

PART 1

CONSERVATION LAND MANAGEMENT

THE EXPANDING HUMAN FOOTPRINT AND THE GROWING threat of climate change place immense pressure on biodiversity conservation and long-term management plans. As global biodiversity continues to decline, conservationists must effectively manage and safeguard designated protected areas. GIS conservation solutions are designed through extensive engagement with leading protected area management organizations. These solutions strengthen operational capabilities, reduce training and implementation costs, and support informed and timely conservation land management decisions.

Conservation solutions for protected areas

Successfully managing a protected area is a difficult challenge. Disease, fire, and climate-related disruptions within protected areas coupled with external population and development pressures require effective management systems to support conservation managers. ArcGIS Solutions is a system within ArcGIS Online that offers a collection of apps, dashboards, and analysis and reporting web applications to support conservation management. Deploying the solutions in ArcGIS Online is automated so that managers of protected areas can focus on configuring an existing system

to meet their needs instead of implementing a system from scratch. These solutions, now in use globally, offer these core capabilities:

Track illegal activity: Many protected areas face pressure from illegal activities including poaching, encroachment, and deforestation. Conservation solutions streamline the collection of field observations and provide a digital chain of custody for law enforcement actions, informing real-time monitoring dashboards to support timely decision-making.

Monitor wildlife: Location-enabled wildlife field observations help managers of protected areas evaluate the effectiveness of management actions. They can monitor trends derived from field information through spatial analysis to inform and evaluate management strategies for protected areas. Conservation solutions offer a data-driven approach to wildlife management in protected areas.

Mitigate wildlife conflicts: The job of managing protected areas occurs within a tapestry of wild and human-populated landscapes. Historic encroachment into natural areas and corridors and, in rare cases, recovery of predator populations have increased conflicts between humans and wildlife in local communities. Conservation solutions support the collection and monitoring of incidents adjacent to a protected area and support planning and actions to reduce conflicts.

Maintain park infrastructure: Conservation land management involves protecting natural areas while providing basic infrastructure for visitors and recreation opportunities. Conservation solutions support planning of infrastructure projects and maintenance programs and efficient management of staff and resources in protected areas.

MANAGING PROTECTED AREAS

Esri and the National Geographic Society

GLOBAL BIODIVERSITY FACES UNPRECEDENTED THREATS from habitat loss, poaching, and climate change. These factors increase the fragmentation of critical habitats and threaten key species. Integrated, technology-based systems for managing and protecting natural areas are desperately needed.

Building upon decades of collaboration, Esri® and the National Geographic Society have formed a strategic partnership to provide advanced solutions for managing protected areas. Through the alignment of Esri's geospatial technology and National Geographic's expertise, the organizations are committed to advancing partnerships, technologies, capacity, and methods for management and storytelling to preserve and sustain natural areas.

ArcGIS Solutions includes a collection of apps developed by Esri and National Geographic specifically for managing protected areas. These apps provided integrated tools that can be configured to serve the needs of conservation area managers around the world.

This suite of tools serves many roles in conservation, as illustrated in a sampling of comments from conservation managers:

- “I’m a community outreach specialist. I need to connect local villages to park management and ensure that people benefit economically from the tourism the park attracts.”
- “I manage my park’s facilities. I need to keep track of the park’s infrastructure, so everything runs smoothly.”
- “I’m a wildlife biologist. I want to help ensure that animal populations remain stable, and I want freedom to do my research.”

- “I’m the park superintendent. I need to keep things running, connect to local communities, and ensure that the habitats and animal populations in my park remain healthy.”
- “I lead an international NGO. I want to conserve lands and species, but I know I can’t do that without connecting to local stakeholders and understanding their needs.”
- “I’m a game warden. I need to know where the poaching threats are greatest and where the wildlife is.”

ArcGIS Solutions for Protected Area Management can meet the needs of all these stakeholders and enable land managers to be more effective in their work.

A comprehensive toolset

Today, web-based mapping tools are revolutionizing the way conservation managers create, manage, and disseminate information needed for decision-making. The solutions provide managers of protected areas with configurable technology for managing and protecting parks and sensitive conservation areas.

The Ecology, Infrastructure, Outreach, and Protection solutions address the diverse challenges of managing parks by providing a secure and flexible framework for deploying useful applications and integrating other conservation technology to support key roles and workflows in park operations.

Ecology solution

The Ecology solution is designed to enable wildlife management activities such as collecting species observations in the field and analyzing and reporting wildlife trends. For example, a park ecologist who manages wildlife species occurrence data can use the tool to monitor species populations, health, fecundity, and range.

