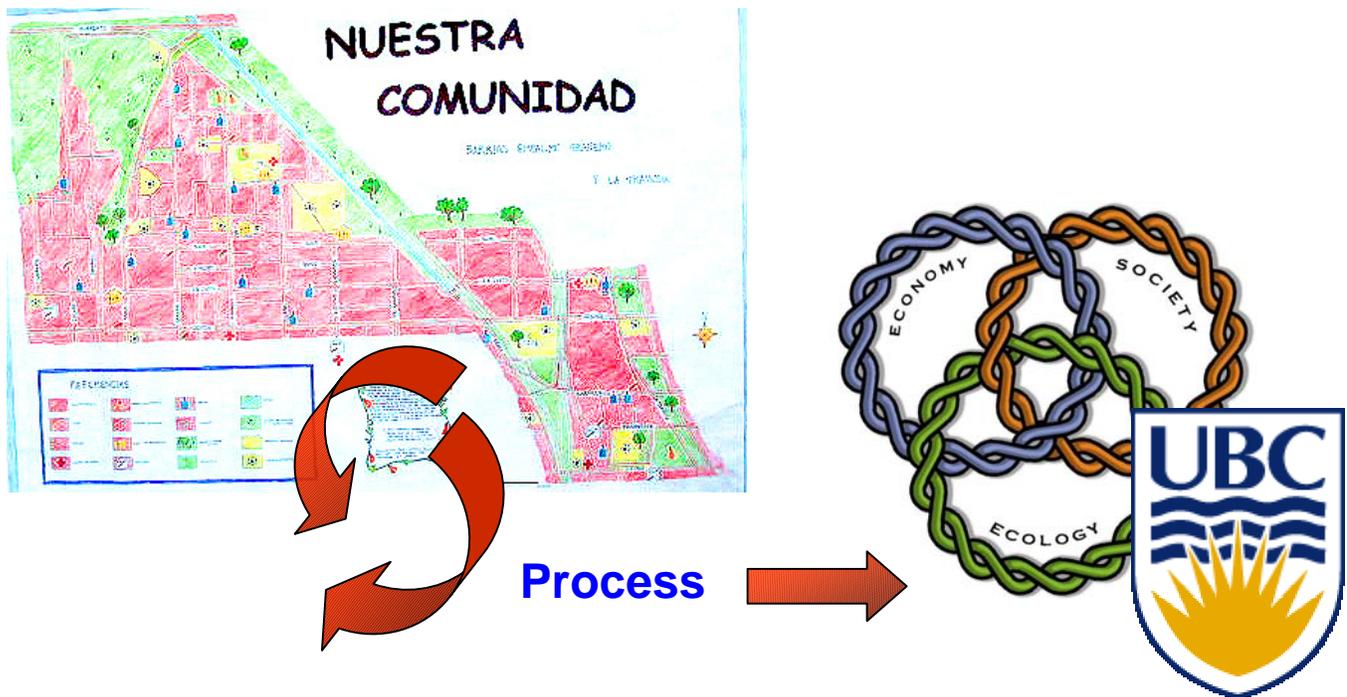

Discover UBC and Tree Tour '04-05: A Collection of Green Maps Fostering Campus Stewardship



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Introduction

Background Information

In 1997, UBC Policy n. 5 made *sustainability*, defined as the integration of Economy, Ecology and Society (CSO, 2004), an official priority and fundamental component of the University of British Columbia (UBC, Vancouver, Canada). With this groundbreaking policy came the need to educate faculty, staff and students about campus sustainability. In September 2002, in response to the September 11 terrorist attacks, UBC President Piper hosted the *Global Citizenship Conference*, inviting UBC to reflect upon global security, and how the campus community fit within a broader global context (UBC VP Academic, 2004). The themes of internationalization, leadership and sustainability increasingly appeared in UBC academic and administrative agendas. UBC Food Services produced, *Food for Thought and Global Well-being*, a brochure representing its commitment to global responsibility and inviting the campus community to think about global sustainability (Juliana Campbell, UBC Food Services, 2004, personal communication). The UBC Office of the Vice President and Campus Sustainability Office started a *Sustainability Pledge*, which students can sign before graduation as a commitment to global ethics (CSO, 2004). Finally, UBC Housing initiated a *Student Leadership Development Program* to foster critical thought and involvement among students (Chad Hyson, UBC Housing, 2004, personal communication).

In spite of the above efforts, an increasing number of UBC campus groups has been concerned with declining campus stewardship and community cohesion among students, but also among faculty and staff (Amina Rai, President Alma Mater Society, 2004, personal communication; Brenda Sawada, Campus Sustainability Office, 2004, personal communication). A report commissioned by the UBC Vandalism Task Force, identified over 700 vandalism acts that occurred on campus between September 2003 and September 2004 (inclusive). The study suggested that UBC students were most likely responsible for the majority of these incidents, emphasizing the impending need to revive campus stewardship at UBC (Jugasolo *et al.* unpublished). Also the Wastefree UBC Committee has observed a severe lack of campus stewardship (Nancy Toogood, UBC Wastefree Committee, 2004, personal communication). The latter explained that in the university junior residences, during the academic year 2002-03, over \$6,000 worth of dishes and cutlery were taken-out of the residence dining rooms, broken and carelessly scattered all over the residence. In response to the above, Wastefree UBC, the Campus Sustainability Office, and UBC Housing created the *Residence Sustainability Coordinator Program*, a social-marketing initiative giving junior residents the opportunity to lead, network, make a difference and inspire (CSO, 2004). As part of this program, 25 top junior residents are trained to educate their peers about sustainability, *creating a culture of sustainability* (CSO, 2004), fostering community cohesion and campus stewardship. According to Wastefree UBC Co-chair, Nancy Toogood, "UBC needs witty marketing tools and promotional materials to support all of these initiatives and fuel the campus sustainability vibe," (Nancy Toogood, 2004, personal communication).

