



# The 21<sup>st</sup> Century Campus Map: Mapping the University of Wisconsin-Madison

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## Abstract

We present two interactive, online maps of the University of Wisconsin-Madison campus: The University of Wisconsin-Madison Interactive Campus Map (<http://map.wisc.edu>) and the Lakeshore Nature Preserve Interactive Map (<http://www.lakeshorepreserve.wisc.edu>). Although these two projects represent the same university campus, the former follows a *wayfinding-based model* of campus mapping while the latter follows an *atlas-based model* of campus mapping. The purpose of the University of Wisconsin-Madison Interactive Campus Map is to search for, navigate to, and retrieve information about specific features on campus. The purpose of the Lakeshore Nature Preserve Campus Map is to present the rich history and unique geography of the University's Lakeshore Nature Preserve. Both maps were produced by the University of Wisconsin-Madison Cartography Laboratory and developed primarily in Flash 8 using ActionScript 2.0. We hope that the University of Wisconsin-Madison Interactive Campus Map and Lakeshore Nature Preserve Interactive Map provide guidance through example for those undertaking similar projects

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*Editorial Note:* University campuses are complex and difficult to navigate for the tens of thousands of people that visit in a given year. The campus map is therefore a vital piece of information, challenging in its design in that it covers a large space, needs to incorporate tremendous detail about building, housing, recreation, and access, and, needs to be displayed on a relatively small computer screen. Interactive web mapping has provided the tool-set necessary to convert this complex, massive, dataset into a manageable form (embedding information in mouse-overs for example). In addition to navigation, campuses are storehouses for many layers of thematic datasets, such as historical information about land use, areas for community gardens, community plans, recycling bin locations and routing - to name a few. Campus maps then can be both navigational and thematic in nature.

Universities act as a 'living lab' where students, faculty and staff have the opportunity to come together to work on projects that benefit the university and give the students applied project experience. Campus maps, for navigation and/or for specific themes such as historical representations of the landscape, are perfect examples of these integrative projects between students and the university. This paper, in addition to the two other papers in this series, is an example of one such project.

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# 1. Introduction: Two Approaches to Interactive, Online Campus Mapping

Universities across the world have fully embraced the digital revolution. Because of this, the 21<sup>st</sup> century university student understands his or her campus in a profoundly different manner from students in decades past. Today, students are enveloped in wireless Internet access, are never more than a few thousand feet away from a student computer station, and manage their various student responsibilities and social activities through digital, web-based applications. Students acquire information about their topics of study as much through online course materials and information repositories as through a lecturing professor in a classroom. We argue that students expect to acquire spatial information about their campus in a similar, digital format and that the campus map therefore should be an interactive, online tool that facilitates spatial information acquisition in a manner familiar to the student brought up in a digital environment.

In the following sections, we describe the development of two interactive, online campus maps produced by the University of Wisconsin-Madison Cartography Laboratory, each taking a different approach in its design. We describe these two approaches as the *wayfinding-based model* and the *atlas-based model* for 21<sup>st</sup> century campus mapping, with differences similar to reference versus thematic mapping (see Slocum et al., 2005). In the wayfinding-based example, the University of Wisconsin-Madison Interactive Campus Map (<http://map.wisc.edu>), the focus is upon searching for and locating specific university features (departments, buildings, athletic areas, etc.), navigating the campus efficiently to reach them, and linking to available information about the desired features posted on University of Wisconsin-Madison websites. Here, the map serves as an organizational device, or spatial catalogue, for retrieving information about the University. Design of the University of Wisconsin-Madison Interactive Campus Map follows that of similar, wayfinding-based mapping applications such as Google Maps (<http://maps.google.com>), Map24 (<http://www.map24.com>), and the University of Oregon Campus Map (<http://map.uoregon.edu>).

In the atlas-based example, the Lakeshore Nature Preserve Interactive Map (<http://www.lakeshorepreserve.wisc.edu>), the focus is upon providing numerous geographic discourses about an important place on campus, the Lakeshore Nature Preserve. Here, the map allows students to understand the Preserve's rich history and unique geography through multiple readings of the Preserve's physical and cultural landscape (after Meinig, 1979). Design of the Lakeshore Nature Preserve Interactive Map follows that of similar, atlas-based mapping applications such as the Atlas of Oregon CD-ROM (<http://infographics.uoregon.edu/projects/atlasCD.htm>), Monticello Explorer (<http://explorer.monticello.org>), and the Theban Mapping Project (<http://www.thebanmappingproject.com>).