Infrastructure solution

The Infrastructure solution is designed to enable asset management activities, including collection of asset information in the field, managing of maintenance crews, monitoring productivity in near real time, and visualizing the location and condition of assets. A maintenance staff member, for example, can use this tool to collect and update asset information and then update managers on the condition of these assets.

Outreach solution

The Outreach solution is designed to enable community engagement activities, including collection of human and wildlife conflict information in the field, monitoring of those incidents in near real time, and communication with protected area stakeholders and visitors about the resources and activities under management. For example, an outreach coordinator can use a map that identifies these resources and activities to support management plans as they relate to stakeholders and constituents in and around the park.

Protection solution

The Protection solution is designed to enable law enforcement activities, including collecting incident information in the field, managing patrol mandates, monitoring active patrols and incidents in near real time, and analyzing and reporting on incident trends. A park ranger, for example, can use this tool to collect, maintain, and submit protection incidents so that protection managers can see the status of incidents and plan patrols and enforcement actions.

Solutions in action

Many organizations use ArcGIS Solutions for Protected Area Management in their daily work. Let's take a closer look at how some leading African organizations use these apps and tools.

African Parks

African Parks is a nonprofit conservation organization that assumes responsibility for the rehabilitation and long-term management of 19 national parks and protected areas in 11 countries across Africa, in partnership with governments and local communities.

To effectively manage, protect, and restore parks across more than 14.8 million hectares (almost 36.6 million acres), the organization and its partners implement a range of core functions from law enforcement and biodiversity conservation to community and enterprise development and infrastructure. They integrate innovative technological solutions to improve monitoring and overall management of these protected areas.

African Parks uses ArcGIS Solutions for Protected Area Management to monitor and enhance park management workflows. For instance, it can manage park roads, buildings, and park boundaries using up-to-date map data.



GIS Rangers compiling field-collected data. Photo by Mia Collis.

The parks require customized solutions and workflows to meet the needs of diverse landscapes. Park staff use field apps and mapping software to save time and improve outcomes for people and wildlife. They also use ArcGIS Dashboards to monitor sensitive species such as rhinos, elephants, and giraffes. These systems closely align with law enforcement efforts to monitor wildlife populations in parks, boosting security so that people and wildlife can thrive.

Peace Parks Foundation

The Peace Parks Foundation aspires “to reconnect Africa’s wild spaces to create a future for humans in harmony with nature.”

The foundation works to renew and preserve ecosystems that span international boundaries by establishing conservation areas. In doing so, the foundation strives to protect biological diversity, natural resources, and cultural heritage. The foundation also supports the goal of reducing poverty through the economic benefits of ecotourism.

Peace Parks requires tools to understand the needs of communities living in and adjacent to protected areas. It uses this knowledge to develop long-term solutions. Mapping technology supports the foundation in its management decisions, tourism planning, and fund development.

ArcGIS Pro provides analysis tools and helps managers as they make decisions in protected areas. Field apps such as ArcGIS Collector and ArcGIS Survey123 help provide information about communities living in and adjacent to conservation areas.

Conservation-focused GIS training on ArcMap™ and field data collection are being used in partnership with local universities in protected areas. These trainings ensure that staff are up to date with the latest tools and best practices in mapping technology.



Peace Parks Foundation GIS rangers using ArcGIS in the field.

The Jane Goodall Institute

Dr. Jane Goodall has long supported local communities in her scientific and conservation work with chimpanzees in the United Republic of Tanzania. Her work has evolved into the Lake Tanganyika Catchment Reforestation and Education program (Tacare), the Jane Goodall Institute's approach to put the needs of local people at the forefront of conservation activities.

As Tacare has evolved, the institute has increasingly used geo-spatial technologies to integrate traditional knowledge with the best GIS data and high-resolution satellite imagery available to guide and inform community decision-making and conservation strategies. The institute has developed GIS layers to understand chimpanzee behavior, movements, and habitat use, as well as to model habitat suitability and human land-use change. It has paired this data with field mobile data collection apps to enable communities to monitor and enforce plans for their village forest reserves and land use.



Jane Goodall's Tacare program works closely with local communities so that they can decide on the best approaches for conservation.

The approach of the Jane Goodall Institute and the mapping technologies it uses have supported the restoration and protection of chimpanzee habitats in western Tanzania, western Uganda, the eastern Democratic Republic of the Congo, and across a larger chimpanzee range as the organization seeks to scale the Tacare approach.

The Jane Goodall Institute supports local people and communities as they become stewards of their own natural resource management, governance, and sustainable livelihoods.

A version of this story titled "Managing Protected Areas: Innovative Solutions to Meet the Needs of Conservation Area Managers Around the World" appeared in a storytelling map on March 8, 2022.