Chapter 5

Mapping campus–community collaborations: Integrating partnerships, service-learning, mapping, and GIS

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Worldwide use of GIS is dominated by business, industry, government, and large academic institutions. The U.S. Department of Labor estimated the market for GIS-related technologies expanded from $5 billion in 2001 to $30 billion in 2005. Yet outside of this "Big GIS" stands the rest of the world, and those who have traditionally not had access to mapping and GIS tools are creating new fields of participatory and community GIS. These new fields apply mapping to varied problems in diverse communities throughout the world, raising the fundamental question, "How does GIS affect the ways in which communities are able to build awareness of their surroundings, develop consensus, and argue persuasively for a better future?" (Goodchild 2002).

Liberal arts colleges, many with close ties to their surrounding communities and a strong desire to be active participants in making their communities better, seem ideally suited to engage in community GIS and community mapping projects. The types and scopes of these projects vary widely, but many have a common goal: to build collaboration between community groups and colleges and address issues of mutual concern. Community GIS, then, is a viable, relevant, and important means for liberal arts colleges to apply GIS and to engage with their community.

Traditionally, participatory GIS or community mapping has roots in local interventions. One strand began primarily in rural areas of the developing world as participatory ethnographic work, a means of encoding "local knowledge" and empowering local populations in response to government and business initiatives (Peluso 1995; Kwaku Kyem 2002). Another strand can be found in bioregionalism, an approach to planning and empowerment based on defining natural and human regions and understanding the relations of environment and human activities in those regions. Mapping specific areas, and their myriad human and environmental phenomena, is a primary

goal of bioregionalism (Aberley 1993). Finally, GIS use is burgeoning in the planning dimension of community development. Asset mapping, for example, is a methodology for conceptual and geographic mapping of community "skills, abilities, and experiences" as a means of moving toward community stability and economic development (Kretzmann, McKnight, and Puntenney 1996).

In a college setting, community mapping projects run a full gamut from simple, short-term initiatives involving GPS data collection of local features, to complex, multiyear projects involving external funding, software teaching, data collecting, and report writing. In this chapter we first provide examples of projects—all initiated at small, liberal arts colleges and all at varying stages of development—then we highlight aspects of service-learning and partnership-building that relate specifically to community mapping projects. Understanding the complexities of a GIS project within the context of a service-learning experience can be critical for its success or failure. We begin with one example of a particularly successful project.

The Ohio Wesleyan collaborative trails project

Since 2001, community members and the recreation department in Delaware, Ohio, have been collaborating with students and faculty from Ohio Wesleyan University (OWU) to develop a system of networked bicycle paths. Using GIS and GPS, we are researching, mapping, and analyzing a system of bicycle paths that connect neighborhoods, schools, commercial areas, and recreational facilities throughout the city (figure 1). The City of Delaware Recreational Trails Project has benefited

Survey will help plan city recreational trails

OWU senior also planning cleanup of abandoned tracks

By MARGO BARTLETT
Features Editor

A handful of Delaware residents took part last summer in a survey about their community. The two-part exercise had them plotting out neighborhoods and frequent destinations on a map, then sorting photographs according to preference.

Analysis of participants' responses will help determine perceived neighborhoods in Delaware, including safe areas and unsafe areas, said Ohio Wesleyan University senior Tim Hawthorne. The survey results will help the city of Delaware as it plans and builds multi-use recreational trails.

Hawthorne, who is working with OWU assistant professor John Krygier, became involved in the project in a geographic information systems class last year. Two grants have helped him pursue the study, which is his senior honors project.

The summer survey was a test, Hawthorne said; he plans a larger study later this year.

A Summer Science Research Program grant allowed Hawthorne, a geography major from Chillicothe, to continue his work through the summer. Last spring, Ohio Campus Compact named him one of four Ohio Student Citizen Fellows, a designation that included another grant, which he is applying this year toward the study.

He reported on the project at the national conference of the North America Cartographic Information Society, held in Columbus last month, and will give an updated presentation at a March conference in New Orleans.

Meanwhile, he's planning a cleanup of the 1.5-mile section of railroad track acquired in October in an agreement among the Ohio Rail Development Commission, CSX Transportation and the city of Delaware. The track will be converted to a multi-use trail.

