Wortman, 2002b). The brainchild of eco-designer, Wendy Brawer, instigated a whirlwind movement globally that has now resulted in 225 local green mapmaking projects in 38 countries (Brawer, 2003). This has resulted in the creation of the Green Map System, a website that encourages the production of locally-driven green maps with guidelines and past experiences to draw from.<sup>4</sup> There also exists a Green Map Atlas, which details stories from around the world concerning the creation of their green maps and what methods were used to do so<sup>5</sup>. Karen de Seve (1995), among others, elaborates that a green map should begin with walk-throughs, where notes are compiled about important areas of interest. Icons are created by

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<sup>3</sup> Center for EcoLiteracy Mission Statement: <http://www.ecoliteracy.org/pages/ourmission.html>

<sup>4</sup> Green Map System: <http://www.greenmap.org>

<sup>5</sup> Green Map Atlas: <http://www.greenatlas.org>

the mapmaker, or obtained online on the Green Map System's website<sup>6</sup>. Finally, if resources exist, the map is expanded through the use of Geographic Information Systems (GIS) technology<sup>7</sup>.

There are several types of green maps; each with different aspects depending on the goals of the mapmakers. Some focus on the flora or fauna of the area, others promote tourism or encourage sustainable planning (Knack, 2001). Few green maps convey the negative features of an area, such as sources of pollution or toxic sites, although the option exists (Jerrad, 2005). One of the many goals of green maps is to bring attention to the various environmental projects that are ongoing in the community; projects that might have otherwise gone unnoticed (Knack, 2001). A recent trend is to involve schools in these projects, in order to make students participate in the community they are growing up in (Wortman, 2002a).

One of the major accomplishments of the Green Map System is involving as many international participants as possible; there exist maps from almost every continent on this Earth<sup>8</sup>. There have also been projects by several universities in North America to create green maps of their campuses. The maps that have been publicly published from Canadian Universities include those from the University of British Columbia<sup>9</sup>, McGill University<sup>10</sup>, University of Victoria<sup>11</sup>, among others.

These universities serve as role models for the surrounding communities, and offer different examples on how to create a green map that conveys the necessary information. These projects also provide validity, both external and catalytic, to this green map, since others have been successful in increasing ecological literacy through these endeavors. Some informal correspondence with participants of these projects was made, particularly Wendy Brawer, of the Green Map System, and Dan Earle, co-coordinator of the green map project in Yarmouth in order to gain some insight from their experiences.

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<sup>6</sup> Green Map icons: <http://www.greenmap.com/home/icons.html>

<sup>7</sup> Green Mapmaking Links: <http://www.greenmap.com/howto/links.html>

<sup>8</sup> Maps online: <http://www.greenmap.com/grmaps/grindex.html>

<sup>9</sup> UBC Sustainability Office: <http://www.sustain.ubc.ca>; see Appendix D for map.

<sup>10</sup> Eco-Montreal: <http://www.eco-montreal.mcgill.ca/ecomontreal/intro.html>

<sup>11</sup> UVic Geography: [http://office.geog.uvic.ca/dept2/green\\_map.html](http://office.geog.uvic.ca/dept2/green_map.html)

*Data Collection: Interviews*

Candidates for these interviews were selected using non-probabilistic sampling through convenience, purposively, and the snowball method. These methods are especially effective when conducting an exploratory study that relies mainly on qualitative information (Palys, 2003).

The interviewees were intentionally sought out based on either research or being publicly recognized as someone who would possess information that would be applicable to our project; their suitability was gauged mainly through their involvement in an environmental sector on campus or a recommendation given on a previous interview. These interviews were a particularly reliable source of information, because we talked with professionals and experts in their fields about their knowledge and first hand experience regarding green initiatives and sustainable practices. The first two participants also provided us with the additional opportunity to conduct a pilot test in order to determine the effectiveness of our questioning<sup>12</sup>.

Contact was established via email, wherein the person was informed of the project and a request was made to arrange a meeting face-to-face (see Appendix E for email format). Once a time and date was arranged, an interview agenda (see Appendix F) was sent so that the interviewee could be appropriately prepared with information or materials.

The interviews were generally conducted with two researchers present so that one person would be able to continue the conversation while the other took notes. The structure of the interviews was relatively informal; although there was a standard funneling of questions towards specific topics, the questions asked were open-ended and formulated so as to obtain the maximum amount of information. There was no issue of bias during questioning, in fact, in order to gain the information that we needed for this map, the interviewees had to realize our bias towards that type of information. The questions were personalized based on the information provided by the interviewee, however, the modifications evolved from the responses obtained from general inquiries such as:

- (a) Are they aware of any sustainable practices or green initiatives that occur on campus?
- (b) Where are these activities being carried out?
- (c) Who is involved?
- (d) How was the practice developed / maintained?

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<sup>12</sup> Mike Murphy and Dr. Bill Louch

The interview format was appropriate for our project due to its fairly flexible structure and the ability to immediately clarify and elaborate on their responses; similarly, if they had any uncertainties on what type of information was needed, we were able to explain (Palys, 2003). Visual aids could also be provided if necessary (such as icons or examples of green maps; see Appendices G and D respectively).

Following the interviews, we expressed our verbal appreciation for their participation and assured them that they would receive a copy of the green map once it was completed. Over the course of the project, interviews were conducted with Mike Murphy, Manager of Environmental Services for Facilities Management; Dr. Bill Louch, Director of Environmental Health and Safety Services; Peter Howitt, Engineering Department of Facilities Management; Jessica<sup>13</sup>, Dal Wellness, Dr. Martin Willison, School of Environment and Resource Development; Tony Pesklevits, Student President of SRES; and Kaarin Tae, Environmental Programmes.

#### *Data Collection: Inventory*

Data collection was also carried out by conducting inventory of the green initiatives and sustainable practices on Studley campus that were openly visible to the public. The inventory was limited to phenomena that were defined by the official icons of the Green Map System (see Appendix G) in order to maintain test-retest reliability. This included documenting instances such as large recycling/compost bins, bike rack locations, or green spaces. A checklist was devised and used for recording these data (see Appendix H).

## RESULTS









Using GPS, a total of 24 bike racks and 8 recycling bins were documented. Through the process of interviewing various knowledgeable individuals, there were 12 instances where Green Map System icons could be used (see Table 1).

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<sup>13</sup> Last name unknown; member of Dal Wellness Group.















