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Blazing a Trail to Smart Parks with GIS

Introduction

Parks and open space are the lifeblood of a community. From small urban parks with picnic areas and recreational fields to large forests with miles of hiking trails and campgrounds or cabins, parklands and conservation areas contribute to the health and well-being of surrounding communities. These areas provide a balance between green infrastructure and the built environments that provide a more sustainable future.

The question that always arises is how state and local governments can manage and maintain these open spaces while improving the overall experience for visitors. Parks require management of assets and infrastructure, monitoring the health of the ecosystem, and ensuring that programs and offerings for the public match changes in demographics and lifestyles. As park managers look for the best approaches to address these issues, they look toward the role technology can play in improving operational efficiency and civic engagement.

Parks are applying technology to modernize their workflows, analyze park use and conservation concerns, and improve communication with elected officials and the public. The results are a more focused application of smart communities – smart parks.

Geographic information systems (GIS) act as a foundation and establish four technology tenets governments need to deliver smart parks: planning and engineering, operational efficiency, data-driven performance, and civic inclusion.

To explore how these technologies can help parks improve the efficiency of their operations and the management of their services, GovLoop partnered with Esri, a leader in GIS. This report outlines the four tenets that make up a smart park information system, highlight leading examples and discuss the capabilities needed to make smart parks a reality.

How GIS Makes Parks Smarter

What makes a park smart? It starts with a location-based approach, because nearly every aspect of park management ties to geography. GIS enables park managers to collect, integrate, analyze and collaborate on location-based data – and to use that data to make better decisions and drive better outcomes.

Today, emerging solutions in areas such as asset management, field mobility, offline connectivity and performance monitoring are building on that foundation, giving park managers new ways to collect data and translate it into meaningful insights. Smart parks solutions take many forms, depending on the unique landscape of the area and the populations it serves.

Managers of smart parks understand that "smart" is not a tool or destination but a journey, and progress must be demonstrated through positive impacts on the community. How can a park be safer, more accessible and more relevant to the larger community? How can it evolve as that larger community evolves and demographics shift?

Esri's smart community information system has identified four technology tenets that can guide the journey:

Planning and Engineering

Parks strive to balance the needs of people, infrastructure and the environment. A smart community information system that incorporates planning and engineering capabilities enables governments to model the impacts of proposed development, adjust to changing demographics and lifestyles, and account for climatic and economic shifts.

Operational Efficiency

The goal is to enable parks to collect information in real time and feed it back into performance dashboards to gauge real impact. More efficient workflows result from being able to collect information at the source, dispatching park staff to where they are most needed, and maximizing materials and resources to improve response times while reducing costs.

Data-Driven Performance

High-performing parks use location as the standard analytical approach to achieve new insights. Increasingly, they are relying on smart devices, the Internet of Things and cloud computing to continuously collect data about the locations of people, nature, vehicles and infrastructure – and to derive actionable insights for decision-makers.

Civic Inclusion

How do leaders support the full community's needs? At its core, civic inclusion is about transparency, keeping the public informed, encouraging public participation and emphasizing equity.

Next, we will share four success stories and best practices on how park managers can replicate these capabilities at city, county, regional or state parks.
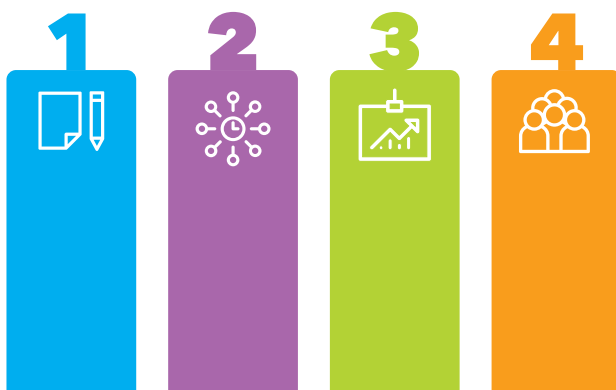
Planning and Engineering

L.A. County Puts a Price on the Value of Parks

The Challenge

In 2015, Los Angeles County officials needed to put together a comprehensive plan to provide safe, well-maintained parks for residents.

