The Green Map System as a Means for PPGIS Education and Exploration

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Green Mapping has become an increasingly popular community-based technique for describing the opportunities for sustainable living and showing patterns of green space. Each community's map is a unique product reflecting that place and the group(s) involved in its construction. "Green Maps give us a fresh perspective of our cities and towns (e.g., Brawer 1995). They help us locate eco-resources such as bike lanes, farmers markets and wildlife habitats, along with cultural sites that make our hometowns special." (www.greenmap.org) Green Maps have become an important tool for community participation in capturing and expressing information about the local environment (Knack 2001).

Building on the well-developed techniques of the Green Map System (GMS), students at Rutgers have developed Green Maps as a class exercise in conducting inventory, analysis, and communicating the environmental assets of a community. This class exercise, used repeatedly, has produced a series of varied maps demonstrating the potential for student products. Limitations of the process as a teaching tool always come back to the participation – a basic part of the GMS – that students are unable to fully utilize within the limitations of the class. Lessons learned include ways that students have learned from the cartographic process, their changing understanding of a role for GIS as a means for integrating a variety of data, their ability to collect new data and the importance of the individual environmental issues to the general public.

The Green Map System

While a detailed history and extensive examples of Green Mapping are available oneline (http://www.greenmap.org) this section will summarize that history and offer a little context. The GreenMap System (GMS) is a process of community mapping that has developed over the last decade to serve as an important grass-roots community movement. The process began with the development of a map of New York City in 1992 called the Green Apple Map (http://www.greenapplemap.org/). This map – updated five times -- captures the locations of a wide variety of environmentally-notable sites throughout the city including natural areas, green vendors, and environmental problems (Figure 1a). Using its own unique symbology the Green Apple Map has been received with a remarkable popularity and impact. The Green Apple Map has brought together teams of participants from across New York City to help advance its content and delivery – including several local variants like a children's GreenMap of Lower Manhattan. By itself, the Green Apple Map would represent remarkable example of community mapping, but the movement it has spawned may overshadow the individual map process.

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Figure 1a – A close-up from a recent version of the Green Apple Map showing the GreenMap icons used in New York City. Over 225,000 copies of the Green Apple Map have been distributed since its first version in 1992.

Based on the initial experiences of Wendy Brawer and a mass of volunteer GreenMappers, the GreenMap System has emerged as a formalized process for communities to engage in community mapping that allows for each community to develop its own unique flavor. Promoting certain common elements (like some of the basic map icons) and the importance of a grass-roots approach, the GMS has used a series of workshops and supporting materials to create a legion of successful greenmappers. Respecting (in fact, revering) the qualities unique to each community has led to the publication of over 150 different maps around the world; GreenMaps have been made in North American, Latin America, South America, Europe, Asia, Oceania and Australia. Most of the maps have been developed at an impressively high level of cartographic and graphic quality while being developed by all ranges of professionals and volunteers.

The popularity of the GMS (with over 250 different projects initiated) has provided significant evidence of both its appeal as a locally unique reflection of place and its power as a tool that can engage and influence the public. A GreenMap of Calgary has been designed creatively without the common street centerlines (although its backdrop hillshade is so detailed that it does include a subtle representation of many street patterns). The Green Apple Map remains the most prominent example of the process, but it also carries an interesting example of the potential these maps have for affecting change. An early version of the map marked a site in New York City's Central Park as storing 11,000 gallons of chlorine. This widely distributed map is credited with motivating the city to remove the chlorine from the park (Brawer 2004).

While many examples of GreenMaps have been developed without the aid of GIS – a hand-drawn map from a small village in Uganda serves as an outstanding example -- the ability to produce sharp, accurate, easily edited and readily reproducible maps has made GIS a popular medium for these processes. Many of the maps are produced in cities or regions where significant quantities of GIS data are available, but the addition of new data is central to the GMS process. Special icons (which are primarily distributed as a

font) have circulated among GreenMappers for these purposes and some communities have published interactive GreenMaps online. Instead of sharing data from place to place, the GreenMappers are sharing the icons (Figure 1b) which becomes an evolving common map language.

Figure 1b – Some of the most common GreenMap icons as presented in the *Green Map Atlas* (2004).