Table 1. Knowledge of green initiatives or sustainable practices obtained through the use of purposive interviews with knowledgeable participants.

Icon	Definition	Location
	Energy Grid	Weldon Law, Central Services Building
	Energy Conserving	Computer Science, FASS, K.C. Rowe, Risley Hall
	Chemical Exchange	Safety Office
	Pollution Monitor	Safety Office
	Ocean Pond	Between LSC and Chemistry
	Community Centre	Women's Centre
	Re-Use Site	Central Services Building
	Community Garden	Near Seymour St.

From the walk-throughs, an inventory of 26 applicable instances of green initiatives or sustainable practices as defined by this study was recorded (see Table 2).

Table 2. Inventory of green initiatives of sustainable practices as obtained through walk-throughs of buildings and pathways on Studley Campus.

Icon	Description	Location
	Green Space	Behind Shireff Hall, Next to Biology wing of LSC, Behind Killam library
	Special Tree	Next to Biology wing of LSC, front of chemistry bldg
	Environmental School	Environmental Programmes, SRES
	Museum	Life Sciences Centre
	Research Labs	Life Sciences Centre, Chemistry Bldg, Dunn Bldg
	Child-Friendly Site	Psychology wing, Dalplex, Child Centre
	Fair-trade Coffee	Life Sciences Centre, Grad House
	Garden	Arts, FASS, Psychology Wing
	Art Spot	Arts Centre
	World Music	Arts Centre
	Recreational Area	In front of Henry Hicks
	Public Transport	Coburd Rd., Robie, Oxford, and South St.

### *Data Display*

Once the data was compiled, it was necessary to determine the best method of display. Although the option of producing a hand-drawn map seemed the most convenient, considerations had to be made concerning the ease of replicating the map. In addition, accuracy would have been compromised in terms of scale. Hence, the use of GIS was preferred.

Geographic Information Systems (GIS) is a type of technology used to analyze data that is spatially/geographically referenced to the earth using a variety of coordinate systems<sup>14</sup>. Maps can then be accessed and manipulated in digital form. One of the more powerful aspects of GIS is the ability to work with layers of information as opposed to an entire map. This allows for a greater range of editing capabilities.

Therefore, the use of GIS to create green maps has various advantages. It is easier to share information, provides excellent structure for organization, and offers user-friendly options for rapid modification. In this case, it is especially beneficial since this green map will be constantly evolving as Dalhousie progresses in the arena of campus sustainability, and using this technology would create a product with a level of reliability that can be easily reproduced. GIS allows us to store the data collected through interviews and walk-throughs in a database which can be conveniently accessed by others. GIS has the ability of combining the strength and organization of that database with graphical features, thus making it simple to keep all the data for a green map efficiently organized and in a single location. Most GIS software, such as ArcGIS, simplifies the layout of the map and can automate the creation of map elements, such as north arrows and scale bars.

### *Creation of the Map*

Two maps were used specifically for the creation of the Studley campus green map. Planometric data of the Halifax Municipality (in the form of a shapefile: sexton\_studley.shp, see Appendix I) was obtained from the Map and Geospatial Information Library<sup>15</sup>, which was developed by the Canadian government in the 1990s<sup>16</sup>. At a scale of 1:1000, the map was extremely detailed and showed the pathways between the buildings; a feature that would be important in our green map. However, due to the fact that it was out of date, a more recent map was needed to provide these updates. A CAD drawing developed by Facilities Management was up to date yet lacked the detail of the Halifax map<sup>17</sup> (see Appendix I).

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<sup>14</sup> ESRI Website – GIS Concepts: <http://www.esri.com/software/arcgis/concepts/overview.html>

<sup>15</sup> Contact curator James Boxall (james.boxall@dal.ca) for GIS related information.

<sup>16</sup> Extract from the 1:10,000 topographic database, Service Nova Scotia and Municipal Affairs, in right of Her Majesty the Queen. (1993-1997) – See Appendix I for map.

<sup>17</sup> Studley Campus, CAD Image. Courtesy of Facilities Management. 25 August 2004.

Both maps were manipulated in ArcMap, where they were modified accordingly in order to isolate the features that we were interested in<sup>18</sup>. The resulting base map was made to resemble the conventional map of Dalhousie (see Appendix J), but with two-dimensional features. This similarity leads to a more user-friendly presentation (MacEacren, 1995; as cited in UBC Green Map).

We registered with the Green Map System in order to obtain permission to use the official Green Map System icons (see Appendix G). The registration fee of 30 USD was waived due to the limited funding available. The organization sent various resources such as green map examples and balloons (with imprinted Green Map icons), as well as digital forms of the icons that could be incorporated into our map via ArcMap.

In order to have a set of data that was geographically accurate using satellite positioning, a Global Positioning System (GPS) unit was used in order to determine the exact locations of the recycling bins and bike racks within Studley campus. Readings were taken from directly above the recycling bin or bike rack and care was taken to avoid large reflective surfaces nearby. Certain points could not be collected due to buildings that obstructed satellite signals or inconvenient satellite placement that limited triangulation capabilities.

The points collected using the GPS unit could be directly imported and placed on the map accurately since they were already geographically referenced to the same coordinate system as that of the map. For the data points not collected by GPS, the points were placed on the map using on-screen digitizing, which merely digitizes a point based on visual placement. Icons were imported into the symbol manager of ArcMap as bitmap files and assigned to each data point accordingly (see Appendix K<sup>19</sup>). Since Dalhousie participates in a Chemical Exchange program that we felt needed to be represented, yet had no icon in the official list, an icon was created using Adobe Illustrator CS.

Considering that green maps are a form of advertising, they have to be visually appealing to the general public, not just a select group of interested parties. Therefore, the decision was made to use imaging software, in this case Adobe Illustrator CS, to upgrade the map to more

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<sup>18</sup> Please contact corresponding author to obtain detailed list of modifications.

<sup>19</sup> These data will be available through Environmental Programmes if interested in carrying this project further.

professional quality. Adobe Illustrator CS was the program of choice since it works with vector art; ArcMap creates vector images<sup>20</sup>.

Once the image was transferred, disjointed lines on the map were fixed and color was added. The layers that were created in ArcMap were preserved to some degree; the buildings, major roads, pathways, and symbols could still be manipulated separately. Text labels were assigned to the appropriate structures in a font that was still legible at a font size of 6 (specifically, Maiandra GD). The color scheme of the map was chosen keeping in mind that printing in color can get quite expensive, and a lot of people will opt to print the map in black and white. The scale bar and the north arrow, which are essential elements to a good cartographic representation, were also imported from ArcMap and rearranged to suit the layout of the map. Finally, the legend was created in Illustrator CS due to design constraints in ArcMap (see Appendix L for final map).