The cleanup is planned for late February or early March. Hawthorne hopes to involve OWU students and organizations, along with community organizations and individuals.

Krygier said his students have worked closely with several Delaware city staff members and citizens as part of the project. The cooperation he's seen among the city, OWU and community members involved with the trails project is encouraging, he said.

"I think it's something everyone agrees is a positive thing," he said.

Delaware Parks and Recreation Director Randy Smith said OWU classes have been involved with Delaware's bikeway plans for at

Please see TRAILS, Page 3

Gazette/Judd Hayes

Ohio Wesleyan University senior Tim Hawthorne, left, and OWU assistant professor John Krygier check a section of railroad track near South Sandusky Street that will be converted to a multi-use trail.

Figure 1. Newspaper article about the Ohio Wesleyan recreational trails project.
Courtesy of the Delaware Gazette.

all parties. Students are learning GIS and mapping technologies in a real-world application, as well as learning about the trails and about the urban planning process in general. City residents have received technical and research assistance from OWU faculty and students, enabling them to document their vision of a comprehensive system of recreational trails in the city of Delaware. Finally, Delaware now has a detailed plan for a project recognized as an important potential improvement to the quality of life there.

The project initially focused on the city, but success is contagious and the project soon expanded to encompass the entire county, mapping both trails and green spaces. The Delaware County Trails and Green Spaces map is an early version of a comprehensive overview of existing and potential trails and green spaces in the county (figure 2). In the spring of 2005 a countywide nonprofit trail development group began planning for a countywide system of bike trails. Several potential trails will be thoroughly surveyed and mapped in a collaboration between community members, Ohio Wesleyan students, and faculty.