Interestingly enough, as GMS has evolved it has taken on many of the characteristics attributed to PPGIS projects without making a strong linkage to the PPGIS community. The GMS promotes a level of participation similar to traditional grass-roots environmental movements. Many communities rely on a significant contribution from local residents in each of the neighborhoods within the city being mapped. Pittsburgh's map was developed with information contributed by 120 individuals. A large number of maps have been generated by children or school groups (Rural Roots 2001). The ultimate outcome is also directed at individual citizens. Explained a landscape architect involved in the Portland GreenMap, "Our goal was to really empower people through information" (Wortman 2002, 51). The decisions about sites to include or exclude (perhaps a café that uses organic foods) are left for the participants to sort out reflecting their local community standards. The graphics are also developed with uniquely local flavors (which can be empowered or minimized by using GIS).

Perhaps the most interesting aspect of the GMS is simply the enthusiasm supporters show for it. While its impacts are more indirect than many other participatory environmental processes, it seems to produce an extremely strong level of support among its designers and users.

> "There could, and should, be a Greenmap for every city. Maybe there is already a Greenmap of your city. Maybe there isn't. Maybe you could be the person to start to make it happen." (Stafford 2003)

Putting GreenMapping Into Context

GreenMapping began in 1991 essentially as an independent idea of Wendy Brawer (Green Map Atlas 2004, G1). However, a rich variety of environmental and community mapping projects and ideas preceded the emergence of GreenMapping. As GreenMapping has evolved, it has benefited from the input of countless individuals, including many who were informed by the traditions of another process or disciplinary background. While it seems impossible to rediscover how these older processes may (or

may not) have impacted the GreenMap System, it is important to present a few as context for this largely independent innovation.

Many PPGIS researchers and writers have previously noted the depth of the thought represented in the traditions of community mapping, so it will only be briefly described here. Traditional notions regarding participatory and community mapping can be seen in formalized processes like rapid rural appraisal in the 1970s and participatory rural appraisal in the 1980s (Chambers 1994). More recent efforts include approaches like the community mapping work undertaken by Common Ground (Maeve 2000). These works connect well with the sorts of community-driven or community-informed mapping (e.g., (Weiner and Harris 2003; Harris et al. 1995) that makes up the bulk of PPGIS literature.

In the 1960s Phil Lewis, a landscape architecture professor at the University of Wisconsin, began to gain attention with an environmental analysis process mapping environmental corridors using symbols to mark features of environmental or cultural value (Lewis 1964, 1996; Thompson 1996). While not meant as highly participatory, his process produced maps with significant potential for drawing the public into discussions about the environmental values represented on the maps. Not only could map readers see the dramatic convergence of icons along stream corridors, but they could also intuitively understand most icons making the maps a new tool for discovering a landscape that they had previously overlooked. Ultimately, this system of 220 environmental value icons become a central element in the analyses underlying Lewis' success in promoting greenways through his E-ways concept (Little 1990). Because, until recently, Lewis' work was rarely published outside landscape architecture literature, its influence of GreenMapping is particularly difficult to assess, but the parallels to GreenMapping are difficult to ignore.

GMS for Teaching Inventory and Analysis

The GMS provides an interesting opportunity for college-level classroom applications. With an overwhelming number of examples for students to study online, existing GreenMaps can be used as strong examples of the potential for community mapping projects. The author has found many of these maps to be successful in reaching students (ranging from the biking GreenMap of Burlington, VT to some Japanese GreenMaps employing no English). As a teaching resource these materials alone are valuable and worth exploring. They certainly can be added to the "cartographic artists' sourcebook of ideas" that many cartographic designers like to keep handy.

Long before McHarg (1969) the processes of site inventory and analysis were central to practice and education in landscape architecture. However, recent decades have helped formalize site inventory and analysis -- often with a strong environmental element with GIS -- as an institutionalized core of landscape architecture. Landscape architects have been among the many disciplinary groups involved in GMS processes and projects (Landscape Architecture Magazine 1999). At Rutgers, the GMS has repeatedly been integrated into a landscape architectural design studio as a proxy for traditional inventory

and analysis processes and as an early application of GIS skills. GreenMapping creates unique opportunities for exploring a site and gathering information about it.