### *Brochure*

We were successful in creating a green map, however, we still needed to put it in a package that was presentable. There were several unique features of Dalhousie that deserved to be mentioned on the green map, yet could not be represented by a simple icon. For example, Dalhousie advocates a scent-free environment and has banned smoking on campus. We also felt that the Ocean Pond, a natural wetland environment on campus created by Dr. Martin Willison also needed to be publicized due to its efforts of education in conservation issues. Therefore, the format of a brochure was chosen, due to the fact that it could easily be printed on a standard 8.5” x 11” page (letter-size), and folded into three sections (see Appendix M).

The cover merely stated the title of the green map, and showed pictures of the recycling bins that were accounted for in the data collection, and the ocean pond, a significant environment on campus. The mid-section merely listed the appropriate credits and affiliations (photos, copyright, class name, etc.) and supplied contact information. Finally, the last panel gave descriptions of the scent-free and smoke-free policies, and elaborated on the Chemical Exchange program as well as the Ocean Pond. The map was printed on the opposite side.

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<sup>20</sup> Vector being defined as images created using points, lines, or polygons that do not fill space.

### *Publishing*

This project focused mainly on the creation of the green map, yet, some consideration had to be made on the potential distribution of this map especially since the goal of this project was to increase ecological literacy. There are currently two options for distribution:

- (1) We print it on 100% post consumer recycled paper in color, double-sided. The Print Centre at the Life Sciences Centre is able to order in the recycled paper, and total costs are approximately 98 cents per pamphlet. Printing should ideally be done on campus to maintain the internal community aspect that the green map is portraying.
- (2) The map should be posted online with the traditional maps of Studley campus. According to web server statistics, 2,479 people accessed the page for the month of January alone<sup>21</sup>. We can assume that this number increases as students begin to scout out the university. This would allow for a wide audience without the issue of paper consumption.

### DISCUSSION

The best way to empower people and make them stewards of environmental sustainability is to educate and to increase awareness of the intricate connection we have with the natural community. One of the ways this can be accomplished is by community mapping. Visual tools have the potential of increasing community pride, and have the ability to show people the consequences of their actions.

To increase ecological literacy at Dalhousie University, a project was designed to develop a green map of Dalhousie's green initiatives and sustainable practices, with hopes that by visually depicting the campus' assets, the university community will be inspired to further its progression towards campus sustainability as promised by signing the Halifax and Talloires Declarations.

The green map was designed in collaboration with the Green Map System. Standard icons were used to represent the instances of green initiatives and sustainable practices which were discovered through interviews and walk-throughs of the buildings and campus areas. The information was collected and compiled using GIS technology. The resulting map was designed into a brochure format using the powerful imaging capabilities of Adobe Illustrator CS. By either printing out these brochures or allowing access to the map via the Dalhousie website, this map

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<sup>21</sup> Personal correspondence with Glen D. Minty, webmaster of Dalhousie University Website.

can be distributed to the members of the Dalhousie community as well as the general public who are interested in Dalhousie's role in sustainable development.

This map is by no means a finished product. The use of GIS was particularly chosen keeping in mind that this project is continually evolving. As the campus progresses, the map will have to be updated accordingly in a reliable fashion. Future groups should establish a more reasonable time frame if they were to recreate this green map, as well as involving more participants in data collection. Perhaps more collaboration with other environmental groups would be beneficial in this aspect. The development of green maps for the Sexton and Carlton campuses of Dalhousie University is also suggested. The GIS portion of this project should also be improved on, insofar as to create a powerful and more interactive database in which to store the data.

The existence of this map may induce several possible reactions. For one, it may have absolutely no effect whatsoever in the workings of the community. A more optimistic view is that the map will act as a chart of progress towards campus sustainability, illustrating areas in need of improvement, as well as glorifying the many achievements. The map may also have the potential of recruiting more students to the university. As environmental issues become more publicized, a university that takes an active role in providing a setting that fosters environmental activism is attractive. Finally, the map may have a more subtle role, in that individuals who peruse the map will become more aware of their surroundings, and start to notice the individual efforts that synergistically make this campus a role model for the rest of society. We hope that this map will be successful in increasing ecological literacy on campus, and helping students truly appreciate the efforts that the university participates in.

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*Appendix A. The Talloires Declaration, adopted by Dalhousie Senate in 1999.*

Policy can also be viewed at: [www.senate.dal.ca/policy\\_d.cfm?id=1548](http://www.senate.dal.ca/policy_d.cfm?id=1548)

### **Declaration**

We, the presidents, rectors, and vice chancellors of universities from all regions of the world are deeply concerned about the unprecedented scale and speed of environmental pollution and degradation, and the depletion of natural resources.

Local, regional, and global air and water pollution; accumulation and distribution of toxic wastes; destruction and depletion of forests, soil, and water; depletion of the ozone layer and emission of "green house" gases threaten the survival of humans and thousands of other living species, the integrity of the earth and its biodiversity, the security of nations, and the heritage of future generations. These environmental changes are caused by inequitable and unsustainable production and consumption patterns that aggravate poverty in many regions of the world.

We believe that urgent actions are needed to address these fundamental problems and reverse the trends. Stabilization of human population, adoption of environmentally sound industrial and agricultural technologies, reforestation, and ecological restoration are crucial elements in creating an equitable and sustainable future for all humankind in harmony with nature.

Universities have a major role in the education, research, policy formation, and information exchange necessary to make these goals possible. Thus, university leaders must initiate and support mobilization of internal and external resources so that their institutions respond to this urgent challenge.

We, therefore, agree to take the following actions:

1. 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. Encourage all universities to engage in education, research, policy formation, and information exchange on population, environment, and development to move toward global sustainability.
3. 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. Create programs to develop the capability of university faculty to teach environmental literacy to all undergraduate, graduate, and professional students.
5. Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.
6. 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. Convene university faculty and administrators with environmental practitioners to develop curricula, research initiatives, operations systems, and outreach activities to support an environmentally sustainable future.
8. Establish partnerships with primary and secondary schools to help develop the capacity for interdisciplinary teaching about population, environment, and sustainable development.
9. Work with national and international organizations to promote a worldwide university effort toward a sustainable future.
10. 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 B. The Halifax Declaration Action Plan for Universities, adopted by Dalhousie Senate in 1991*

The full Action Plan can be found at: [www.iisd.org/educate/declarat/actionpl.htm](http://www.iisd.org/educate/declarat/actionpl.htm)  
Below are the Local/Regional Guidelines.