The Social Economical Ecological Development Studies (SEEDS) Program

SEEDS is another initiative stemming from UBC Policy n. 5. In particular, the UBC Campus Sustainability Office recognized that university communities bring together some of the best and brightest minds in the country (CSO, 2004). Thus, in 2001, it launched SEEDS, *Canada's first sustainability program bringing together students, faculty, and staff in academic projects addressing campus sustainability issues* (CSO, 2004). So far, more than 200 UBC community members have taken part in unique projects that include, studying wastewater treatment alternatives, designing new waste bins to help custodial staff avoid injuries and, designing a database interface saving staff time and money. Because of their participatory character (Weiner et al. 2002) community-mapping projects are ideal for SEEDS, as they do not only promote, but also *act* sustainability. In other words, a community's sustainability project inherently requires the participation, input and passion of its people. Community mapping can be used to promote sustainability while bringing together citizens to enhance their community, mitigating apathy and carelessness.

The Green Maps System (www.greenmap.org)

The Green Map System (GMS) is an international community-mapping network that could be of great value to UBC and the SEEDS Program, aiming at interconnecting Ecology, Economy and Society within the campus community. GMS encourages design teams of all ages and backgrounds to create green maps, "charting urban areas in a manner that illuminates the interconnections between the natural and designed environments" (GMS, 2002). There is not a specific definition of what constitutes a green map. GMS calls for creativity and variety, emphasizing that each green map can represent its community in a unique, site-specific way. Green maps have the power of effective communication and data visualization. They combine practicality, aesthetics and creativity to identify, promote and link ecological and social resources. On the GMS website one can read,

Each [green map] merges the ancient art of map-making and new media in creating a fresh perspective that helps hometown residents discover great ways to get involved with the urban environment, and guides tourists (especially virtual ones) to special places and successful greening initiatives they can experience, and then replicate back home.

Thus, a green mapping SEEDS project would fit perfectly within UBC TREK 2010 Vision of making internationalization, community involvement and sustainability a university priority (TREK 2010). Moreover, the resulting maps could be published on the GMS website, making UBC the first Canadian university to contribute to this international network. This would further contribute to UBC being Canada's leader in campus sustainability (CSO, 2004).

A SEEDS Green Mapping Project for UBC

Our project adapts the Green Map concept to our university community, meeting UBC's growing need for marketing tools promoting sustainability, global citizenship and campus stewardship. We propose to create a visual tool that would fade-away the stereotypical definition of sustainability as being only about the burdens of recycling and biking uphill. Our project initiates a collection of maps portraying sustainability as being about cultural, ecological and social heritage. It promotes trees and composting, but also personal well-being, fine cuisine, sports and fine arts. It promotes a healthy, economically, ecologically, and socially sustainable community. As Arnheim (1976) p. 5 pointed out, "maps frown upon the isolation of single items. They preserve the continuity of the real world." In the real world, health and environment, culture and community, sports and academia are not separated, but integrated elements. Maps contribute to visualizing details of the real world within a broader context. This is analogous to considering one's campus community within a broader global context. Thus, there is no most perfect tool than a map to revive people's perception of Ecology, Economy, Society and Culture as being an integrated continuum, rather than a set of separate objects. Maps can be the ultimate vehicles for learning and communicating specific messages (Arnheim, 1976; MacEachern, 1995). Prompts and norms are key ingredients for effective social marketing, fostering sustainable behaviour within a community (McKenzie-Mohr and Smith, 1999). The latter authors define a prompt as "a visually or auditory aid which reminds us to carry out an activity which we might otherwise forget [i.e. switching lights off before leaving an empty room]," (p. 61). Moreover, they explain that, for a social norm to be successful it needs to be visible in the community. However, most sustainable social norms (i.e. composting) are not. Here, green maps become vehicles of effective social marketing, as they constitute attractive prompts while making sustainable norms, such as a waste-free campus, visible. Thus, the goals of our project are to,

- 1) Create and initiate a collection of green maps which would deeply integrate ecological, economical and social sustainability within the existing socio-cultural matrix of UBC,
- 2) Contribute to the revitalization of campus stewardship at UBC and,
- 3) Inspire UBC students, faculty, staff and visitors to get involved, make a difference, lead and inspire.

General Methods

Overview of the mapping process

On January 29th, 2003, a formal proposal for a UBC green mapping project was brought to Natural Resource Canada, the UBC Geography 472 instructor, Sally Hermansen, and the UBC SEEDS Manager, Brenda Sawada. Throughout spring and fall 2003, there were meetings with the Campus Sustainability Office Communications Manager, Ruth Abramson, to identify social marketing needs and objectives of the Campus Sustainability Office. On January 13th, 2004, SEEDS facilitated a meeting with campus stakeholders such as UBC Public Affairs, Landscape Architecture, Campus and Community Planning and the Sustainability Office, in order to identify the needs and objectives of the broader campus community. At this point the project was divided into two sub-projects: 1) a mapping of a campus sustainability orientation tour for first year students and, 2) a mapping of a tree tour for the UBC Botany Department and campus visitors interested in UBC's ecological heritage. Robinson and Petchenik (1975) emphasize the importance of considering the map user's needs, interests and inclinations for efficient cartographic communication. Thus, both sub-projects maintained a dynamic, participatory character involving stakeholders and potential map-users, and several feedback loops. Throughout the mapping process, we also considered Board's (1978) questions for the *evaluation of maps in terms of user requirements* (p. 4). In particular, we asked ourselves,

- 1) What is the geographical information (such as street names, building names, directions) to be used for?
- 2) What are the purposes of our project, and are maps suitable for the stated purposes?
- 3) For whom are the maps intended?
- 4) Under what conditions will the maps be used?
- 5) What map reading tasks are appropriate for the maps we are designing? And,
- 6) What sort of map do we want to create?