## 2. The Wayfinding-Based Model: The University of Wisconsin-Madison Interactive Campus Map

### 2.1 Purpose and Development Description

The creation of the University of Wisconsin-Madison Interactive Campus Map (Figure 1) was undertaken with the objective of providing an easily accessible and navigable gateway for users to access university departments, buildings, resources, and facilities. The University of Wisconsin-Madison Interactive Campus Map is the latest iteration in a series of University of Wisconsin-Madison campus maps designed to assist campus wayfinding, although the volume of information available via this map is exponentially greater than its paper predecessors. The map has two primary audiences: (1) potential and new University of Wisconsin-Madison students unfamiliar with the University of Wisconsin-Madison campus, requiring general information about the spatial configuration of campus features, and (2) existing students and faculty familiar with the spatial layout of campus, but requiring specific details about one or more of its features. With this in mind, design of the University of Wisconsin-Madison Interactive Campus Map encourages interactive exploration of the full campus extent while also providing an immediate means to query specific locations on campus or information about campus. Such site navigation follows Schneiderman's (1996, 337) mantra "overview first, zoom and filter, then details-on-demand."

The development of the University of Wisconsin-Madison Interactive Campus Map began in September 2005. The first beta version was released the following May, and the full-featured version went live in December 2006. The map was developed by one full-time employee with an undergraduate degree in computer science and three University of Wisconsin-Madison cartography students working part-time. The project was funded by University of Wisconsin-Madison Communications (<http://www.uc.wisc.edu/>). The majority of development was completed in Flash 8 using ActionScript 2.0 (AS2); Adobe Illustrator CS2 and Adobe Photoshop CS2 were also used for preparation of the data layers. Zoomify (<http://www.zoomify.com>) was integrated with AS2 to yield more efficient map navigation through raster tiling. The mapped data were stored in a MySQL database and a simple client-side interface was developed using Ruby on Rails to allow for administrative revision of individual map features and information content outside of the Flash environment.

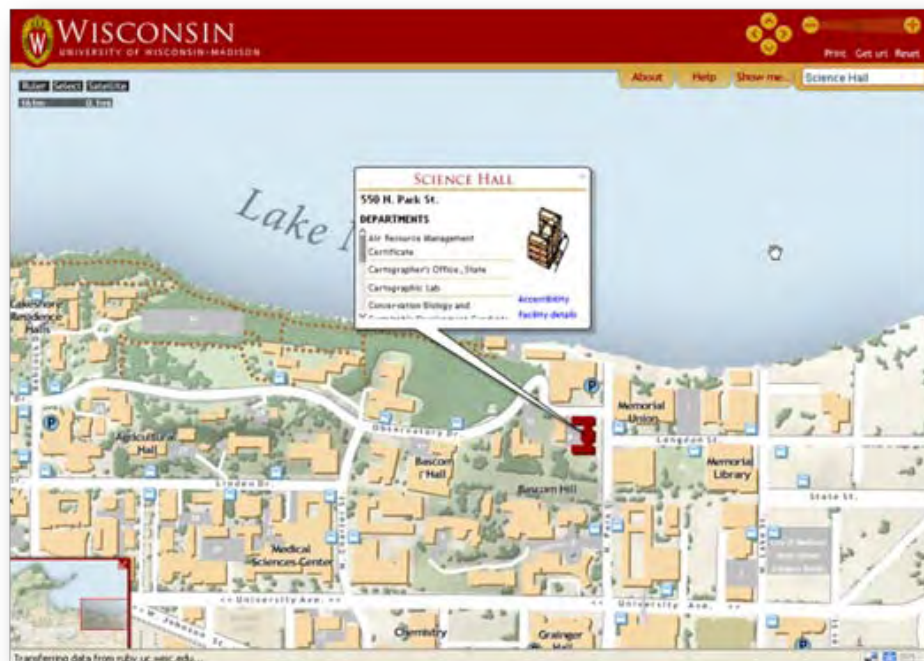


Figure 1. The University of Wisconsin-Madison Interactive Campus Map (<http://map.wisc.edu>).

## 2.2 Data Sources and Site Navigation

Because of its focus on wayfinding, and because much of the information content is populated dynamically from extraneous websites, construction of the University of Wisconsin-Madison Interactive Campus Map required relatively few spatial data sources. Spatial data for campus buildings, transportation networks, athletic areas, and vegetation cover were derived from a redesign of the University of Wisconsin-Madison Campus Print Map (<http://www.vip.wisc.edu/images/campusMapFinal.jpg>). The departments and programs located within each campus building are gathered in real-time from an external university website maintained by the University of Wisconsin-Madison Space Management Office. The orthophotomap layer and shaded relief image were provided by Dr. Frank Scarpace of the University of Wisconsin-Madison Environmental Remote Sensing Center.