## **1. LOCAL - REGIONAL FRAMEWORK**

The local-regional framework comprises actions which may be instituted within the university itself, and those which require that the university interact within the geographic region where it is situated.

Within the university itself, the following actions might be considered in the short-term: Unit/focal Point Identification: the first step recommended is to identify a unit or focal point responsible for developing a sustainable development strategy for the university. Minimally the unit/focal point would be an individual: ideally the unit should be a small task group linked clearly to an administrative unit in the university for support purposes. The unit must work comfortably across the university system --so the working style will be important. It should not be a new centre or bureaucratic body: it is simply to be seen as a small task force to help refine and launch these initiatives. The president of the university should work closely with this unit to demonstrate personal commitment to the process.

University Sustainable Development Strategy: It is suggested that within two months of establishment, the sustainable development unit should have completed an initial sustainable development strategy for its particular university (i.e. by March 31, 1992 at the latest). The emphasis should be on actions and results -- not on lengthy papers.

### **Such a strategy could have two time frameworks:**

1. up to June 1992;
2. longer-term. Some longer-term, outputs can/should be started before June, 1992. A more refined strategy can be designed in the later period (e.g. April - August 92).
- 3.
4. **Practical Tasks: It is suggested that, in the initial strategy, a number of clear and operationally practical tasks be identified. For the shorter-term, each university strategy might include the following eight activities:**
5. A meeting between the president and senior management of the university to explain the conference and its outcome and to distribute copies of the key conference papers (including the Halifax Declaration and this follow-up strategy). The group would determine the best approach for follow-up in their particular university. It is suggested this be undertaken in January, 1992. The Board of Governors and also Senate should, it is suggested, be informed of the process underway and the proposed university specific strategy should be tabled at senate, once it is drafted.
6. A meeting between the president and other university presidents within the province/state/region should be arranged to explain the conference outcome to those not represented and to encourage them to endorse the Halifax Declaration and to participate in this process. Some regional mechanisms for follow-up might well occur and should be encouraged. It is suggested this should be undertaken in January 1992. Obviously it can be added to the agenda of routine meetings.
7. Each university represented (and endorsing the Halifax Declaration) might organize at least one substantial public presentation on sustainable development and the challenge represented by UNCED, at which time reference should also be made by the organizers to this process. The focus should be on the challenge and content of sustainable development, not narrowly on the process of UNCED itself. The sessions might include panelists from several disciplines (sciences, law, social sciences, arts). Obviously the more ambitious the event(s) the better -- but since this should not be viewed as a single event, but the start of a

process, it is important to make a beginning. The suggested initial session is before the end of March, 1992, so a maximum number of students can participate.

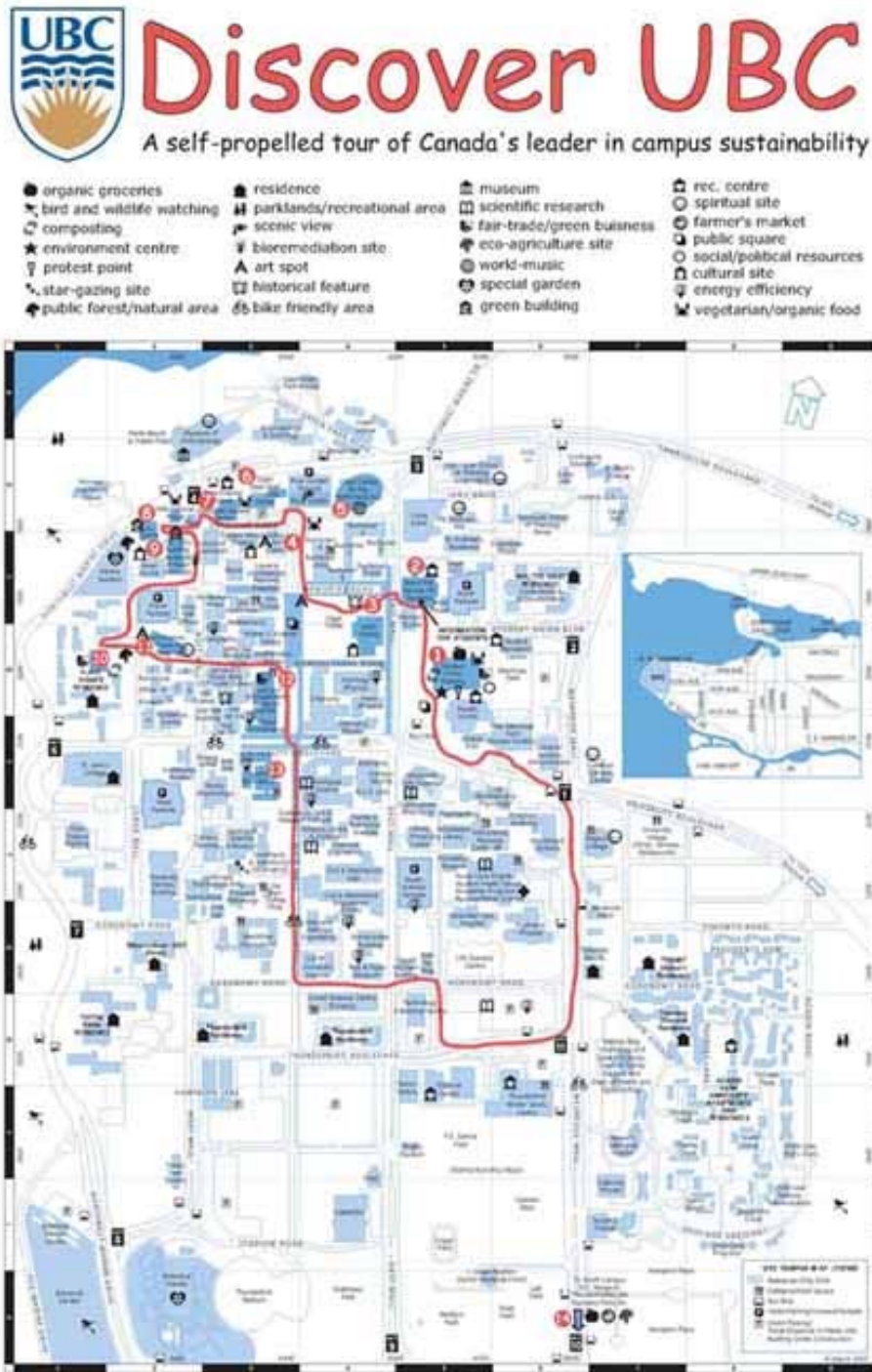
8. Each university might encourage faculty to review their course curricula and also their research agendas to see how sustainable development might best be integrated in and between disciplines. This should not be introduced in a "threatening" way. Special workshops for faculty on sustainable development ideas might be considered as one way of approaching the situation. (To be started before June, 1992.)
  9. Each university might sponsor a series of university prizes in sustainable development, linked to UNCED. They could be for papers contributed by students and also by faculty from any discipline.
  10. Each university might review all university linkage projects to explore how sustainable development elements are being or might be addressed.
  11. Each university might undertake a review of its own "sustainable development" impact on the region, e.g. from recycling paper to "green architecture". This goes beyond a narrow tradition of "environmental audit", to include a proactive dimension.
  12. Each university might participate in a "Sustainable Development Day", linked to UNCED in June, 1992. These eight activities only represent a starting approach. Obviously the sustainable development units in each university might add new activities, drawing from the Recommendations for Follow-Up to this strategy and adding to it also.
13. Within each university in the long term: Proposals for the longer-term are not identified in this strategic plan, but a number of ideas are listed in the Recommendations for Follow-Up. A longer-term strategic plan for sustainable development should be identified as an outcome of the work of the particular university units for sustainable development and their work. A representative task force from these universities could be set up to design the draft for a longer-term strategy to be completed by May 31, 1992 (in advance of UNCED). It could be along the lines of this initial plan, i.e. some eight or so strategic steps, with additional recommendations in an annex that can be routinely enlarged upon as ideas are exchanged within the network of universities. The strategic steps are likely to include curricula and teaching steps, new or reinforced research programmes across disciplines, inter-university linkage arrangements, new approaches with NGOs and governments, etc.
- With respect to the interaction of the university and the local region in the short-term each university might undertake the following:
14. University presidents and representatives from the sustainable development units might meet with the Minister of the Environment of their province to brief the Minister on the process underway. Similar meetings could be held with appropriate representatives of chambers of commerce, NGOs, federal departments, municipal governments. The precise mechanism would vary from province to province; for example, while the initial meeting with the responsible minister would be a special meeting, the other meetings could be through the mechanism of adding the subject to appropriate conferences that are already being organized, at lunch-time speeches that the presidents may already be scheduled to give to Chambers of Commerce, and so on.
  15. Each university might arrange to give a series of talks in schools on sustainable development and UNCED.
  16. Each university might work with the Citizens Support Programme, linked to the Ministry of the Environment and UNCED, in order to contribute ideas and help make it effective.
  17. Each university might meet with local NGOs to see how they can work effectively together for sustainable development (e.g. see the ideas in the Recommendations for Follow-Up re: possibilities in cooperation with the Red Cross).
  18. Each University might meet with representatives of key sectors in the province (e.g. banks, forest industry representatives) to work out ways to cooperate for sustainable development.
  19. Each university might meet with local town/city councils to see how they might cooperate in support of sustainable development.