Methods Specific to:

Mapping of a Campus Sustainability Orientation Tour for UBC First-year Students

On March 12th, 2004, a one-hour community mapping workshop was held in the Geography 472 class. Also, on March 15th, 2004 a group of 13 UBC Residence Sustainability Coordinators, aged 18 and 19-year-old, were consulted and asked the questions, "what would make a map of campus sustainability interesting to first and second year students? And, what would you like to see on a map of campus sustainability?" The above consultation sessions allowed obtaining ideas from UBC students regarding the mapping of a campus sustainability orientation tour for junior students.

Data for the map was provided by:

- Jodi Scott, UBC Campus and Community Planning,

- Jeff Nulty, UBC Landscape Architecture,
- Jorge Marques, UBC Campus Sustainability Office Energy Manager,
- Ruth Abramson, UBC Campus Sustainability Office Communications Manager,
- Margaret Friesen, UBC Library Statistician,
- Justin Lesiuk, Imagine UBC Coordinator,
- The UBC Graduate Student Society Website,
- The Alma Mater Society Website and,
- The UBC website.

Layers used to compose the map include,

- LifeSciencesBuilding.shp
- ForestNeedCover.shp
- Forestcover.shp
- Tour_Final.shp
- BuildingVisitEdited.shp
- BuildingVisitScarfe.shp
- BuildingVisit.shp
- trees 2004.shp
- building2.shp
- road2.shp
- ocean.shp

These were overlaid in ArcMap 8.3 (ESRI, 2002). Map Icons were obtained from the GMS website (GMS, 2002), in order to follow international green mapping standards.

Data accuracy:

Some of the layers used were not up-to-date. Thus, certain buildings that had just been completed as of March 2004, were missing from the original building2.shp. On March 16th, 2004, when field-testing the two-hour tour drafted, we noted down new buildings and any inaccuracies we noticed in the map. Once back to the computer lab, we manually digitized the corrections. For example, we added the Life Sciences Building in front of the Thunderbird Winter Sports Centre, and two new houses in the Place Vanier Residence Complex.

Costs:

A cost-assessment analysis was carried-out, and it was estimated that to print 100 copies or more of an 11*17 colour map (two-sided), it would cost \$2.20 per map (UBC The Media Group, 2004, personal communication). This seemed a reasonable cost to the Campus Sustainability Office and Wastefree UBC Committee (Nancy Toogood, Wastefree UBC, 2004, personal communication). Thus, after having considered the map end-use and the conditions under which it was to be utilized (Board, 1978) it was decided to produce an 11*17, double-sided colour map.

A first draft of the map was completed on March 23rd, 2004, and circulated among stakeholders including the Wastefree UBC Committee, the AMS Resources Groups, UBC Bike Coop, UBC Food Coop, UBC Graduate Society (Koerner's Pub), UBC Residence Sustainability Coordinators, UBC Housing and UBC Food Services for feedback and design suggestions. Community mapping is a dynamic, participatory process (Weiner D. et al., 2002). Thus, several drafts of the maps were produced and further refined before obtaining a final product, satisfying the majority of the stakeholders.

Printing:

Since the map cannot be printed in the geography 472 computer lab, it was necessary to export the map from ArcGis into a *DiscoverUBC.tif* file with a resolution of 400 dpi. The supporting information of the map (i.e. the back side) was produced in Microsoft Powerpoint, and was saved as *DiscoverUBC.ppt*. To minimize printing costs, upon advice of UBC Media Services, the *DiscoverUBC.tif* file was inserted in a slide in *DiscoverUBC.pp*, and submitted for printing.

Final product and Data Storage/Holding:

We propose to provide a copy of our final product and data to:

- Sally hermansen, UBC Geography 472 Instructor
- Brenda Sawada, UBC SEEDS Program Manager,
- Nancy Toogood, Wastefree UBC Co-chair and,
- The UBC Geographical Information Centre (GIC)

Methods specific to: Tree Tour '04-05

Data for the map was provided by:

- Jeff Nulty, UBC Landscape Architecture,
- Dr. Anthony Griffiths, UBC Botany
- UBC Geography GIS Centre

Layers used to compose the map include,

- UBC Campus orthographic photo was taken in 1999
- Roads
- Trees not included in tour
- Tree Tour Path
- Evergreen Trees
- Deciduous Trees

These were overlaid in ArcGis between March 10-April 15, 2004.

Data accuracy:

The designed layers used were last updated in 2003, while the orthographic photo was taken in 1999. Thus, certain buildings, land marks and trees that had been constructed between 1999 and March, 2004, were missing from the original orthographic photograph. On March 23th, 2004, when field-testing the two-hour tour drafted, we noted any new and cut down trees we found on the map. Once back to the computer lab, we manually digitized the corrections.

Costs:

A cost-assessment analysis was carried-out, and it was estimated that to print 100 copies or more of an 8.5*11 colour map (two-sided), it would cost \$1.00 per map (UBC Geography Lab). Should the UBC Botany, Geography, Campus Planning, or Sustainability offices wish to print; the map will be made readily available for them. A first draft of the map was completed on March 31, 2004, and fully completed on April 15, 2004. The map can be easily printed from any colour bubble jet or laser printer.

Final product and Data Storage/Holding:

We propose to provide a copy of our final product and data to:

- Sally Hermansen, UBC Geography 472 Instructor
- The UBC Geographical Information Centre (GIC)
- UBC Botany Department and Dr. Anthony Griffiths
- UBC Campus Planning and Jeff Nulty

General Results

From the stakeholder meeting held on January 13th, 2004, the main points that came-up were, 1) paper versus web-based map and, 2) important themes to map in order to serve UBC. Detailed notes of the meeting can be found in Appendix A of this report. Half of the stakeholders favoured a web-based map, while the other half a paper-map. Considering that, 1) the cartographers (i.e. Alice Miro and Nick Mason) are more familiar with paper-based data visualization and, 2) that a paper map could have been of immediate use to Imagine UBC orientation leaders and UBC Housing Residence Advisors, it was decided to produce paper maps. A digital copy of the maps in .pdf format is also being made available to the UBC community for campus web-sites and for publication on the Green Map System website.