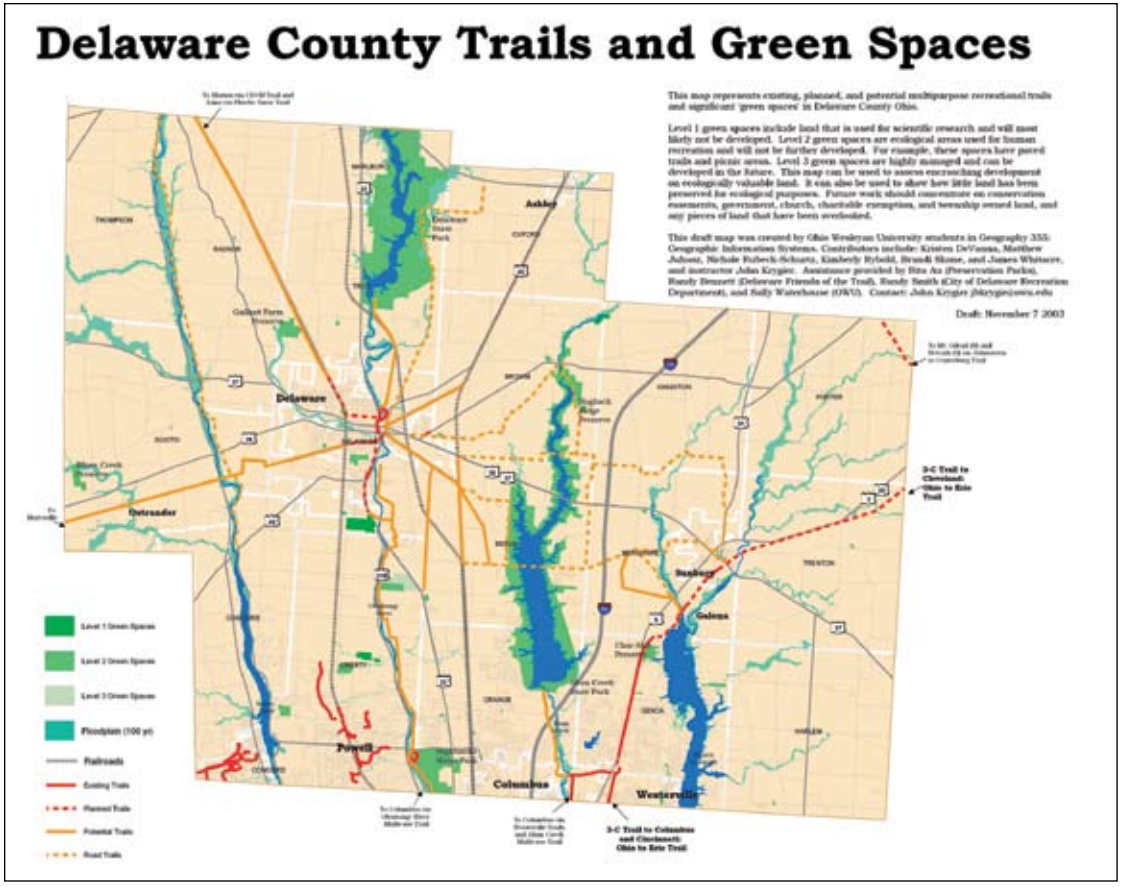

Figure 2. Delaware County Trails and Green Spaces map.
Delaware Appraisal Land Information System (DALIS) Project.

Teams and team projects

The Ohio Wesleyan project illustrates a successful collaboration. We attribute our success to hard work from many participants who have many other demands on their time, though patience had a lot to do with it too. It was good fortune to engage with a nascent effort that attracted significant community attention, as it can take years for a project to gel and move forward.

Inspired by the model of the trails project, a conference on Mapping Campus–Community Collaborations was held in 2004 at Ohio Wesleyan University.[1] The conference brought together ten teams (consisting of liberal arts faculty, staff, students, and community members) to develop collaborative community-based projects that used GIS (figure 3). Over the course of several days, each team iteratively defined and developed its goals and objectives, while hearing presentations by experts on exemplary collaborative community projects, geographic and spatial thinking, forging partnerships, service-learning, and reflective learning. The ultimate outcome for each team was an action plan ready to take back to campus and implement.[2] This action plan provided a clear sense of the issues, many detailed later in this chapter, that must be understood before a collaborative project begins.

Figure 3. Photo of teams conferring at the Mapping Campus–Community Collaborations conference held in 2004 at Ohio Wesleyan University.

Projects developed at the 2004 conference are typically initiated by liberal arts faculty, staff, and students. We will highlight several of these conference projects (from among the hundreds in existence worldwide) as representative examples as we review important tenets of GIS and service-learning and partnership building. One year after the conference, some of the projects were established and productive, while others were stalled—not unusual for community collaborations.

Carleton College: Buckthorn identification and eradication. Buckthorn is an alien shrub of Eurasian origin, originally planted for ornamental purposes along fence lines and wildlife habitats. Now we consider it undesirable, as it hosts organisms that threaten agricultural crops and provides inadequate protection of erosion-prone stream banks. The Carleton group, consisting of faculty and librarians, planned to survey and map buckthorn infestations (using GPS and GIS) in Northfield, Minnesota city parks, as part of an eradication effort. Once the infestations are mapped, GIS will be used to assess the viability and potential cost of buckthorn removal. This is a collaborative project between Carleton students, faculty, staff, and city and community environmental groups.

Grinnell College: Mapping Grinnell parks. The Grinnell College group—consisting of librarians, the college's biological field station manager, a Grinnell city planning consultant, and a community member from a local land stewardship program—is collaborating with the city and community

groups to establish a master park plan. Their initial goals included defining the function of each city park and suggesting future and specialized park development. Grinnell faculty, staff, and students will engage with the community on park-related issues and assist in the use of GIS, particularly the development of a GIS database of park-related data. Progress has been made on the project—students and community volunteers started by mapping the condition of trees in local parks (figure 4).

Macalester College: Land-use plans in St. Paul, Minnesota. Together, the Geography Department and the Community Service Office at Macalester College have engaged for many years in community collaborations involving GIS. One current project will assist community members in the seventeen planning districts with city-required land-use plans. The Macalester group will help each district to define land-use goals unique to their area and develop maps using GIS as part of this process. Students in a Macalester GIS course will participate in this collaborative project, working with different districts and community members.