The county, which covers more than 4,751 square miles, has 3,024 open spaces that cover 900,000 acres. But most of that open space is in mountain parks, not areas that are immediately accessible to residents in the county's many urban centers.

For many years, the L.A. County Regional Park and Open Space District had primarily been funded by two benefit assessments, generating about $80 million annually. But those assessments expired in 2015 and 2019, so the agency needed to present a plan that taxpayers would support.

The first proposal, put on the ballot in 2014, failed – in part because it left too many questions unanswered. County officials recognized that they needed to conduct an in-depth assessment of their parkland to identify what was missing or needed improvement.

Specifically, they needed to make decisions about development using a scientific approach, testing the impacts – both positive and negative – of different scenarios, with a focus on balancing the needs of people, infrastructure and the environment.

"GIS and mapping were central to the assessment effort."

- Clement Lau, Departmental Facilities Planner at the Los Angeles County Department of Parks and Recreation

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GIS helps L.A. County manage:

- 40 county parks
- 14 wildlife sanctuaries
- 3,024 total parks or open spaces
- 900,000 acres

The Solution

GIS was central to the county's ability to turn around the assessment quickly and effectively.

County officials mapped out the assessment by dividing the county into 188 study areas based on jurisdictional boundaries and population size. To get the data they needed, officials relied on a large range of stakeholders, including cities, unincorporated communities and community-based organizations in each study area. To ease the process of collecting and integrating that data, county officials provided a GIS portal where each city or community could enter details about its parks.

The county used Esri's network analysis tools to assess park access, analyzing how long it takes residents to walk to each park, its estimated population reach, its size and the population of the surrounding area. They also mapped park location relative to other available open space.

After assessing other factors, including the quantity and conditions of park amenities, county officials were able to develop a comprehensive plan that presented a clear picture of the problems to be addressed, proposed solutions based on sound planning and engineering principles, and listed the cost of those solutions.

This time, voters supported the plan.

Operational Efficiency
Ohio Rewrites the Trail-Mapping Process

The Challenge

In 2014, the state of Ohio dedicated $88.5 million to improving its 75 state parks, which encompass more than 5,000 miles of trails. The record amount of funding brought new interest in the park system, but also revealed a gap in data.

Early on, a group of outdoor enthusiasts asked the Ohio Department of Natural Resources (ODNR) to put a "You Are Here" designation on confidence maps along the trails in their local park to make it easier for hikers to navigate trails.

In reviewing their request, ODNR officials realized that they did not have the data they needed to produce an accurate trail map for the park.

They launched an initiative to produce new maps based on Global Positioning System (GPS) tracks – which provide data such as geographical coordinates, altitude and distance – and showing trail names, park boundaries and related information. ODNR staff affixed the maps to signs posted at regular intervals along the trails.

The project was a hit with park visitors and soon caught the attention of park managers across the state, who requested similar signs. The idea of a statewide initiative made sense, but it would be a massive effort: In addition to the 75 state parks, ODNR manages 21 state forests, 136 state nature preserves and 151 wildlife areas.

The processes that ODNR had developed for the one-off effort would not work at such a scale, given the department's staffing and other resources.

"Previously, someone had hand-drawn trail maps for park brochures, and there was zero accuracy. Now it's a complete digital platform. There's no paper involved."

- Donovan Powers, Chief Information Officer, Ohio Department of Natural Resources

The Solution

Although ODNR could not send teams to every park to collect data, they realized that local staff at each park could collect data simultaneously. The key was to create a streamlined and standardized process for collecting, managing, analyzing and sharing that data.

Using Esri GIS, ODNR developed an app that enabled staff at each park to collect their own GPS tracks. The app also has pull-down menus for capturing additional details, such as whether a trail was dirt, gravel, paved or boardwalk – an important consideration for determining a trail's accessibility.

What might have been a long, costly process proved quick and effective. Within a year, ODNR was able to pull enough data to begin creating "You Are Here" confidence maps for each park.

Later, ODNR staff used the data to create new visitor pamphlets for each park – providing accurate trail maps and information, such as the location of restrooms, parking and camping – and they created large maps for park kiosks.

The mapping initiative is now an ongoing project. Officials regularly update trail maps and post them on a trail website.