Based on initial inventory experiences, the process forces students to develop a theme and communicate it and cartographic information about the place. While it is not a substitute for a landscape architectural design problem, these class projects do allow the students to apply their creativity in problem-solving, icon design, graphic design, and communication (Figures 2-5). These projects have also been remarkable in their ability to help apply GIS skills even as the students are still learning them.

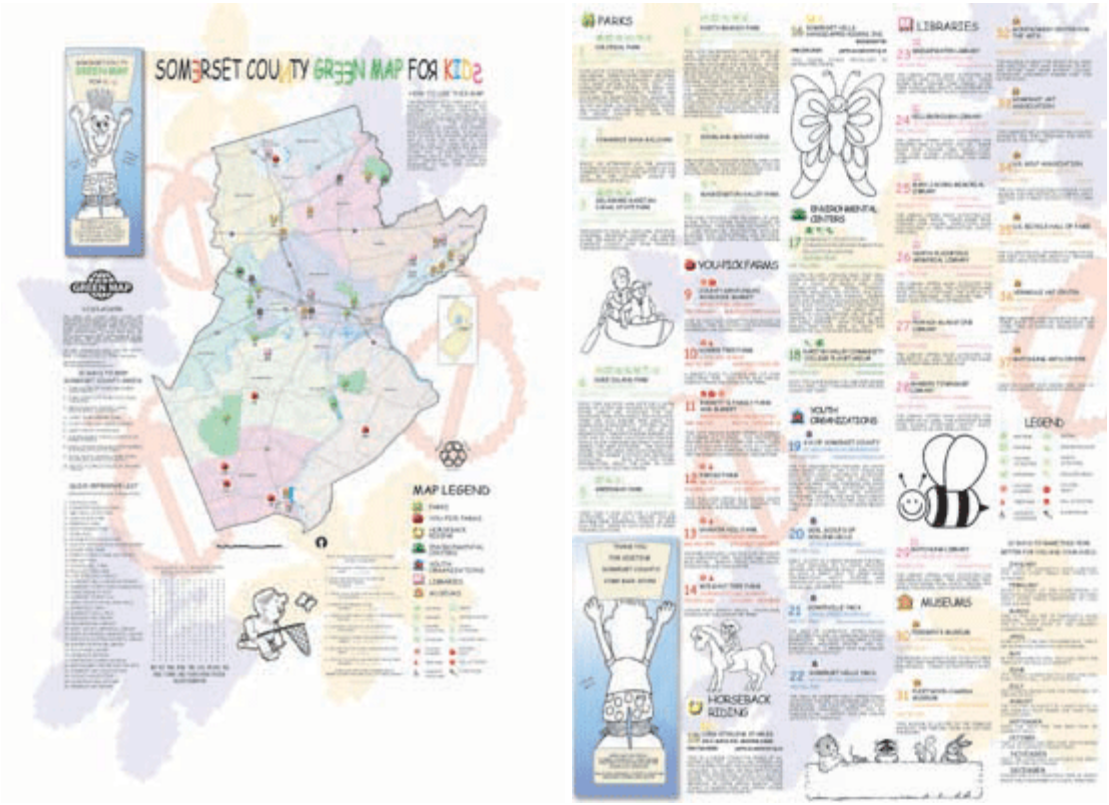

Figure 2 – Somerset County GreenMap for Kids.

Unlike student assignments of past decades, landscape architecture studio projects are almost always conducted in data-rich environments, which create an unusual set of opportunities and problems. In New Jersey, a variety of agencies have developed a robust series state-wide datasets which allow landscape architecture students to produce projects in a day that might have taken weeks previously (or perhaps have simply been unachievable). A key educational challenge is to force the students to process the data mentally and select data to include and – more importantly in this case – omit . Making subjective decisions about the importance of issues represented by these data and communicating the reasoning behind these decisions is still a very difficult skill to develop for the undergraduate student. Because students quickly become keenly aware of the volume of data, many also find it difficult to collect more data – "if it doesn't exist, there is probably a reason." Certainly it makes it very difficult to help students recognize

that gigabytes of digital data (with metadata, no less) can be less valuable than a few hundred data points derived through participatory processes.