Finally, two maps, *Discover UBC* and *Tree Tour '04-05*, were designed, thus addressing the themes of campus sustainability and ecological heritage (i.e. campus heritage trees). We involved a total of 47 UBC people, students, faculty and staff in an innovative community mapping and campus sustainability project. We obtained \$600 in funding from Wastefree UBC, the AMS Resources Groups and the Residence Sustainability Coordinator budget to print 250 copies of *Discover UBC*, for distribution to Imagine UBC leaders and residence advisors. Overall, this project's educational value and ability to integrate energy efficiency within a community's existing socio-cultural matrix, won it a Natural Resources Canada 2004 Energy Ambassador Prize.

Results Specific to:

Mapping of a Campus Sustainability Orientation Tour for UBC First-year Students

From the Geog 472 workshop, we heard that,

- Spirituality,
- Health care (i.e. hospitals),
- Alternative transportation (i.e. TREK Program Centre and U-pass),
- The Sustainable Development Research Institute (SDRI),
- The Bike Coop,
- The Food Coop,
- Speakeasy, Safewalk, and other AMS services
- Fraternity Houses and,
- The Old Steam Power House

were important elements to feature on a campus sustainability tour. The Geography 472 class also suggested making the tour path of the same colour as the three rings (Ecology, Economy and Society) of the Campus Sustainability Office logo. We were able to satisfy all of the above suggestions except the one about the tour path being of the same colour as the Sustainability Office logo, due to design constraints.

From the Residence Sustainability Coordinators and Residence Advisors, on March 15th, 2004, we heard that an attractive map for first year students should be,

- Cartoonish (i.e. colourful and cheerful font)
- Dynamic, energetic and,
- Informative

The students further remarked that the map should include themes relating to,

- Sexual Education
- Social Sustainability (i.e. parties and beer gardens)
- Counseling and resources
- Stress-management/health
- The UBC Farm and,
- Safewalk/personal safety

Discussion

Discussion specific to: *Discover UBC*

Colour:

In order to fulfill our objective of deeply integrating sustainability within the existing socio-cultural matrix of the university, we used the official UBC colours (blue and yellow) for the title and important features of the map. In particular, blue and yellow are the official colours of the UBC Varsity Sport teams, thus making the map appealing to the thousands of students directly or indirectly involved in campus athletics. Background colours were selected with the intentions of 1) escaping flatness (Tufte, 1990 p.12), 2) minimize noise (Robinson and Petchenik, 1975) and, 3) establishing a hierarchy (Arnheim, 1976; Dent 1996, p. 256). Thus, the landscape and building colours are *pastels* as suggested by Tufte (1990, p. 90), with the darker building standing-out from the green background, creating hierarchy and relief. Two different hues of green for trees and lawns allowed creating a slight three-dimensional effect, a technique suggested by Arnheim (1976). Roads and parking lots have been made with two different shades of grey to, once again, quietly escape flatness. The tour path is blue and red in order to give it hierarchical priority while giving it texture and creating a sense of motion, almost a three-dimensional effect, (Arnheim, 1976).

Font:

In order to choose an appropriate font, we followed Dent (1996, p. 281), *intelligent font-type criteria* of legibility, harmony, suitability of reproduction, economy and ease of execution. We selected the font *Comic Sans MS* in order to follow the Residence Sustainability Coordinators' advice of giving the map a "cartoonish" style, and because this font type is found in any version of Powerpoint (i.e. avoid discrepancies between different places where the map might be printed from). The only exception for this font-type is the word, "fair-trade," in the supporting text at the back. This word was written with an *Arial* bold font in order to make it stand-out and convey its importance for campus sustainability and global citizenship.

Map Orientation:

Arnheim (1976) and MacEacren (1995) emphasize the importance of selecting a user-friendly map orientation for sound cartographic communication. Thus, *Discover UBC* has the same orientation as the traditional UBC map (UBC, 2004), which is what most UBC people are familiar with, (Jodi Scott, 2004, personal communication).

Symbology:

As green maps become more popular, it becomes increasingly important to maintain a consistent symbology that people can easily understand and relate to. Thus, we used the

same internationally-recognized symbols of the Green Map website. In order to *escape flatness* (Tufte, 1990, p.12; Arnheim, 1976) we added a layer with all of the campus trees, bird's-eye-view, and symbolized them with a simple, plain dot. Also, all the people consulted in the map-making process said they could intuitively understand that the green dots on the map were trees seen from above.

Legend:

There are over 70 legend icons available on the GMS website. We could have used them all for the UBC map. However, this would have resulted in a cluttered, tedious mix of shapes and symbols. Thus, we narrowed it down to 13 icons that best summarized the main messages we wanted the map to communicate. In Harley's (1989) language, we had a "hidden agenda" of promoting,

- Sustainable food systems (i.e. the organic groceries, fair-trade, vegetarian restaurant and composting legend icons),
- Civil rights, democracy and public participation in the decision-making process, (i.e. the environment center, public-square, protest point and social/political resources legend icons)
- The beauties of the natural world and landscape (i.e. star-gazing and scenic view icons),
- Art, history and cultural heritage, (i.e. the museum, historical feature, art spot and world music icons)
- Recreation, community, affordable campus housing, personal and social well-being (i.e. the recreation center and residence icons)
- Spirituality and respect for the sacred (i.e. the spiritual site icon)
- UBC as a top-notch, scientific research institution (i.e. scientific research icon),
- Ecosystem services, ecological design and bioresource engineering (i.e. the bioremediation site icon)
- Sustainable development and architecture, (i.e. the energy efficiency and green building icons)
- UBC's socio-ecological heritage (i.e. the special garden, public forest, farmer's market and eco-agriculture site icons).

Due to design constraints, the parkland, () , bird and wildlife watching () , and sustainable transportation () icons appear on the map but not in the legend. We felt that these icons significantly added to the cartoonish style and sustainability themes of the map (i.e. subconsciously transmitting to the map reader cognitive messages of nature, the outdoors and sustainable transportation). However, placing them in the legend resulted in the legend being too large and cluttered, creating "noise" (Robinson and Patchenik, 1975). Thus, we decided to remove them and let the map-readers intuitively perceive that they symbolize nature and sustainable transportation.