GIS helps the Ohio Department of Natural Resources manage:

- 75 state parks
- 21 state forests
- 136 state nature preserves
- 151 wildlife areas
- 5,000+ miles of hiking trails

Data-Driven Performance

Missouri State Parks Ease Response to Flooding

GIS helps Missouri State Parks manage:

- 91 state parks and historic sites
- 160,000 acres
- 1,000 miles of trails
- 3,500 campsites

The Challenge

Flooding is a recurring threat for the Missouri state park system because many of its parks lie along major rivers including the Missouri and the Mississippi. In 2019, for example, some locations along the Missouri river dealt with flooding for seven months or more.

Such floods can wipe out portions of hiking and biking trails, strew mud and debris across campgrounds, and damage park facilities, all of which can require costly repairs. To receive financial assistance from the Federal Emergency Management Agency (FEMA), the Missouri Department of Natural Resources needs to document the damage, including its precise location, and prepare an estimate.

In the past, once the waters receded, park staff would go into the field with a GPS device, paper and pencil, making notes, and returning to the office to enter the information into a spreadsheet. It was a slow and cumbersome process.

The process for getting the word out to the public about potential hazards or closings also was cumbersome. Park staff would survey the damage in their area and email a short blurb to the central office to post online.

The problem was that the advisories were in text format. In the event of a major event, potential visitors to the Katy Trail, which is 239 miles long, could be faced with a list of advisories for 20 or 30 different areas, with no intuitive points of reference.

The Solution

Missouri DNR's first concern was improving the process for conducting damage surveys and disaster calculations.

The key solution was an Esri ArcGIS app that park staff could use to capture coordinates, take photos and record their observations, with the information automatically captured in the backend GIS system. As simple as it is, the solution has streamlined the process for preparing estimates and submitting reports.

That project, however, also led to a better solution for sharing advisories with the public. They created a web-based app that park employees can use to report hazards and closures. As soon as the information is entered, the park superintendent can review and publish to the park website.

More important, rather than being published in list format, it is displayed on a map – which makes it much easier for people to understand where exactly the trouble spots are in relation to where they wish to go.

Missouri DNR has deployed this application first for Katy Trail, which is one of the state's most popular sites. After they have completed adequate testing and trained the staff, they hope to expand to parks statewide.

"We used Esri GIS in our flood damage assessment efforts to provide FEMA with accurate locational data of areas affected by flooding along Katy Trail State Park."

- Jon Haslag, GIS Analyst, Missouri Office of Administration, IT Services Division, Office of Geospatial Information

Civic Inclusion
A Digital Transformation for Minnesota's Three Rivers Park District

The Challenge

The Three Rivers Park District in Hennepin County, west of Minneapolis, manages more than 30 parks encompassing 150 miles of regional trails and recreational facilities. The district has a large staff to help manage this network of parks, including 500 full-time employees and 1,500 seasonal workers.

GIS has been an important management tool in the park district for more than a decade, but for many years, its impact was limited. Ten years ago, about a dozen employees scattered across the park district used GIS tools on an individual basis to manage their own data and perform individualized workflows.

The tools proved their value, but the park district had no way to scale their use, so it was missing out on the opportunity to develop a more comprehensive picture of management activity across the park district.

What's more, the benefits of GIS did not extend to citizen science volunteers – nature enthusiasts who were willing to share their field observations with park managers. Such observations often arrived as notes scribbled on paper, which district staff then had to decipher and enter into a system.

The Solution

The park district's GIS department transformed its operations by moving to a centralized GIS program that replaced the district's disjointed system of datasets. Apps and data collection tools allow end users to gather information in the field and automatically feed it to the back office.

This approach expanded the use of GIS by park staff, seasonal employees and citizen scientists throughout the park system.

With the new system in place, the GIS department created web apps that volunteers can use to share their observations. The data is available to district staff in real time via operations dashboards.

For example, as part of a wildlife management program, the district invited volunteers to report on the nesting activities of osprey and bluebirds. The web app guides users as they enter information, ensuring that their observation adheres to scientific standards.