Appendix C. Dalhousie Campus Map – Studley

PDF File can be obtained at: [www.dal.ca/visit/map](http://www.dal.ca/visit/map)



Appendix D. University of British Columbia Green Map used as an example for interviews



*Appendix E.* Email formats used to establish contact with potential interview participant.

\_\_\_\_*Name of participant*\_\_\_\_,

My name is Alana-Dawn Eirikson and I am a fourth year IDS student at Dal. I am in Tarah Wright's Environmental Problem solving class and our group project is to create a Green Map of Dalhousie Campus. Right now we are in the process of collecting information of green initiatives and sustainable practices that are occurring on Dalhousie campus that we could plot on our map. We would like to set up an interview with you to find out more information on green initiatives or sustainable practices that you are aware of that are occurring on Dalhousie's Studley campus.

Thank you for your time!

Best regards,  
Alana-Dawn Eirikson

---

\_\_\_\_*Name of Participant*\_\_\_\_,

My name is Ebony and I am currently a fourth-year student. As part of a major project for a class in environmental problem solving, we have decided to create a green map of our university campuses (Studley and Carlton).

This green map would essentially plot all instances of sustainable practices (such as recycling and composting) and environmental initiatives (encouraging the use of coffee mugs as opposed to disposable cups).

We are interested in any information you might have that we could use on this map. Would it be possible to arrange an interview so that we may discuss this matter in greater detail?

If you are willing to meet with us, please let me know when you are available.

If you need more information about our project, let me know, and I can elaborate further on our methodology.

Thank you very much!

Regards,

Ebony Wickramanayake  
Student, Dalhousie University  
Supervisor: Dr. Tarah Wright ([tarah.wright@dal.ca](mailto:tarah.wright@dal.ca))

*Appendix F.* Interview preparation material provided if interview was confirmed with participant.

*Statement and Significance of Problem:*

The unavailability of clear and accessible information regarding environmental initiatives and sustainable practices at Dalhousie University contributes to an ecologically illiterate community. This deficit in community information fails to promote the importance of understanding environmental issues and how human actions impact the environment. People are therefore unable to learn about the natural community that surrounds them and about environmental issues that inherently affect their lives.

Our group project is to create a “green” map of Dalhousie’s main campus (Studley). This Green Map will provide the opportunity for the university community, as well as the general public, to learn more about the campus, appreciate green initiatives that are currently in place or in the process of being developed, and become aware of environmental issues. With increased awareness of the current activities and movements towards sustainable change, people then have the opportunity to contribute to their environmental community.

*Definition of terms:*

**Green map:** a representation of sustainable activities and green initiatives based on geographic location.

**Green initiatives:** any activity that works towards positive environmental change as outlined in the Talloires Declaration 10 Point Action Plan.

**Sustainable activities:** projects that promote long-term environmentally-friendly services as outlined in the Action Plan for Universities of the Halifax Declaration, signed in 1991.

**Ecological literacy:** “a profound understanding of the natural world, grounded in direct experience that leads to sustainable patterns of living.”(Center of EcoLiteracy: <http://www.ecoliteracy.org/pages/ourmission.html>). This will be measured by awareness and knowledge of the previously defined green initiatives and sustainable activities on the Studley campus.