Map Items, Labels and Mapped Tour:

Harley (1989, p.2) argues that maps “locate the presence of power.” He explains that cartographers have the power to decide what to place on a map and control people’s perception of the real world. Analogously to highway maps being “instruments of State Policy” (Harley, 1989, p. 10), Discover UBC is an Instrument of University Policy (i.e. Policy n. 5, sustainable development). Specifically, the buildings featured in the campus tour (highlighted in blue and yellow to indicate their primary importance) have been carefully chosen to suit UBC’s TREK 2010 Vision, as well as the needs and goals of the many stakeholders and students consulted throughout the mapping process. As Arnheim (1976, p. 5) remarked, “a map is an iconic image.” Thus, the buildings featured in the tour are emblems, icons of the messages that UBC would like to transmit to its community.

For example,

- The Student Union Building (SUB) and Brock Hall offer services and resources promoting personal sustainability and well-being, as well as ecological, economical and social sustainability.
- Main Library is one of UBC’s oldest buildings (i.e. campus cultural heritage and UBC history); it is also emblematic of UBC being a top-notch research and educational institution.
- Frederick Wood Theatre and the Chan Centre for the Performing Arts are UBC’s cultural jewels, something UBC students should be aware and proud of.
- Sage Bistro, Koerner’s Pub and the International House offer students, faculty and staff a selection of culinary and social experiences for a diversity of budgets and occasions.
- The International House, Liu Centre for the study of global issues, and CK Choi Building (Asian Studies Centre) celebrate UBC’s internationalization (TREK 2010), while featuring world-renown green architecture.
- Place Vanier is home to 1300 undergraduate students and showcases UBC Food Services’ commitment to sustainability. UBC Food Services has invested several thousands of dollar to renovate this residence dining room in order to promote community-building and make it more sustainable (i.e. in-vessel composting and waste-reduction facilities). Highlighting Vanier on our campus green map means recognizing UBC Food Services for their efforts and encouraging them to proceed in this socially and environmentally-conscious direction.
- The First Nations’ House of Learning (FNHL) illuminates our national heritage and further UBC’s TREK 2010 vision to “expand UBC’s links and collaborations with First Nations” (TREK 2010).
- UBC Food Services’ 99 Chairs encourages students to enjoy a cup of fair-trade coffee with a friend (promoting social and economical sustainability, global citizenship)
- According to the Campus Sustainability Office’s Energy manager, Jorge Marques, the Scarfe building best exemplifies UBC’s energy retrofits and conservation initiatives.
- Finally, the UBC Farm, while being of priceless spiritual, ecological and social value, is still largely unknown by most UBC students. Our map will contribute to elevating the farm’s presence on campus.

Points of secondary importance on the map have been labeled in black. They highlight sustainable transportation (bus loop and TREK Program center), affordable housing (residences), spirituality (Vancouver School of Theology and St. Andrew's Hall), culture (museum of anthropology), health care (Student health Services), and sports and well-being (Osborne Gym, Thunderbird Winter Sports Centre, War memorial Gym).

Also major streets have been labeled in black in order to help the map readers orient themselves; a scale bar gives an idea of distances (important for those who might want to estimate how long it might take to travel from point A to point B on the tour), and a North Arrow fulfills fundamental cartographic standards. Overall, the amount of labeling and information on the map was minimized to the strictly essential, as suggested by Robinson and Petchenik (1975), in order to minimize the noise in the communication flow between the map and the percipient.

Supporting Information:

The photos at the back of the map make a tribute to UBC's exquisite architectures, and celebrate campus social sustainability while showing *Imagine UBC* students bonding together. The text at the back strengthen the messages of internationalization, research, community, culture and sustainability, conveyed by the tour on the map. The purpose of accompanying text such as,

Need groceries? Check-out your student-run Food Coop, a not-for-profit cooperative providing fair-trade and organic groceries at a student's budget. [...]
Looking for adventure? The Aqua Society, another student-run enterprise offers scuba diving lessons and trips,

is to inform, educate about sustainability and inspire. Specifically, in the above example, students are informed about the availability of affordable organic and fair-trade groceries on campus (i.e. ecologically, economically and socially-responsible foods). The accent is placed on student-run initiatives and entrepreneurship in the hope to inspire students to get involved and lead with innovative projects. Further this energetic guide emphasizes the importance of personal sustainability and well-being, mitigating the myth of sustainability being only about recycling and biking.

The logos act in synergy with the text to create visually-appealing prompts and norms, an effective social marketing tool, as described by Mackenzie-Mohr and Smith (1999). Cartographic techniques have been used to create hierarchy among the logos, while maintaining figure balance (Dent, 1996, p. 241). For example, the UBC Residence Sustainability Coordinators and Residence Advisors consulted throughout the mapping stressed the importance of educating students about personal safety and the Safewalk service. Natural Resources Canada and the Campus Sustainability Office valued the promotion of energy efficiency and energy-conscious behaviours at UBC. Thus, the Safewalk and Campus Sustainability office "Lights Out" logos were placed at the top-left and bottom right corners of the back of the map, giving them visual priority, (Dent, 1996, p. 257). The Wastefree logo (i.e. monkey) visibly placed under the map title, and strategically catching the

reader's eye at first sight contributes to giving the cartographic work dynamic expression (Arnheim, 1976), while acknowledging the Wastfree UBC committee, which committed most of the funding to produce this map. In addition, this logo contributes to the cartoonish style suggested by the Residence Sustainability Coordinators and to the promotion of the waste-free norm among the campus community. Finally, the text and logos result in the map being an effective promotional tool for the AMS, Campus Sustainability Office, Wastfree UBC, Food Coop, Bike Coop, Graduate Student Society (Koerner's Pub), and UBC Farm- a recognition of their involvement in campus sustainability.