A citizen science project like this serves two purposes. First, it enables program managers to track the health of the osprey and bluebird nests more closely than would be possible relying only on their own staff. Second, and equally important, it involves local residents in supporting one of the missions of the park district: engaging the community for environmental stewardship.

GIS helps Three Rivers Park District manage:

- 30 parks
- 28,000 acres of land
- 150 miles of regional trails

"Our biggest goal is to make GIS as prominent a tool as Microsoft Office for the average person."

- **Chris Martin**, Technology Director, Three Rivers Park District

GIS Capabilities

A smart parks initiative can take countless forms, depending on the specific context and requirements of a park system. Esri has identified a core set of technology and business capabilities that, incorporated into GIS initiatives, deliver the best results.

Park managers can use this list as an implementation framework for developing a smart parks strategy.

Spatial analysis and data science: Use location as the connective thread to uncover hidden patterns, improve predictive modeling and create a competitive edge. Better yet, use the power of spatial analysis and data science on demand and at scale with a cloud-based solution.

Field operations: Location is at the heart of field activities. Applications can be used alone or in combination to support field workflows and enable office and field personnel to work together, using the same authoritative data.

Mapping: Maps help you spot spatial patterns in your data so you can make better decisions and take action. Maps also break down barriers and facilitate collaboration. The key is to be able to create, use and share maps on any device.

Real-time visualization and analytics: Real-time GIS empowers you with location monitoring of

any type of sensor or device – accelerating response times, optimizing safety and improving operational awareness across all assets and activities, whether in motion or at rest.

3D GIS: 3D GIS brings real-world context to your maps and data. Instantly transform your data into smart 3D models and visualizations that help you analyze and solve problems and share ideas and concepts with your team and customer.

Imagery and remote sensing: Manage and extract answers from imagery and remotely sensed data using imagery tools and workflows for visualization and analysis.

Data Collection and Management: Ensure that you can easily collect, crowdsource, store, access and share your data efficiently and securely. The goal is to integrate data stored in your business systems and geo-enable any data from any source.

A Smart Parks Toolbox

A smart parks toolbox takes advantage of all the capabilities of the Esri ArcGIS platform. These tools make it easy for park staff to collect, analyze and act on data while leveraging the capabilities of an underlying enterprise GIS platform.

Here are some key tools that support the development of smart parks applications.

Operations Dashboard for ArcGIS

Operations Dashboard for ArcGIS is a configurable web app that provides location-aware data visualization and analytics for a real-time operational view of parks, including park employees, services, assets and programs.

Web AppBuilder for ArcGIS

Web AppBuilder for ArcGIS is an intuitive what-you-see-is-what-you-get application that allows you to build 2D and 3D web apps without writing a single line of code. This is a benefit for park managers and employees who might not be GIS experts but can still envision new ways to use location data.

Survey123 for ArcGIS

Survey123 for ArcGIS is a complete, form-centric solution for creating, sharing and analyzing surveys. Park employees can use the app to collect data via web or mobile devices even when disconnected from the internet – a common occurrence in many remote parks.

ArcGIS StoryMaps

This application enables park managers to create interactive maps that incorporate text, photos and videos – in short, maps that tell stories about their parks. These stories can be used to share information with visitors about specific park features or to inform the public about proposed or upcoming changes to a park.

Conclusion

For government agencies looking to digitally transform their parks and park systems, the concept of smart communities offers a framework that can address both current and future requirements.

The foundation of that framework is a geospatial infrastructure. GIS provides park managers with an unmatched means to understand their data and translate it into actionable intelligence that betters the community.

Above all, the concept of smart parks makes it possible for park visitors to have safe and satisfying experiences – to find the oasis they seek.

When Esri was founded in 1969, we realized even then that geographic information system (GIS) technology could make a difference in society. Working with others who shared this passion, we were encouraged by the vast possibilities of GIS.

Today our confidence in GIS is built on the belief that geography matters - it connects our many cultures and societies and influences our way of life. GIS leverage geographic insight to ensure better communication and collaboration.

Explore our website to discover how our customers have obtained the geographic advantage by using Esri software to address social, economic, business, and environmental concerns at local, regional, national, and global scales. We hope you will be inspired to join the Esri community in using GIS to create a better world.

go.esri.com/smartparks

GovLoop's mission is to inspire public sector professionals by serving as the knowledge network for government. GovLoop connects more than 300,000 members, fostering cross-government collaboration, solving common problems and advancing government careers. GovLoop is headquartered in Washington, D.C., with a team of dedicated professionals who share a commitment to the public sector.