Upon loading the Campus Map, the user is presented with three primary means to access the map's data: (1) a query field to search for academic departments, building names, campus areas of interest, and bus routes; (2) direct navigation to a location or object using a variety of map browsing methods recommended by Harrower and Sheesley (2005) (e.g. direct manipulation, zoom and re-center on mouse click, navigator window, interactive compass/zoom slider, and keyboard shortcuts); and (3) a list of 'popular'

campus sites and resources, such as arts venues, public parking, and visitor centers. Selection of a query result or a popular list entry re-centers the map upon the chosen feature, highlighting its spatial bounds. When the zoom level is changed, a dynamic semantic labeling engine displays a scale-dependent subset of map object labels, ensuring that the labels for the most important map objects are always legible. Other notable features of the University of Wisconsin-Madison Interactive Campus Map include an interactive distance measurement tool, a hybrid representation of the campus map using a vector data overlay on an orthophotomap background instead of the reference raster map background, and the ability to create a unique URL address for a user-generated map, producing a permanent link to a particular map parameter configuration.

### **3. The Atlas-Based Model: The Lakeshore Nature Preserve Interactive Map**

#### **3.1 Purpose and Development Description**

The Lakeshore Nature Preserve is a 300-acre plot (roughly one-third of the total campus area) of protected campus land owned and maintained by the University of Wisconsin-Madison. Although the Preserve has a united front today in the form of the Lakeshore Nature Preserve Committee, its history is one of contestation between parties interested in expanding development into the Preserve lands and parties interested in protecting the donated Preserve lands from such expansions. A primary function of the Preserve Committee is to combat any future development by articulating and disseminating both within the University and to the larger public the value of maintaining a large natural area. The goal of the Lakeshore Nature Preserve Interactive Map (Figure 2) was to tell numerous geographic stories about the Preserve using an atlas metaphor to the end of enhancing public awareness about and support for the Preserve as well as legitimizing and solidifying the Preserve as a vital fixture in the campus landscape.

Development of the Lakeshore Nature Preserve Interactive Map began in June of 2006, with the first beta version released in September of 2006. Following several rounds of usability testing and revision (see [Roth and Harrower, 2008](#), for a detailed account of the usability evaluation and findings), the full-featured version went live November 2006. The project was funded by the Lakeshore Nature Preserve Committee, the Friends of the Lakeshore Nature Preserve, and generous private donations. The map was developed by three University of Wisconsin-Madison cartography students, one working full-time and two part-time. Development was completed in Flash 8 using ActionScript



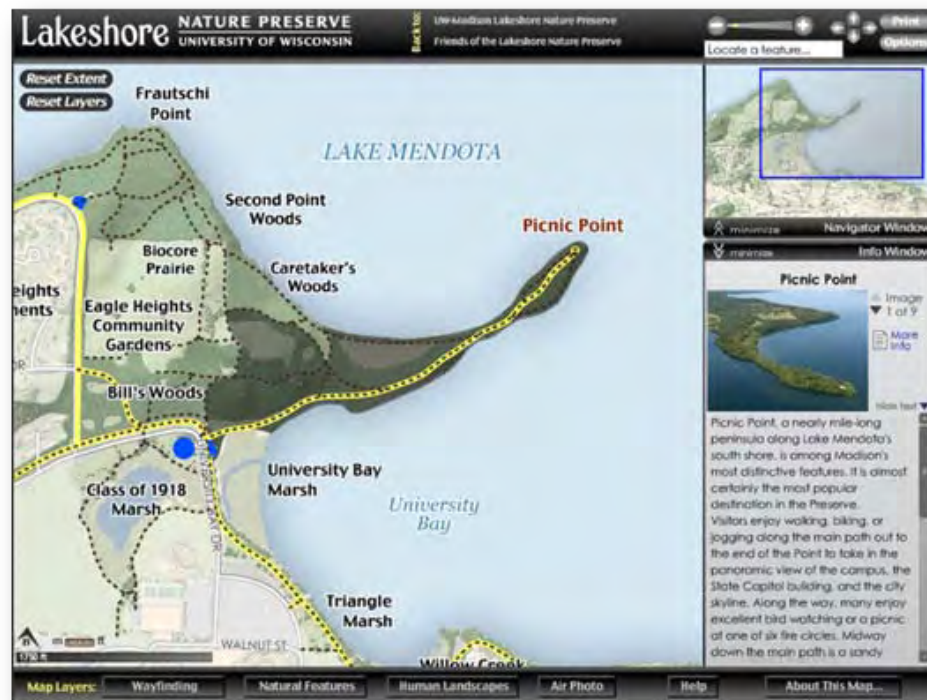


Figure 2. The Lakeshore Nature Preserve Interactive Map (<http://www.lakeshorepreserve.wisc.edu>)

2.0; Adobe Illustrator CS2, Adobe Photoshop CS2 and ArcGIS 8.0 were also used for preparation of the data layers.