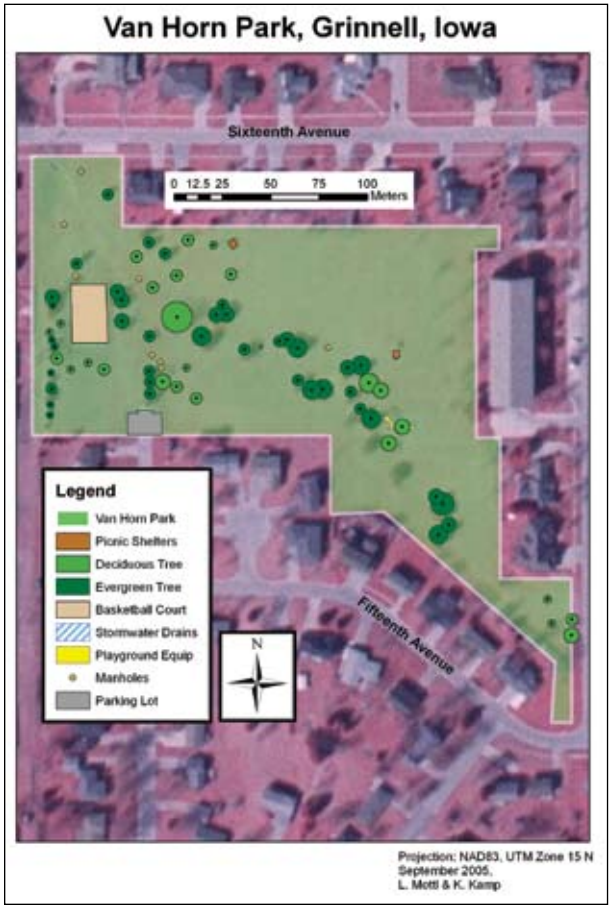

Figure 4. Maps of trees and conditions from the Grinnell College Collaborative Project. ISU GIS Facility and the Iowa Geographic Image Map Server.

Middlebury College: Using GIS with local social services. The Middlebury project continues a collaboration between the Champlain Valley Head Start office, the Addison County United Way agency, Middlebury College's Alliance for Civic Engagement office, and the Middlebury College Geography Department. The program's overall objectives are to provide information about available social services, such as health-care and day-care facility locations, through an Internet-based mapping service. Personnel at these local community service agencies are integrally involved with all aspects of this mapping project, from designing the interface to identifying the specific information that the maps will provide—that which they have determined to be most useful and necessary.

Otterbein College: Mapping Ohio's revolutionary patriots. The Otterbein project seeks to reveal how GIS and local history can assist in meeting geography and history educational requirements (social studies and technology) for middle school students. The project entails collaboration between Otterbein faculty, educational technology students, regional public school teachers, elementary school students, local genealogical groups, and the Daughters of the American Revolution. After the conference at Ohio Wesleyan University, a grant was submitted for funds to support the mapping of local Revolutionary War participant graves by Otterbein students and eighth graders (figure 5). The service-learning course was successfully implemented and a Web site was developed in which grave locations are linked to information about the soldiers.[3] The project has helped connect eighth-grade educational benchmarks, including local history, American history, and geography.

Figure 5. Patriot grave at Old Colony Burying Ground.
Patti R. Albaugh 2005.

Swarthmore College: GIS in the curriculum and the community. The Swarthmore group, consisting of faculty and students, is developing two collaborative GIS projects: a local history project for an economically depressed community in Chester, Pennsylvania, and a watershed pollution and restoration project in suburban Philadelphia. The goals of both projects are to bring GIS into the Swarthmore curriculum, generate funding and support for a campus GIS lab, collaborate with community groups in the region, and address the specific needs of each of the projects.

GIS in service learning

GIS community-based work in higher education has been informed and enhanced by the innovative pedagogy of service-learning. Service-learning is a structured learning process grounded in explicit learning objectives, preparation, and reflection within a community context (Bringle and Hatcher 1995). Students provide community service in response to community-identified concerns while they learn about the community context, the connection between their service and their academic coursework, and their roles as citizens. Structured service-learning helps foster civic and social responsibility, is integrated into and enhances the academic curriculum, and includes structured time for students and participants to reflect on the service experience.