Figure 3 – Somerset County GreenMap emphasizing the "sense of place".

These student projects have been successful within certain limitations. Unfortunately these projects have been undertaken in an extremely constrained environment with little time available for detailed analysis of these sites or community input. In each case the students have proceeded to design a large site/area within the previously studied regions. These designs have clearly benefited from the depth and breadth of knowledge that the students developed during the GreenMap exercises, suggesting that they served a similar purpose as the more traditional inventory and analysis projects that are so often used in landscape architecture studios.

Figure 4 – GreenMap of the Rutgers campuses emphasizing a new approach.

Figure 5 – RUGReen? GreenMap of the Rutgers campuses emphasizing campus activities with an environmental flavor.

It is hard to be certain, but experience would also suggest that the students have learned some important lessons about community participation and the potential for PPGIS from each of these projects. Each process has concluded with design juries featuring ocals knowledgeable about the areas mapped. The students have generally entered this phase of the project with a fair degree of self-confidence in their inventory work only to discover a myriad of missed sites, incomplete data, and blatant misinformation. As an educational experience this has been powerful and important (and has shown itself as a lesson learned on the final design projects). But this has made it difficult to work with

some community groups who are uncomfortable with these learning-related stumbling blocks.

Another problem for using GMS projects as a true PPGIS experience in the design studio is the difficulty in getting undergraduate students to successfully follow-through on suggestions and corrections unless the project is major portion of the final grade. And, as many faculty are aware, an undergraduate class of students could include a very wide variety of levels of talent, discernment and motivation so that a class experience may include several successful and unsuccessful products. In the isolation of a classroom, they might all be successful learning experiences but in an applied setting with an anxious client they could be viewed otherwise. Educating the public participants in the process to this reality can be critical, especially if they hope to see a map get published at the conclusion of the process. However, the powerful graphic abilities supported by current releases of GIS software products has made it increasingly possible for these student projects to have an impressive and professional appearance regardless of the content.

The use of GreenMaps in the classroom can lead to some unfortunate lost opportunities, particularly in the longitudinal possibilities associated with long-term projects. The Rutgers projects produced maps that could have been of great interest to local papers or media (imagine Figure 2 as a full-color insert in the community paper). But the flow of the semester in a landscape architecture studio demands rushing students past the published project into a design project. The ability to revisit a site over time exists as different classes attempt to build on past work. But if the students have been allowed to work fairly independently, then their data and work takes on a very individualistic nature that makes incremental change difficult except in the loosest sense.

Future Opportunities

While community mapping and PPGIS have many success stories to share with the public to demonstrate opportunities for grass roots involvement, the GMS and published GreenMaps need to be considered as powerful opportunities for engaging a larger element of the public. Published GreenMaps have the potential to reach vast audiences because they can be used by children, parents, tourists, community groups, and environmentally-unaware citizens. Although it has been used in over 100 communities, the GMS still has the potential to be used much more widely. The success that these projects have had shows the ease of use and excitement that this process can generate in a community group. Examples of these impacts are told in the stories included in the new Green Map Atlas (Green Map System 2004).

As an educational tool, applications of the GMS has great potential for a variety of classroom situations. While opportunities for K-12 GreenMapping has been well developed (for examples, see Nishinomiya Green Map (http://www.sanynet.ne.jp/%7Eazeta/greenmap/index.htm) or Dan Earle's work on the Yarmouth Green Map (http://homepage.mac.com/dan_earle/green_map/TOC.html)) , the opportunities for college-level education has been largely overlooked. At Rutgers the

landscape architecture classes have served as an interesting, albeit constrained, experiment in a rather rapid application of GMS. But, the author is currently exploring the possibility of running a semester-long GreenMap project in an Environmental Geomatics class that could embrace the participatory elements and more fully explore the inventory and analysis. The potential for an applied geography or cartography class could significant as well.

Most importantly, GreenMappers should be more actively encouraged to contribute to the growing PPGIS case studies and literature. While they may not be entirely representative of the larger PPGIS field, they certainly fit soundly within the boundaries that have been established thus far.

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