Error/Biases (*Deconstructing the Map*):

Due to design constraints, we had to generalize and enlarge the original shape of the key buildings featured in the tour. For example, in order to allow the yellow label, *IH*, to fit inside the International House building and be legible, we had to elongate this building by 5 mm. This brought some scale inaccuracies in the map. However, since the exact size of buildings is not nearly as important information as the name and tour number of the building, it was decided to allow for this slight distortion, a trade-off between map accuracy and functionality. This generalization is also consistent with Arnheim (1976), emphasizing how cartographers can play with shapes and colours to create hierarchy, give relief to a map, and create a dynamic, powerful visual tool. Thus, in *Discover UBC*, key buildings, emblems of sustainability and community well-being, have been made slightly larger than all the other building. This *game of bigness and smallness* (Arnheim, 1976, p. 6), resulted in these buildings standing-out, dominating the map and bonding to the reader's mind.

In response to Harley's (1989) call for ethics in cartography, we felt it was important to explicitly discuss some of the biases and distortions we might have introduced in the map. MacEachren (1995, p.4) talks about the "inevitably 'distorted' views of reality held by the cartographer," the filters between the real world and the messages received by the map *percipient* (Robinson and Patchenik, 1975). In this project, the cartographers acted as filters by bringing to the various consultation workshops promotional material from the Campus Sustainability Office, Natural Resources Canada and Wastfree UBC Committee, and inevitably introducing their own biased definitions of sustainability among the people interviewed. Moreover, the 13 Residence Sustainability Coordinators interviewed had been exposed to several workshops held by the AMS Student Environment Centre, having its own "biased" definition of sustainability. This might explain why, for example, the students listed the UBC Farm as an important item to be featured on the map. Finally, the cartographers had an ultimate say on what was to be mapped or not, highlighted or hidden, generalized or specified. In spite of the above, we still heard and implemented ideas and suggestions from the general public that we had not thought about ourselves (i.e. outside of the predetermined agenda). These include featuring Fraternity Houses and spirituality in our map. We thought of making our biases explicit on the map, by placing the message, "Careful: this map was designed by human beings with specific biases and the explicit purpose of promoting their vision of sustainability." However, this would have risked defeating the main purposes of the map and turning it into a weak social marketing vehicle.

Discussion Specific to: Tree Tour '04-05

The *UBC Tree Tour 2004-05* reference maps displays natural objects from the physical environment, while placing emphasis on the campus' abundant supply of trees. The maps include such features as buildings, roads, green areas, and trees. The maps were created to show UBC students, faculty, staff, and visitors a variety of trees on a guided or non-guided tour. The maps were in demand by the UBC Botany department and were thus demand driven, rather than merely supplied for the public should they want to go on a tree tour. Furthermore, we agree with some other cartographers that maps shape our perception of place and "The information that maps contain is as important as the process used to arrive at the final product" (Knapp, 2003).

Figure Ground:

The orthographic photo that is the main layer of the maps, while at first bringing excitement to the reader's eyes as they see a fascinating display of colour and shape, quickly recedes to ground while the dashed red line and green points along the path move into figure. The red coloured path dominates the contour of outlying areas. The maps provide plenty of texture, including a ranging colour scheme, while allowing the reader to focus on what the maps were designed for (the tour). The transformation of visual data from the original photo is precise and the reader is able to visually distinguish the difference in areas among the maps (green areas, buildings, roads, ad trees). The shading provided by the raster based orthographic photo from the larger buildings and trees gives excellent visual acuity and provides an escape from the one-dimensional surface of 'flatland' (Tufte, 1990).

Overall Balance and Design:

Agreeing with Dent that the selection of scale is often the most important decision a cartographer makes (Dent, 1996), the scale chosen represents only the map maker's view of what was defined as needed to display all the necessary attributes to make the maps easily readable, while still providing the precise locations of trees. Yet, this scale selection has consequences as to how and why it was chosen. At a smaller scale, the maps would cover more area, which may coincide with what some people believe is the true area of all of UBC's trees and thus should be included on a tree tour map. Yet, this tour is specifically designed, through the help of campus planners and Botany professionals to show tourists an eclectic arrangement of trees from around the world. At a larger scale, the maps would become too focused solely around the tour path and would not allow other important spaces within the campus tree tour to be identified. Fortunately, for most map readers, the scale was chosen to provide an excellent view of the tour, while still allowing readers to venture off the path and explore the rest of the heavily landscaped campus themselves. The titles of the maps are relevant to the purpose and are easy to read. The abstract symbolization is compiled with care and accuracy and does not require the reader to refer back to the legend often.

The layout of the maps was designed to allow the user to understand what they are looking at first (by placing the title in the top right corner in a larger size text than any other, next to the map figure itself, and finally to the legend, scale bar, north arrow, and sources. The visual hierarchies of the maps were designed such that the maps have precision while still using a simplified design. The design of the map is such to allow the tourist to easily carry the map in hand. The map is balanced in that the reference points on the map are easily identifiable and with no points holding a higher place among the readers visual hierarchy.

Supporting Information

On the back side of the guided tree tour is a listing of tree names in both English and in Latin. Experienced tourists with tree knowledge will find the Latin translation as necessary should they want to compare different strands of trees from a tree family (i.e. Camperdown Elm VS. American Elm). In addition to listing the tree names, certain trees have a short description saying where the trees came from, how they are used historically and today, and/or cultural significance. The guided tour is meant to last 2.5 hours as the guide (likely a Botany Professor or other person with extensive tree knowledge) will be lecturing about the trees.

The self-guided tour is nearly identical to the guided tour, however also includes some pictures of trees that are identified by numbers on the front side of the map. The numbers are used for both tours to show the starting point, the direction in which to travel, and a reference to difficult to find trees. Both tree tours are approximately 3 KM in length and this was measured by the cartographers using an approximation from the maps scale.