Applying service-learning to community GIS as a learning process challenges students to move out of the traditional classroom, beyond their comfort zone, and into the real world among members of a community who may or may not be like themselves. Applying service-learning to community GIS as a teaching method challenges instructors to reenvision the landscape of learning. To frame this new landscape for students means giving them a well-defined set of learning objectives that clearly link the academic context of the course with the community-based experience (Heffernan 2001; Eyler and Giles 1999). These learning objectives should be clear to both students and community partners so that, regardless of the students' learning environment, their learning is focused, contextualized, and assessed. Participants at the Ohio Wesleyan conference specified learning objectives that ranged from "learning about the interaction between geography and diverse disciplines," and "gaining a deeper sense of how history is important in the creation of local social identity," to "developing the ability to design and execute an environmentally and socially based mapping project."[4] Faculty who design courses to include community GIS may consider the following principles of good practice for service-learning pedagogy (Howard 2001):

- Academic credit is for learning, not for service.
- Do not compromise academic rigor.
- Establish learning objectives.
- Establish criteria for the selection of community placements.
- Provide educationally sound learning strategies to harvest the community learning and realize course learning objectives.
- Prepare and train students for learning from the community.
- Minimize the distinction between the student's community learning role and the classroom learning role.
- Rethink the faculty instructional role.
- Be prepared for variation in, and some loss of control with, student learning outcomes.
- Maximize the community responsibility orientation of the course.

Pedagogical challenges are inherent in community-based GIS, and members of several conference teams at Ohio Wesleyan proffered valuable solutions. Strategies included regular meetings to overcome communication gaps, peer mentoring relationships to train students in GIS strategies, and using familiar lab notebooks enhanced with reflective journaling exercises. In Macalester College's GIS class (Geography 364), students using Ramsey County parcel data to create maps for the planning districts of St. Paul worked in highly successful learning communities of four to

five students and a community partner. Learning groups provided a valuable place to review land-use data, discuss mapping procedures, evaluate the nature of the community, and move closer to articulating district plans.

Students' reflection

Much of what we do with our students in community GIS in a liberal arts setting is experiential. Students move out into the community to prepare maps for nonprofit organizations, historical societies, schools, and government agencies. The students gain new technical skills while they witness GIS in action—GIS helping cities make important decisions about green spaces, plant infestations, health care facilities, recreational trails, and historical sites. However, it is important in these types of service-learning courses to provide opportunities for students to reflect on the service activity to understand and appreciate the intersection between their community-based work, their public contribution, and their academic journey. For one of the project teams, having students develop a deeper understanding of the "productive and humanitarian use of GIS in real-life, real time situations" was an important learning outcome.

To achieve this understanding, reflective exercises for students are critical. Reflection can take many forms, including small learning groups, process meetings in the classroom, journal writing, formal essays, workshops, class discussions, and public presentations. As instructors we need to provide a reflective lens of discovery for our students, helping them to uncover the ethical, social, economic, and political dimensions of the maps they are forging with community partners. National Campus Compact, a national coalition of college and university presidents that promotes service-learning and the civic purposes of higher education, offers guidelines for effective reflection for faculty embedding service experiences into their courses.[5]

The reflective process allows students to engage with the material they are creating for the community in more meaningful ways. For example, one project team noted the illumination that resulted from students' reflection on how to create a map that represented different categories of people as different colors on the map. The process of creating divisions between groups prompted discussion of diversity, provided a profound geographical learning experience, and also made evident "inequities and inequalities in communities" based on the estimated market values of homesteaded parcels.

Community partnerships

Community GIS is dependent on durable, carefully planned, and formally articulated partnerships between the academy and the community. Partnership building is greatly enhanced when both faculty members and community members share community-identified goals and worldviews (Jacoby and Associates 2003; Strand, Marullo, Cutforth, Stoecker, and Donohue 2003; Gilbert and Sameh 2002). For example, the Swarthmore College team is collaborating with the Chester Consortium for a Creative Community (C4), an organization whose goal to "stimulate problem-solving" with respect to an economically depressed community aligns well with the team's academic goal of apply-

ing GIS methodologies to community problems. With the assistance of teams of college students, C4 will realize their vision of creating a history of the city of Chester to demonstrate to younger generations the "precious places" of a once-vibrant city. Students will produce a CD-ROM on the history of Chester for high school students. The CD includes GIS maps created from demographic and geographic data to inform classroom exercises on the structural issues that have "conspired to generate urban poverty."