### 3.2 Data Sources and Site Navigation

Due to its thematic emphasis, data for the Lakeshore Nature Preserve Interactive Map was derived from a much wider variety of sources than the University of Wisconsin-Madison Interactive Campus Map. Like the University of Wisconsin-Madison Interactive Campus Map, the Lakeshore Nature Preserve Interactive Map used the University of Wisconsin-Madison Campus Print Map as its base layer for campus buildings, transportation networks, and athletic areas as well as the orthophotomap produced by Dr. Frank Scarpace the University of Wisconsin-Madison Environmental Remote Sensing Center. Elevation contours and the shaded relief image were derived from the United States Geological Survey (<http://seamless.usgs.gov>). Data on hydrology, present vegetation, future vegetation, existing historical sites, and vanished historical sites were derived from The Lakeshore Nature Preserve Master Plan (Cronon et al., 2006). Soil data was derived from Natural Resources Conservation Service of the United States Department of Agriculture (<http://soils.usda.gov>). Data for the witness trees layer was

derived from the Land Ordinance of 1785 (<http://digicoll.library.wisc.edu/SurveyNotes>) and data for the 1939 vegetation layer was derived from the 1939 Bordner Survey (<http://steenbock.library.wisc.edu/general/bordner.html>). Data on the American Indian habitation sites and mounds was derived from the Archaeological Site Inventory of the Wisconsin Historical Society (<http://www.wisconsinhistory.org/archaeology>). The historical air photos were collected from a variety of sources and processed by Dr. Sam Batzli at the University of Wisconsin-Madison Environmental Remote Sensing Center. All other data layers were compiled by members of the Lakeshore Nature Preserve Committee. A full account of the data sources is provided at <http://www.lakeshorepreserve.wisc.edu/map/about.htm>.

The Lakeshore Nature Preserve Interactive Map is structured so that a user can first examine a general atlas theme then zoom to a specific feature of interest within the atlas theme to retrieve specific information about it, again following Schneiderman's (1996, 337) mantra. When the map loads, several base layers, mostly for reference from the wayfinding menu, are immediately provided. Use of the map begins by selection of a particular reading of the Preserve from the bottom menu bar or searching for a theme or feature using the search box. Selection of an individual map symbol from a visible atlas theme activates an information window containing a textual description of the feature, photographs and other images related to the feature, and a link to the main Lakeshore Nature Preserve website with a full description of the feature and its importance to the atlas theme. Other notable features of the Lakeshore Nature Preserve Interactive Map include map browsing flexibility (direct manipulation, zoom and re-center on mouse click, navigator window, interactive compass/zoom slider, and keyboard shortcuts), an interactive distance measurement tool, an analytical comparison tool for examination of the relations between two map layers composed of vector polygons, and an animated help system.

## 4. Conclusions

The previous two sections summarize the University of Wisconsin-Madison Interactive Campus Map and the Lakeshore Nature Preserve Interactive Map projects completed by the University of Wisconsin-Madison Cartography Laboratory. The interactive, online development of these maps follows the broader university transition to digital media for retrieving information and organizing student activities. Although both maps represent the same campus, the two interactive, online maps take two distinct approaches to campus mapping. We describe these two different approaches as a wayfinding-based model and an atlas-based model of campus mapping. As demonstrated through the two examples, both approaches can produce a useful and engaging tool. However, we encourage the cartographer to think carefully about the purpose of the map be-

fore selecting one approach over another. These two approaches in practice may be the antipodes of a continuum, with a given project falling somewhere between, as the University of Wisconsin-Madison Campus displays some characteristics of the atlas-based model (e.g. mapping all instances of a popular theme or topic) and the Lakeshore Nature Preserve Interactive Map displays some characteristics of the wayfinding-based model (e.g. the wayfinding menu of reference features and the interactive distance measurement tool). We hope that the University of Wisconsin-Madison Interactive Campus Map and Lakeshore Nature Preserve Interactive Map provide guidance through example for those undertaking similar projects.

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