*Interview Questions:*

- Are you aware of any sustainable practices or green initiatives that occur on campus?
- Where are these activities being carried out?
- Who is involved?
- How was the practice developed / maintained?


These are the general open ended interview questions. We are also looking for more specific information regarding the infrastructure of buildings on campus. For example do any of the buildings on campus have energy saving technology, or water saving/recycling technology, use Eco-conserving Products (recycled paper), or have wastewater treatment.

[www.greenmap.org](http://www.greenmap.org) is a great web site that has examples of a green map. The Green Map System is an international project that anyone can participate in by creating a green map of their local community. I will bring an example of a green map and green map icons to the interview.









THANK YOU FOR YOUR TIME!!!!

Appendix G. Official icons obtained from Green Map System and used to represent phenomena studied.















## Green Map® System Icons












**Economic Development**

-  Farmers market
-  Eco-agricultural site
-  Organic produce / Natural food
-  Vegetarian / Natural cafe
-  Green business / Service
-  Strictly green store
-  Green / conserving products
-  Fair trade / Social shop















**Culture & Design**

-  Cultural site
-  Museums / Institution
-  Art spot
-  World music
-  Historical feature
-  Traditional way of life
-  Ecodesign / planning feature
-  Eco building
-  Significant building
-  Shanty town / Self-built house
-  Eco design resource
-  Child friendly eco-site
-  Senior friendly site
-  Eco-spiritual site








**Renewable Resources**

-  Solar energy site
-  Wind energy site
-  Renewable technology site
-  Water recycling system
-  Bioremediation site
-  Composting
-  Reuse site
-  Remediated / (cleaned up) site
-  Re-development opportunity site

**Information**

-  Eco-information center
-  Info resources by phone
-  Info resources online
-  Environmental center
-  Environmental school
-  Community center
-  Green tour available
-  Eco-tourist destination
-  Significant organization
-  Social / political resources
-  Alternative health resources
-  Scientific / research site
-  Pollution monitor
-  Protest point

**Infrastructure**

-  Drinking water sources
-  Wastewater treatment plant
-  Recycling
-  Landfills
-  Solid waste transfer station
-  Incinerator
-  Energy grid generating facility

**About Green Map Icons**

This globally designed visual language identifies, promotes and links environmental resources – both natural and cultural – through locally produced Green Maps. A fresh perception of the city is created, and our icons help spread greening initiatives around the world. These award-winning icons are the heart of our eco-info collaboration. See the resulting maps, info on participating and more at our website.

**Green Map® System**  
[greenmap.org](http://greenmap.org)

GREEN MAP SYSTEM ICONS  
 COMPLETE SHARED SET  
 FONT VERSION 2 P.1

Green Map Poster  
 © Green Map System 2003  
 Email: [info@greenmap.org](mailto:info@greenmap.org)

Appendix G (cont'd). Official icons obtained from Green Map System and used to represent phenomena studied.

Green Map System Icons  
Font Version 2 p.2

**Nature:  
Land & Water**

- River and water-front park
- Wetlands
- Water feature
- Climate and currents
- Landform / geological feature
- Open space
- Wilderness site / info
- Camping
- Snow activity
- Great views / Scenic vistas
- Star-gazing site
- Sunset site

**Nature:  
Flora**


- Public forests / Natural area Parklands / Recreation area
- Special tree
- Spring blossoms
- Autumn leaves
- Bamboo forest
- Shaded boulevard
- Bio-regional site / Indigenous plants
- Wildlife corridor / Greenways
- Garden
- Community garden
- Special garden
- Gleaning area/ Fishing

**Nature:  
Fauna**

- Bird and wildlife watching
- Significant habitat
- Coastal habitat
- Marine habitat
- Amphibian habitat
- Insect watching site
- Wildlife info / Rehab center
- Zoo & wildlife center
- Duck pond
- Farm animals
- Dog run
- Fly-over zone

**Mobility**

- Bicycle site
- On road bike paths / Bridges
- Separate bike paths / Bridge
- Secure bike parking
- Wheelchair accessible
- Best walks
- Pedestrian zone
- Public square / Care-free zone
- Boat launch site (sail/human-powered)
- Ferry
- Major public transport stop
- Local transport stop
- Light rail transit
- Park'n'ride facility
- Alternative vehicle / Fuel station
- Park'n'charge facility



Contact

**Green Map System**

Email: [info@greenmap.org](mailto:info@greenmap.org)

Mail: PO Box 249  
New York, NY 10002, USA

Tel: +1 212 674 1631  
Fax: +1 212 674 6206

Website: [greenmap.org](http://greenmap.org)

**Toxic Hot Spots /  
Pollution Sources**

- Blight site
- Danger zone
- Traffic hazard zone
- Noise pollution source
- Air pollution source
- Water pollution source
- Oil and natural gas facility
- Oil spill
- Underground storage tank
- Officially listed contaminated site
- Toxic chemicals storage
- Toxic chemicals release
- Hazardous waste generator
- Hazardous waste facility
- Waste dump
- Mining site
- Nuclear facility and waste site

**Miscellaneous**

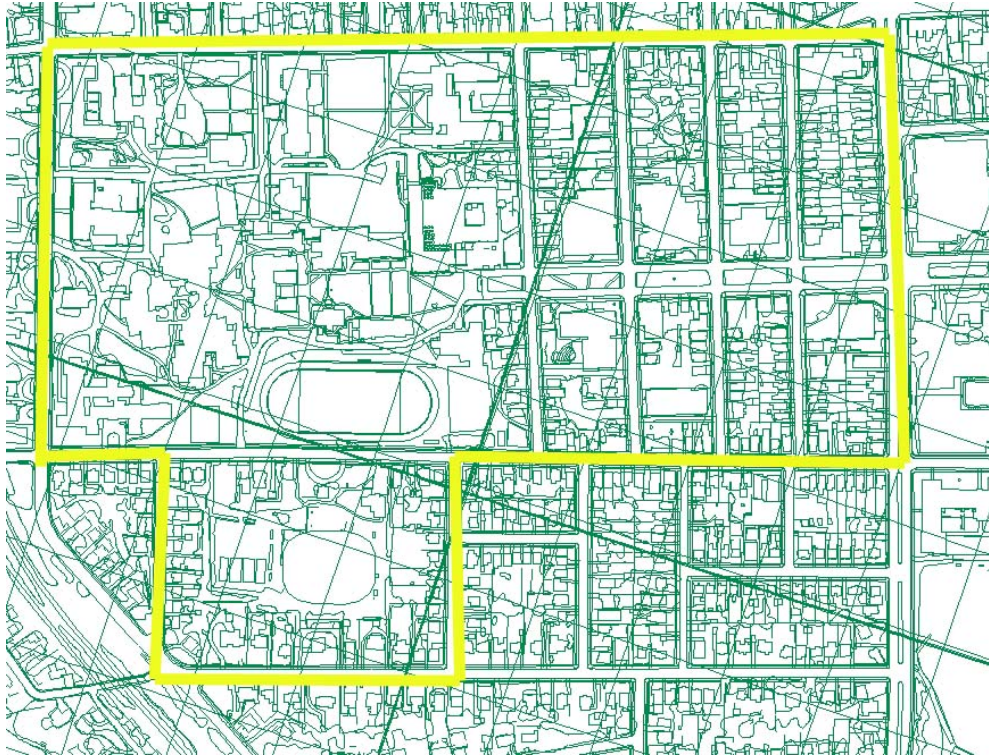
- Call first / Appointment needed
- Green Maps available here
- Special or supporters' site