The sustainability of new partnerships depends on regular communication and time dedicated to relationship building. Participants need to negotiate and to assign tasks, to talk together about parity and inequalities in the relationship, and to build trust. Community partners and university faculty usually come to the relationship accustomed to very different organizational structures, norms, cultures, and professional behaviors and this difference can impact our ability to build alliances. Also, our watches tell very different time. The bells in the ivory tower chime at the beginning and end of a quarter or semester. Community clocks follow grant-funding cycles, nine-to-five work shifts, and seasonal variations. Partnerships need time to grow a culture of mutual respect and communication. When a course includes community GIS, it is essential to welcome community partners into the classroom, to fold students into the partnership, and together formulate questions and process the gathered information. As one project team noted, "face-to-face conversations among students, in a group with the community representative, are highly interactive and valuable. Each side has questions about data, mapping procedures, and the nature of the community."

Successful partnerships are mutually beneficial and reciprocal when the needs of each collaborator are prioritized and resources are shared. CAPHE (The Consortium for the Advancement of Private Higher Education) researchers for the Council of Independent Colleges suggest that community partners may view relationships with colleges and universities from a cost/benefit standpoint (Liederman, Furco, Zapf, and Goss 2003). Costs of collaboration can include additional work and supervision, use of staff resources, time lost, loss of organizational identity, and a lack of parity. Benefits of partnerships can include the advancement of the group's mission, new perspectives gleaned from students and faculty involvement, access to campus knowledge and resources, grant opportunities, and credibility (Liederman, Furco, Zapf, and Goss 2003). Reviewing the costs and the benefits of the partnership for all stakeholders as the relationship is formed is helpful.

Researchers advise that parity between partners emerges when all stakeholders are focused on a long-term, sustainable relationship that will produce meaningful change for local and global communities (Liederman, Furco, Zapf, and Goss 2003). Partnerships between the academy and local planning districts, county boards, chambers of commerce, school districts, historical societies, and environmental agencies can benefit by setting up advisory boards and planning teams who share the authority for prioritizing goals and sharing financial resources. Formal partnership agreements that articulate shared goals, strategies, learning outcomes, roles and responsibilities, financial and liability issues, effective communication strategies, and assessment criteria can also help to develop both parity and trust between partners. Some of our project teams have emphatically embraced reciprocity and committed to equal sharing of resources by writing collaborative grants and sharing the costs of GIS equipment and software. For example, the city of Grinnell and two local organizations, Trees Forever (a volunteer-based tree-planting group) and Imagine Grinnell (a grassroots

community organization), agreed to contribute funding to purchase new field equipment for the Grinnell College project to define the functions of local city parks, identify areas for bikeway development, and provide tree-mapping inventories. Acquiring a more precise GPS handheld computer and necessary software will expedite data collection time and facilitate the use and maintenance of park maps and inventories. According to the Grinnell College team, "agreeing to share the equipment cost and use has been a big step in solidifying the partnership."

Faculty members developing partnerships and incorporating service-learning pedagogies need not innovate in isolation. Many campuses have centers for community engagement, community service, community-based service-learning, or public service that can (1) assist faculty in brokering new partnerships for GIS collaborations, (2) formulate partnership agreements, (3) provide pedagogical support for courses, and most importantly, (4) ensure that the college or university is ready to "step up" and engage with organizations beyond the context of the GIS partnership.

Sustainable community mapping projects

Campus and community collaborations involving service-learning are a challenge and positive outcomes from such partnerships can be elusive: mapping and GIS add to these challenges.

GIS, GPS, and related technologies are expensive and require specialized knowledge to learn and use. Even if GIS software and hardware are provided by one of the partners (usually a university), it is vital to consider limits on access to the technology (can partners use the technology, when, and where?). Does a software license allow off-campus use or installation of the software on an off-campus computer? Also important are issues of training and use of the software and hardware. What skills do project participants have and are there provisions for training? If skilled GIS users are part of the team, are they responsible for training other participants or actual GIS work or both? What kind of time commitment can they make? If the skilled GIS users are students, will they be available during the summer, on weekends, or evenings (when off-campus partners may be able to meet and work)?