The maps also include supporting information to allow accreditation to the people who helped with data collection, dissemination, and eventual design input and critique. It was deemed unnecessary to provide an inset map of the entire campus as there are numerous campus-wide maps available from information kiosks, standing information signs, and from the internet. The map does provide the user with a chance for feedback and consultation by providing the map authors' names and others who contributed in its construction.

Content

The map reader who is looking for a specific place on the map will not be provided with that information. Rather, they are only provided with information regarding the tree tour itself and thus the maps keep their focus. There are, however, a few places of interest visually available for reference by the tourist where they are able to find more information regarding trees on campus (Main Library) and other interesting places (Rose Garden, First Nations House of Learning).

The symbolization of the maps was designed to allow quick reference to the trees along the tour. Originally it was thought that by using different coloured symbolization for the two different tree classifications that the reader would be able to mentally identify the trees.

However upon reflection, it was decided that by using two different types of symbols, with a single colour, the reader would not be distracted by the increase in colours and would still be able to identify Deciduous Trees with an octagon (resembling a Deciduous Tree in full bloom with a rounded top) and Evergreen Trees with a triangle (resembling a winter tree or a Christmas tree).

Certain tree stops also include a number to show the reader where the beginning of the tour is and which direction they should follow. In addition, on the self-guided tree tour, numbers were symbolized for certain, difficult to locate trees such that the reader would be able to refer to the back of the map to visualize what they would look like.

The lettering provided on the maps is designed such that the reader is able to distinguish foreground from the irregularities of natural objects (roads, trees, buildings). By writing the lettering angled towards the important streets on the maps, the reader is able to quickly identify where they are and where they should be going, should the remote chance arise that they become lost. In addition, the street names are written on the maps close to the tour's main streets to allow the reader to focus their eyesight on the center of the maps and the tour itself. The street names are written in a pastel yellow, which is not too bright, and recedes into the foreground. The lettering enclosed in the boxes that have a 'leader' (line attached to location) is in a small black font which calmly stands out against a pale yellow background. By adapting some of the lettering to the orientation of the natural features of the maps, (i.e. roads) the lettering is merged with the landscape and recedes into the background pattern (Arnheim, 1976). The tourist should only need to reference the roads should they become lost. Lettering size was chosen to allow easy readability, with increases by two point graduations to allow a hierarchy to be established among the lettering itself. By keeping the text low on visual hierarchy, the map user can focus on interpretation of the changing tree tour path. By providing a specific, tour path, we have achieved heterogeneity in the user's visual experience, which is necessary for figure perception.

The visual acuity provided to the reader, both in resolution and in visibility, allows easy readability of the maps. By providing the reader ease in distinguishing figure from ground, the intended message that the campus area defined in the maps are abundant with trees. The symbolization of the maps is simple and is easily retainable in the reader's memory (Arnheim, 9), with the reader being allowed to reference tree types through the legend. By not writing the place names of each building or street on the maps, noise is reduced and the reader can quickly switch from a peripheral to cognitive process in map reading. Noise has been limited to the area surrounded by the tree tour path, since this area is not necessary to the communication of our message (Robinson, Petchenik, 1975). The maps are precise in that the orthographic photo is a true representation of the land (as of 1999). The only generalization occurring in the maps happens with the shape and contour of the roads and the exact location of the trees, which allows the reader to focus on the purpose of the maps and appreciate the varying types of trees. Thus the movement from peripheral scanning to foveal inspection can be easily accomplished, and "To reach the communication goals set forth for a given map design problem, the cartographer looks carefully at the intended audience and then defines the map's purpose with precision" (Dent, 1996).

Data

The digital data for constructing the maps is absolutely necessary for the use of this project. The data comes from legitimate sources and has been approved by scholars and planners who helped designed the map. By not hand drawing the maps, the reader is benefited with the knowledge that the orthographic photograph is true in representation and is objective. While often with digital data the complexity of maps are increased dramatically (and noise is often extreme), these maps use the digital orthographic photos to increase visual appreciation of the green spaces and ecological diversity that UBC has to offer. Through this application of photographic science, the most precise representation of visual reality can and has been produced (Harley, 1989), through the use of the orthographic photo. The digital data provides acuity in visibility and resolution, and is not distracting as there is no prior motive by the map's designers in influencing how the map reader feels about the spaces and places located at UBC. The digital data provides extensive colour schemes that needed to be chosen carefully and certainly represent an advantage to the designers in their decision in compiling these maps.

Although the original aerial photo was scanned at a very high resolution, there is no way to avoid a decrease in visual acuity. The colour red was chosen as it stands out as we have decided that the pathway should be emphasized. The line weight of the path is generous, but is not overbearing such that the trees located close to each other are visually hindered. Furthermore, the design of the path and the trees were chosen to allow equal silences as not everything on the map should/could be high on visual hierarchy.

The paper data for the location of the trees was severely flawed as it was created for a past tree tour which was to occur in the past. Since the design of the past tree tour, some trees have been removed and others moved to different places. In addition, there were many trees that were not located in the exact spot from the original data source. Although it was difficult for us to find the correct trees from the original map it was necessary to make correct spatial adjustments on the new tree tour in order to decrease any error.

Reader Perception and Interpretation

In the introduction, it was outlined that there are many potential users for the Tree Tour Maps: students, faculty, staff, and visitors. Yet, by reading between the lines and in the margins of the text (Harley, 1989), a deconstructionist analysis shows that there is indeed a specific audience for the use of the map: those interested in campus sustainability and tree ecology. Take for instance the use of the maps symbolization that references places located on the map. These places were specifically chosen by the map designers to portray places that we deemed necessary for the map reader to identify.