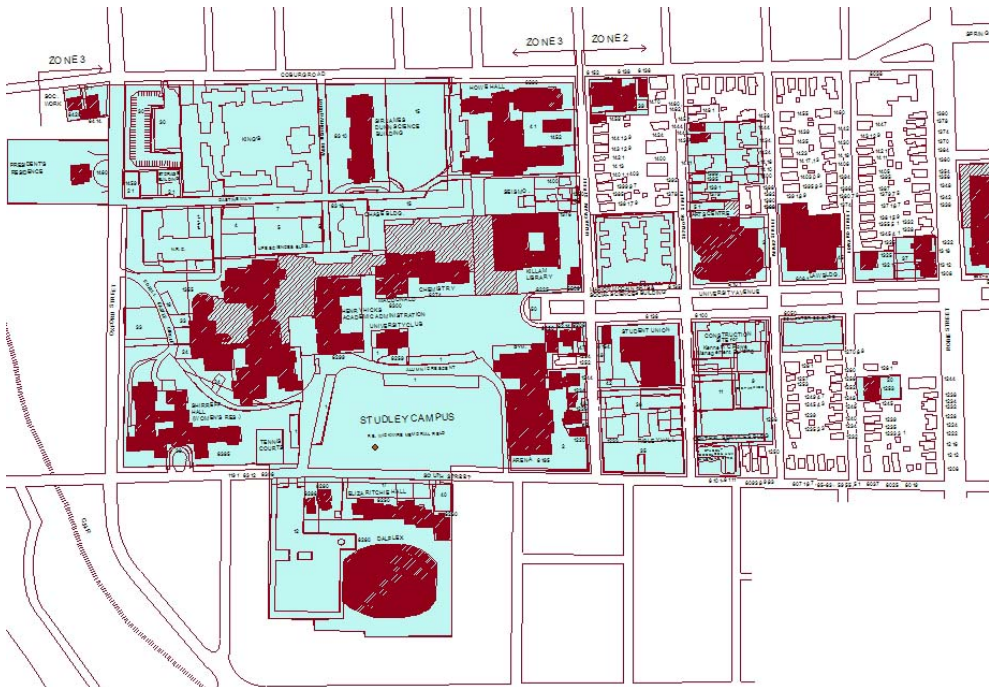
Appendix H. Checklist used for inventory of green initiatives and sustainable practices accounted for during walk-throughs of buildings and campus area (*modified for size*).

<b>Economic Development</b>
<i>Eco-Agriculture Site</i>
<i>Organic Produce/Natural Café</i>
<i>Green Business/Service</i>
<i>Green Store</i>
<i>Eco-conserving Products</i>
<b>Culture and Design</b>
<i>Cultural Site</i>
<i>Museum</i>
<i>Art Spot</i>
<i>World Music</i>
<i>Historical Feature</i>
<i>Eco Design/Building/Resources</i>
<i>Eco-spiritual site</i>
<b>Nature: Fauna</b>
<i>Bird/Wildlife Watching</i>
<i>Significant Habitat</i>
<i>Insect Watching Site</i>
<i>Duck Pond</i>
<i>Flyover Zone</i>
<b>Nature: Flora</b>
<i>Natural/Recreation Area</i>
<i>Special Tree</i>
<i>Native Plants/Trees</i>
<i>Garden</i>
<i>Community Garden</i>
<i>Special Garden</i>
<b>Mobility</b>
<i>Bicycle Site</i>
<i>Bike Racks</i>
<i>Public Square/Car-Free Zone</i>
<i>Major Public Transport Stop</i>
<i>Local Transport Stop</i>
<b>Infrastructure</b>
<i>Drinking Water Sources</i>
<i>Wastewater Treatment Plant</i>
<i>Recycling</i>
<i>Solid Waste Transfer Station</i>
<i>Incinerator</i>
<i>Energy Grid Generating Facility</i>
<b>Renewable Resources</b>
<i>Solar Energy Site</i>
<i>Wind Energy Site</i>
<i>Water Recycling System</i>
<i>Composting</i>
<i>Reuse Sites</i>
<b>Information</b>
<i>Environmental Center</i>
<i>Environmental School</i>
<i>Community Center</i>
<i>Significant Organization</i>
<i>Social/Political Resources</i>
<i>Scientific/Research Site</i>
<i>Pollution Monitor</i>

Appendix I. Original maps used with GIS to create green map of Studley Campus.