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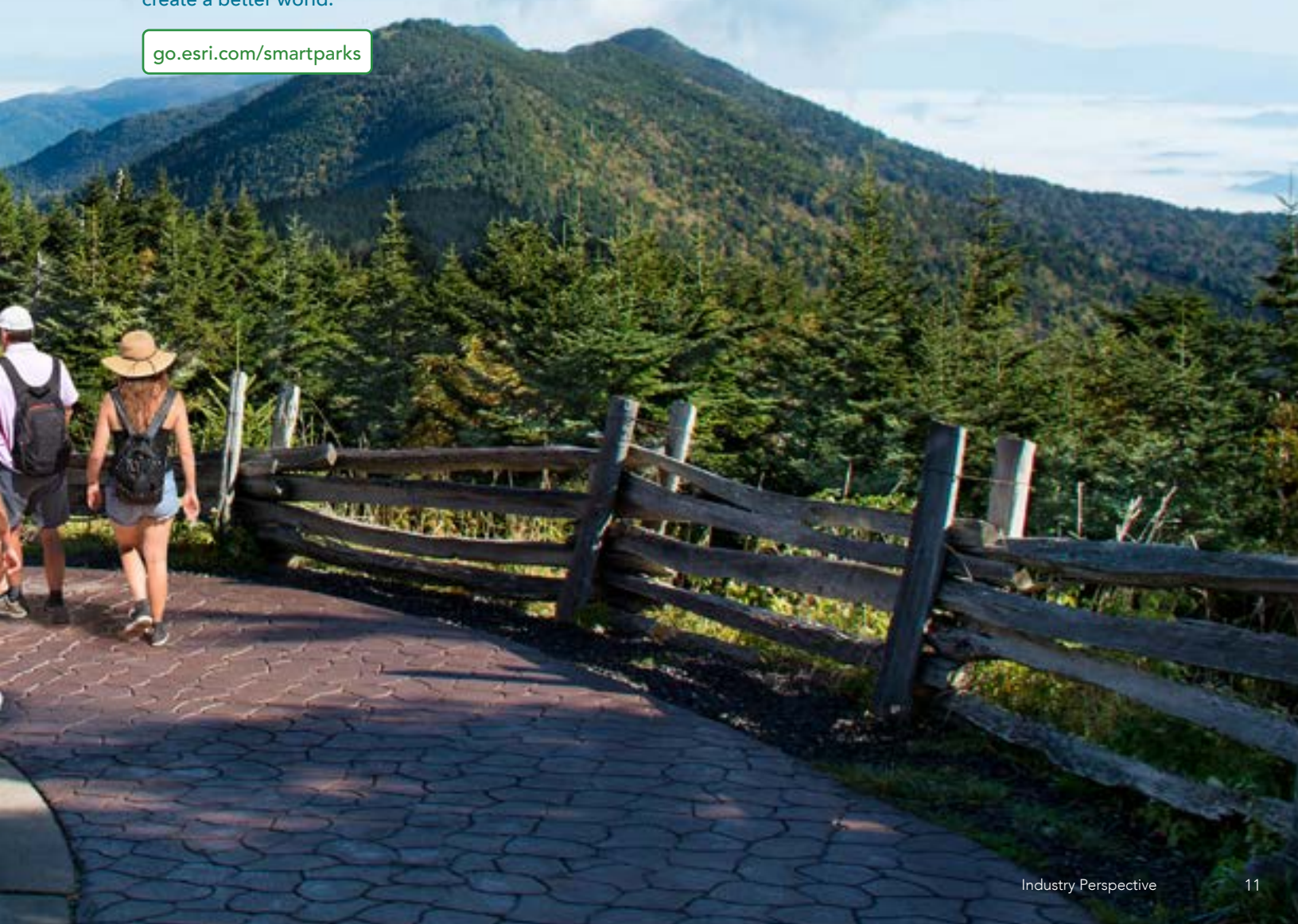
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