GIS for Public Gardens, Parks and Zoos
Advancing your organization's unique needs with geographic information systems

Alliance for Public Gardens GIS
The Missouri Botanical Garden uses GIS information for a wide variety of uses including updating collection information (top), vegetation mapping (bottom left) and mapping irrigation controllers (bottom right).
What is GIS?

You’ve heard the term GIS, know that it stands for Geographic Information System, and understand that it is a robust tool that combines technology and maps. You are interested in finding out more about the possibilities and whether or not investing in the resources to take advantage of this type of tool would be valuable for your organization. If any of this describes your situation, this information is you!

The idea of GIS can be difficult to understand. Is it software that you buy? Is it a type of hardware? Is it a profession? Is it a set of information that describes the position of a person, place or thing on the planet? Is it a brand? How do I get it?

GIS is not any one thing, but, as the abbreviation suggests, a system that integrates hardware, software, skilled users and data. GIS gives users the ability to view, store, edit, inventory, manipulate and analyze large amounts of geographical data for a variety of extremely useful purposes.

Because the idea of GIS can be daunting for those unfamiliar with its capabilities, the UC Davis Arboretum, with funding from the Institute of Museum and Library Services (IMLS), has created print materials, presentations, a website, a guide to GIS and variety of training materials to provide those interested in advancing their public garden organizations with the information needed to find out more about GIS and get started! This brochure is just the beginning.

Why Start Now?

At work and at home, we now rely on a host of location-based technologies via our desktop computers, laptops, mobile tablets, and smart phones. GIS is one of the key technologies powering this new ecosystem of information about our world. Along with other mobile technologies, GIS is being adopted by many botanical gardens, zoos, and other public gardens. Several market forces are driving this change:

- GIS is becoming simpler to use and more user-friendly.
- GIS is rapidly moving to fast, affordable cloud-based platforms enabling users the flexibility to edit data in the field.
- Mobile technology is now widely available, faster, and affordable.
- Easy-to-use mobile devices (smartphones, iPads, etc.) link seamlessly to GIS.
- An international collaborative consortium, the Alliance for Public Gardens GIS, provides peer-to-peer support, advice, and encouragement for public garden staff working with GIS and exploring its use.
- A free GIS template for mapping public gardens is now available from the Alliance for Public Gardens GIS.
- Esri, the creator of ArcGIS software, now provides free GIS software, training, books, and conference registration to members of the American Public Gardens Association (APGA).
**What Can GIS Do?** *Connect workers.*

**Executives.** When leaders have a clear view of what is going on at every level they can easily weigh alternatives and make informed choices about where and when to invest the time and money needed to meet important strategic goals.

GIS executive dashboards offer a high-level, visually compelling, map-based views of key performance indicators (KPIs) and can be powerful visual tools that summarize the most critical information that senior management need to run their organization effectively.

**Employees across departments.** When a GIS is used across many departments in a botanical garden or zoo, from operations to communications, shared data can be collected once and then used many times; one department will benefit from the work of another.

New information never before mapped or perhaps known only by staff who originally installed a landscape, managed the construction or the renovation of a site, can now be captured, included in the GIS, and shared with everyone from gardeners to marketers.

**Field staff and volunteers.** The latest GIS tools, when connected with cell phones, tablets, and other mobile technologies, can consolidate information about a multitude of diverse garden and museum work tasks currently documented in hard-to-find files and scattered across many departments, into a single, streamlined workflow. This is revolutionizing how, where, and to whom information is available—staff or volunteers in the field can now have real time, critical project information at their fingertips without leaving the work site.

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*At UC Davis, staff from the Arboretum and Public Garden are working to map the extensive collection of trees throughout campus. Field workers document location, maintenance schedule and health of each tree. Curators and volunteers note the importance of each specimen to the campus collection while fundraising personnel note whether or not the tree has been dedicated by a donor. This information can then be used to inform senior management involved in campus planning and development.*
Using GIS, arborists at UC Davis record the size, health and maintenance needs of heritage trees (above left); groundskeepers and tree trimmers schedule upkeep based on information from the arborists (above right); senior management and planners use the data when planning areas for new construction (bottom).
Locating plant specimens like the fried egg poppy or lady tulip (top left) during their blooming periods is easy, but with GIS curators know exact specimen locations regardless of the season; curatorial volunteers assist staff with documenting plant accessions (top right); finding a specific tree is not a treasure hunt with the help of GIS: Hunnewell Building Magnolia Collection from the Arnold Arboretum of Harvard University (bottom).
What Can GIS Do? Save time and money.

Locate information quickly. GIS can reduce costs caused by duplication and loss of information. This is not a problem that public gardens alone face. In large commercial institutions, research shows the following:

- Staff spend almost 9 hours each week searching for lost information.
- Staff often re-create content that already exists.
- Almost 30% of the work week is spent managing incoming information with inefficient tools that were not designed for elegant, rapid information delivery.*

Eliminate work-arounds. The return on investment (ROI) for incorporating GIS into your workflow ranges from 38% for upgrading an existing information system, to over 600% for putting in a new integrated knowledge management system*. The savings come from eliminating costly work-arounds created by staff to independently track information.

Speed Planning. Thanks to GIS, what was once an overwhelming task of creating multiple maps to explore competing alternatives and outcomes has become a thing of the past. Live maps generated by the GIS can provide clear metrics on project alternatives, and compare the costs and benefits of competing ideas.