The identification of the bus loop was chosen as we are hoping tree tourists will come to campus by public transportation and thus reduce the pollution caused by excessive personal automotive emissions. The Botany Building was also included should tourists feel that they would like to know more about the trees on the tour and where they can gain additional

information regarding the campus' ecology. Another place chosen by the designers is the First Nations House of Learning. Not only was this building highlighted for its proximity to a large number of the trees on the tour, but also to encourage tourists to visit the building and to learn more about the First Nations. The First Nations were originally the inhabitants of the land to which the tree tour is located, and many tourists may find it of interest to learn more about their people, culture, and use of the trees on the tour. The Rose Garden and the parkade located next to it were highlighted to show an interesting campus space which has a variety of other plants rather than trees. The tourists are able to venture off the path and visit the rose garden where benches and information signs are located for viewing pleasure. While the map is designed to promote the use of public transit, there will inevitably be some tourists who will be driving to UBC and will need a place to park their vehicles. Should the map be made available online, the tourist can print the map off the internet and find their way to the parkade highlighted and begin their tour at tree #20. Finally, the Main Library was chosen to be placed on the map to allow tourists to research sustainability and the different ecology that the supporting information of the map provides.

It should be realized that while trying to be objective to the spaces and other locations on the map, the designers do have a political motive behind the map construction: campus social and ecological sustainability. Hopefully through taking the tour the tourist will gain an appreciation of the campus' ecology, and return for future tours. As the map reader decodes the map, they will instantly begin to search, locate, and identify different aspects of the map that they will begin to discriminate against. As we encoded various aspects of the map, we tried to limit visual noise as much as possible by making the various design decisions that will foster easy readability and use.

While we have proceeded to deconstruct our own maps, the basic argument behind this section is that there is always something subjective behind human constructed maps. Each map user has their own situated knowledge that will affect how, when, and why they perceive the things that they do. We have designed maps portraying a portion of the campus' extensive botany; the power behind the map is in how the readers understand its message. Hopefully the readers will come to appreciate UBC as a leader in campus ecological sustainability. Being that the maps appear to be designed from a semi-authoritative body (undergraduate cartographers), the map reader will hopefully read the map to be honest and constructed upon factuality (Harley, 1989). We feel that the correct interpretation of the map by the reader is the most important and has been accomplished. Through end user consultation, we have gained vital feedback to the map design and have made numerous adjustments to the final product. This feedback loop was imperative to the hopeful success of the maps, and we hope future consultation will occur between our initial design, and those who carry forward with future tree tour projects. We are emphasizing the fact that "Maps must be talked about and shared to provoke thoughts and feelings of place. They must be studied and questioned to promote understanding" and only this will allow the design and appreciation of a well thought out map (Knopp, 2003). These maps were designed to represent the physical landscape exactly, while promoting campus sustainability.

Questions that we find are necessary to be asked upon completion of the project include: What did we take from the recent map construction and experience that will help make future

map design more efficient and of better quality? Can we better utilize available resources to apply existing mapping technologies? How can academic standards be addressed and practiced more effectively? (Knopp, 2003)

Error

Error on the map is very limited since the maps were designed using an exact orthographic photo of the mapped space. Potential error arises in that the orthographic photo taken was from 1999, and certain buildings and other spaces may have minutely changed. This should not pose a large problem, as the tourist will be focusing on the map trail and will be giving their attention to the trees.

Further error occurs in the exact location of the trees. While the guided tree tour will allow the map readers to follow the professional guide and easily be directed to the trees, the tourists of the self-guided tree tour may find it difficult to locate all the trees on the map. We designed the map for a user group with an intermediate level of tree knowledge and they should be able to easily find their way throughout the tour. Although there are tree tags on each of the campus' trees, the map designers and tree experts deemed it both unsafe to the tourist and the existing foliage should the tourist try and look for the tree tags themselves.

Finally, the tree tour path itself may be subject to error as it was digitized using an approximation of where the tourists should walk. Although we zoomed into the map to find the absolute best path way and place the tree symbols on the correct side of the path, the map reader may find, again, the trees difficult to find. This is only because there is a great abundance of trees close to the ones on the tour.

General Discussion

Challenges:

Overall challenges we faced included maintaining figure balance and readability and avoiding cluttering while conveying large amounts of information. We had to spend several hours finding the most appropriate colours, adjusting discrepancies between computer screen and printers, combining functionality with aesthetics. The details of how we surmounted these challenges are discussed in the preceding paragraphs.

The Future of UBC Green Maps Collection:

We hope that *Discover UBC* will be extensively used by Imagine UBC leaders, UBC Residence Advisors and Campus Sustainability office volunteers. We also hope that Tree Tour '04-05 will help preserve heritage trees on campus while attracting amateur naturalists from within and outside the campus gates. We stress the importance for these maps to be

maintained, updated and modified to suit spatial and cultural changes occurring on campus. We also emphasize how the addition of new maps with different themes (i.e. heritage and small donours) would elevate the profile of this collection and contribute to campus sustainability. We plan on submitting these maps to GMS and UBC Public Affairs for publication on their official websites. Finally, as suggested by Robison and Petchenik, we encourage future geography 472 students to undertake a study on the effectiveness of the *Discover UBC* map (i.e. 2 years from now) and assess its impacts on the UBC community. This could include an assessment of students' perception of the map to see if the cartographer-map percipient communication system was efficient (Robison and Patchenik, 1975).

Conclusion

In conclusion, we have initiated a collection of UBC green maps embedding Ecology, Economy and Society within various aspects of the UBC campus community. We have involved over 40 people in a community-mapping project aiming at restoring campus stewardship in our university. In a dynamic process, we have brought together UBC businesses, residents, students, faculty and staff to celebrate and enhance our campus community and heritage. Combining aesthetics and functionality, our maps promote and visualize UBC's official mission,

As responsible citizens, the graduates of UBC will value diversity, work with and for their communities, and be agents for positive change. (UBC, 2004)

Due to time constraints we were unable to test whether we achieved our third objective, "to inspire UBC students, faculty and staff to get involved." Thus, we leave it to future Geography students to innovatively bridge Arts and Science, and investigate the effectiveness of the cartographic system we created. We have broken the boundaries between energy efficiency, fair-trade, sports, libraries and fine cuisine. Overall, we have shown how maps can be used to shape people's perception of sustainability- how an elegant ancient art can be applied to modern marketing techniques to restore ancient, yet priceless, values of community, cooperation and spirituality.

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