**Figure 1. Halifax Map provided by Map Library**

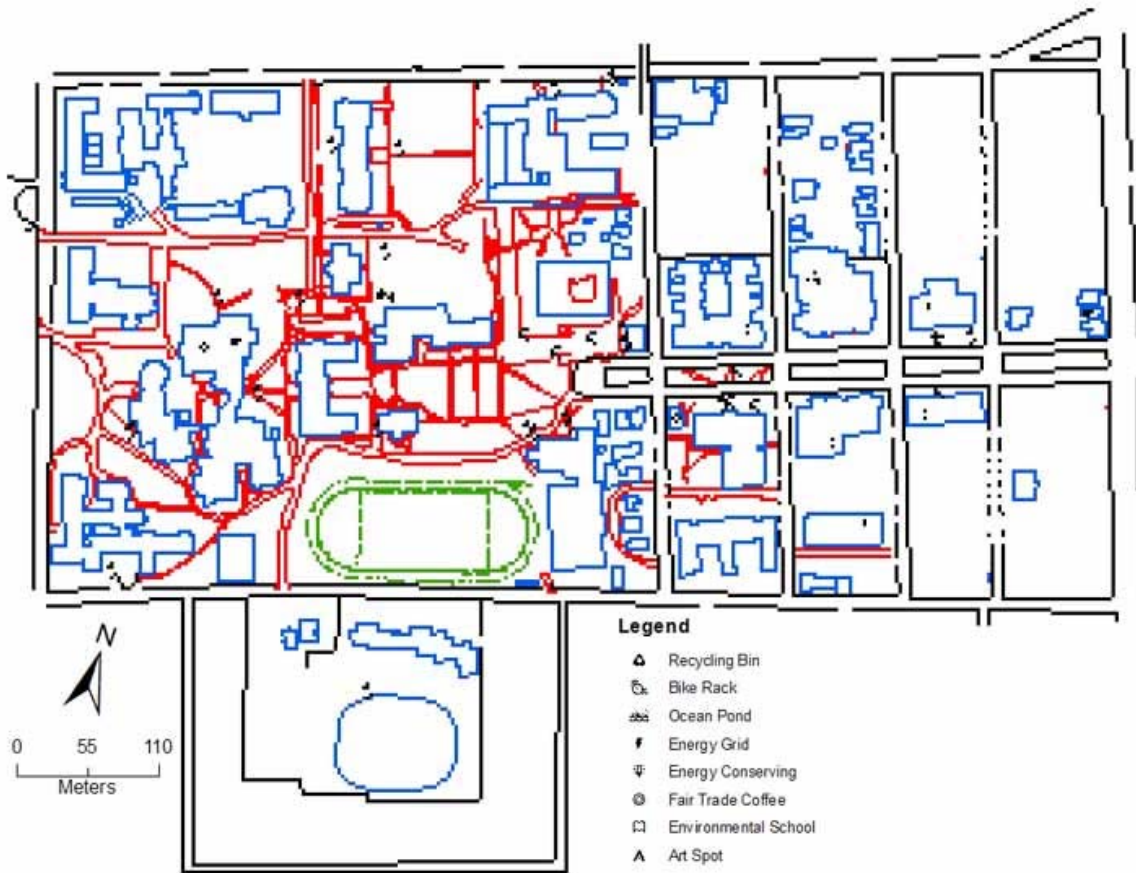


**Figure 2. CAD Drawing provided by Facilities Management**

Appendix J. Base map created from Halifax Map and CAD Drawing by combining features and removing unnecessary data.



Appendix K. Base map containing data points and some of the icons. (Note: Due to degradation of image quality during export, it is difficult to see icons.)





Appendix M. Brochure layout

**Points of Interest**

**SCENT-FREE ENVIRONMENT:**

Since 1995, Dalhousie University has advocated a scent-free environment in order to protect people that are particularly sensitive to the chemicals in scented products. The "We Share the Air" movement strives to encourage individuals to use unscented products where possible. More information about this campaign can be found at <[www.dal.ca/~ehs/scent.htm](http://www.dal.ca/~ehs/scent.htm)>.



**SMOKE-FREE POLICY:**

Dalhousie became the first university in Canada to prohibit smoking on all university-owned buildings, properties and vehicles. This policy has been in effect since September 2003.



**CHEMEX:**

The Dalhousie University Laboratory Chemical Exchange Program is an effective way of reducing chemical wastes from laboratories. Any useable chemicals that would have otherwise been disposed of are sent to the Health and Safety Office, where they are then redistributed to labs at Dalhousie and local institutions that need them. For more information, please visit <<http://www.dal.ca/chemex>>.

**OCEAN POND:**

Nestled between the Life Sciences Centre and the Chemistry building, the Ocean Pond was the brainchild of Martin Willison (School of Resource and Environmental Studies), who wanted to create a natural wetland which could be used for ecological research and teaching. Eventually, the area will host an environment of native flora and fauna that can be enjoyed on both aesthetic and research levels. More information at: <http://biotype.biology.dal.ca/oceanPond/index.htm>

Photo credits:  
Recycling bin: Facilities Management  
Website <<http://fm.dal.ca/waste.htm>>  
Ocean Pond: Shannon Clohosey, Fall 2004



**Charting our progress  
towards campus  
sustainability...**



This Green Map was created for  
ENVS 3502.03 (Winter 2005).  
Please see full report for more information  
at [www.dal.ca/environment](http://www.dal.ca/environment)  
or contact [ebonywicks@dal.ca](mailto:ebonywicks@dal.ca).



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More information: [www.greenmap.org](http://www.greenmap.org)  
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**APRIL 2005**

Printed on 100% post consumer recycled paper

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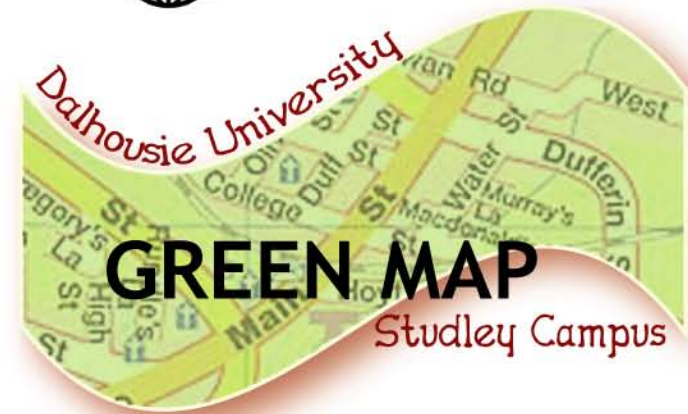
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Recycling bin: Facilities Management  
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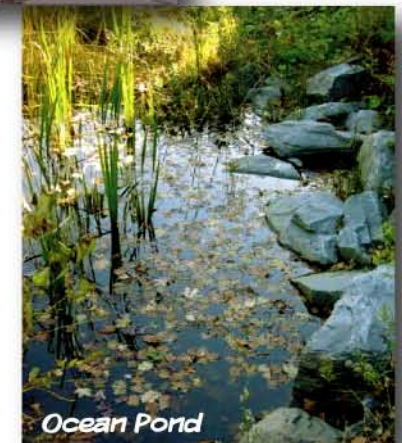
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# Studley Campus