Leveraging future financial support is also critical for the long-term sustainability of participatory community mapping. Financial support may support equipment purchases and fund staff or student help. Many teams at the Ohio Wesleyan conference noted that funding and staffing resources greatly influenced their ability to get projects off the ground. They anticipated the need to secure local and national grants to support their projects. Future collaborations may well depend on the success of pilot projects, such as the ones described in this chapter, to help funders take notice of this important work.

Even with present and future support for GIS technology and skills, it is important not to underestimate the diversity of issues that will affect the positive completion of a collaborative project. GIS data is a good example of an issue that is often poorly understood at the onset of a collaborative project, and this in turn can ultimately undermine the project. Usable data can be expensive and time consuming to acquire. The Ohio Wesleyan Recreational Trails Project owes some of its success to the availability of very detailed and extensive county-level GIS data, maintained and provided by

the GIS department in the county. In many mapping and GIS projects, acquiring data comprises the majority of time and expense. To avoid high data acquisition costs, self-collected data is often used. But the costs of technologies used to collect and process such data are not insignificant, nor is the large time commitment. The quality of the data is of fundamental importance: what standards are developed to ensure that data is systematic and appropriately accurate for the given project? The reason that data purchased from private providers is expensive is that good data is expensive to create.

Also necessary to sustain projects is the institutionalization of GIS and related technologies. Many liberal arts schools do not have a geography department. Where, then, will GIS and its associated hardware and software—and the people who maintain and use it—be situated, and who will pay for it? At Otterbein College, GPS technology has found a home in the Education Department and is now an integral part of an educational technology course offering undergraduates the opportunity to teach eighth graders how to apply GIS tools to the preservation of American revolutionary history. Mapping teams of college students and elementary school children are using the technology to identify patriot graves in a historical Ohio cemetery as part of a collaboration with the Daughters of the American Revolution and local genealogical societies. This course is part of the Education Department's initiative to become a fully engaged service-learning discipline and will be embedded in the department's curriculum for years to come.

Finally, what are the prospects for institutionalizing GIS off-campus on the sites of our community partners? The recreational trails project at Ohio Wesleyan has benefited greatly in having partners (planners, park managers) who have acquired GIS technology and skills, so they are not wholly dependent on university GIS technology and skills. Universities and colleges need to serve as capacity-builders for these organizations, assisting with training and leveraging future resources to support continued use of these technologies for the common good.

Concluding thoughts

When a campus collaborates with community members, applying GIS to projects of shared interest, we create a complex synthesis of teaching, collaborative work, technology, and real-world engagement. Such projects may seem complex or complicated, but they hold great potential for all participants. Instructors should consider how such projects can reshape their pedagogy: moving beyond closed classrooms, passive lectures, and canned exercises to expose students to collaborative work, reflection, and learning with other students, faculty, and community members. Students learn GIS skills, problem-solving skills, and strategies for effective collaboration. Learning how to collaborate, and learning the benefits of collaboration when solving problems of shared concern, are critical elements of a sound education. Although GIS technology and concepts are often channeled to serve the interests of big business, big government, and big universities, community projects demonstrate how GIS can be used for humane purposes that meet the needs of communities and the mission of liberal arts colleges. The benefits of well-conceived, successful campus and community collaborations using GIS are diverse

and important. Take up an attainable challenge and make a difference in the communities surrounding your campus.

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Notes

1. See Mapping Campus-Community Collaborations at go.owu.edu/~jbkrygie/comgis/comgis_nitle.html.
2. You can obtain a copy of a blank Action Plan as a PDF from gis.nitle.org/~diana/CommunityGISActionPlan.pdf.
3. See teachers.ohiodar.org/cemeteryresearch/otterbein/index.htm.
4. Anonymous quotes from project teams were taken from action plans and progress reports associated with the MITC OWU Conference.
5. See www.compact.org.

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