Reduce Maintenance Costs. Facilities managers using GIS-created maps spanning multiple trades can detect trends related to service requests. When data suggests an update or renovation, they have the tool they need to make intelligent, cost-effective decisions knowing where new construction is planned, when system maintenance is required and where future demolition is planned.

Plant documentation serves as the backbone of any public garden. Record keeping is critical for teaching, research, and planning, but especially difficult to manage with living specimens that require regular inspections, care and maintenance. To assist in this important process, GIS is rapidly being adopted to document every element necessary for plant curation. GIS combines and displays collection data so that the process of locating specimens is not only streamlined for staff, but this information can also be accessible to the public where it will serve larger conservation purposes.

What Can GIS Do? Engage your community.

**Inspire Visitors.** Just as facilities and curatorial staff with mobile devices can now update GIS data in the field, garden educators can use the GIS as a foundation to create cloud-based, content-rich mobile tours linked to audio, video, and photographic resources for your visitors and engage garden visitors with location-aware activities with mobile devices that many people already have in their pockets.

**Share Your Story.** The progress your garden is making on restoration projects, new construction or the mapping of a recently planted collection isn’t only of interest to management. GIS builds maps that tell stories, document innovation and record progress which can and should be shared with the public, members and donors with an interest in your success.

**Work with local schools.** Students learn best when working on real-world problems, especially those that can make a difference in their own lives, like community mapping. GIS is widely used for STEM (Science, Technology, Engineering, and Math) education projects in school and museum collaborative projects because it is a powerful tool for discovery, invention and creation, and communication:

> GIS allows students to collect and visualize authoritative data about the question of interest, adding their own data to the map before performing a wide range of analyses on the data in question. GIS problems are steeped in both critical thinking and spatial thinking elements, motivating learners as they learn work-force ready skills. In short, GIS allows STEM students to do exactly what STEM professionals do in thousands of career fields daily.

> Tom Baker, in “Advancing STEM Education with GIS”

Researchers from the Missouri Botanical Garden and Massachusetts Institute of Technology (MIT) are working with upper elementary and middle school teachers to design games in which students move around in the real world but interact with simulated characters on the screen of a handheld and use the handheld to make observations and measurements that are generated by a simulation. Some of the scenarios that they have explored in their games include watershed studies, food web investigations, and a cemetery-based scavenger hunt where students “meet” people who had lived in their community through minibibliographies crafted from historic census records.
Community members, students and retirees interested in gaining new skills or sharing their GIS knowledge are eager to help public garden organizations with mapping tasks.

Arkansas 4-H team leader demonstrates a practical GIS application in the field (top left); Puget Sound Partnership displays a project atlas on their website to give their donors and wider audience the opportunity to see the number of projects they support (middle left); high school students learn about careers in GIS from a specialist with National Resource Conservation Service (middle right); students from the Chicago Botanic Garden gather data to assist scientists’ understanding of climate change (bottom).
Next Steps

It's an exciting time to incorporate GIS into your public garden organization's workflow. Leaders in the industry are working together to create and test products customized to meet the needs of public gardens worldwide.

1. Find out more


Here you can sign-up for email updates, access online training resources including our "Guide to GIS," download PowerPoint presentations that will help you start the GIS conversation with your organizations, find how-to information with helpful resources to kick-start your own GIS community volunteer program, watch training videos and more!

2. Stay connected

Sign-up for the Alliance for Public Gardens GIS newsletter on the homepage of our website.Via email you'll be informed of the latest public garden GIS happenings, the most recent training materials, software downloads, GIS news and GIS training events.

3. Join the community

We realize that many public garden organizations may feel isolated and uncertain about taking on a new, technically challenging project so we've launched multiple social networking sites to share stories, ask questions, mentor others and build a body of shared knowledge.

Of all our social networking sites, our LinkedIn group has become the most active and is a convenient place for staff working with GIS to exchange ideas and explore alternatives.

Join and become an alliance member along with the organizations listed on the following page.
About Us

**Alliance for Public Gardens GIS**

Since 2007, the UC Davis Arboretum has led a nationwide team of botanical gardens and zoos staff—with funding provided in part by the Institute of Museum and Library Services (IMLS)—to develop GIS as a tool to help garden staff manage public gardens more effectively.

**Key Partners**

Key partners include the San Diego Zoo and the San Diego Zoo Safari Park, the Missouri Botanical Garden, the Arnold Arboretum of Harvard University, the Montgomery Botanical Center, the San Francisco Zoo, the San Francisco State University, the Center for Integrated Spatial Research at University of California, Santa Cruz, and the Chicago Botanic Garden, among many other gardens. The Alliance for Public Gardens GIS grew out of these efforts.

**Special Acknowledgements**

For more than 20 years, Jack Dangermond, president and founder of Esri, Inc., the world’s largest GIS software company, and Dr. Peter Raven, world leader in botany and ecology, advocate for global biodiversity conservation and president emeritus of the Missouri Botanical Garden, have enthusiastically advanced the use of GIS for global plant conservation and supported efforts to develop this technology as a powerful management tool for these living scientific collections. Together, they have worked to directly support or advocate for the national teams developing data models, customized applications, and training materials for GIS in public gardens. Their vision and leadership has been a powerful force behind the success of these national collaborative efforts.