The Arches Heritage Inventory and Management System for the Protection of Cultural Resources

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Inventories are essential for the effective management and protection of cultural resources. At a minimum, by providing authoritative information identifying cultural resources, their locations, and their conditions, inventories inform the decision-making of organizations responsible for protecting these resources and applying historic preservation–related laws and policies. At best, inventories can provide more in-depth information—such as explanations of a resource's significance and its characteristics—that enables preservation and planning professionals to make more complex, nuanced, and proactive decisions. When such information is presented efficiently and goes beyond simple textual lists, it can make relationships and connections between resources more apparent. Also, by making inventory information available to the public, preservation organizations can engage community stakeholders and communicate the importance of both cultural resources and historic preservation practice.

Preservation organizations frequently put considerable emphasis on collecting data through surveys without adequately planning for or supporting the long-term management and searchability of those data through inventory systems. This is at least in part because preservationists can sometimes secure special funding to conduct surveys, which capture snapshots of the state of cultural resources; by contrast, maintaining and continually updating an inventory, which is an ongoing and evolving record of cultural resources, requires stable, continuous staff time and funding.

In 2012 the Getty Conservation Institute (GCI) and World Monuments Fund (WMF) began developing the Arches Heritage Inventory and Management System as a direct response to the demonstrated need for an economical and modern information system purpose-built for cultural resource inventories—one that could be customized to accommodate the different inventory

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programs of preservation institutions around the world. During the initial stages of the project, the partners identified some fundamental challenges that most preservation organizations, and the preservation field as a whole, face in creating and maintaining inventory systems. These include:

- complexity of cultural resource information;
- rapid changes in information technology; and
- lack of financial and staff resources.

Arches specifically addresses these challenges to create more robust inventory systems, advance inventory practice, and ultimately help conserve cultural resources.

CAPTURING THE COMPLEXITY OF INFORMATION

Significance and Relationships

First of all, an inventory must be able to describe why a cultural resource is, in fact, significant. In the past, complex explanations were recorded in lengthy narrative texts, but, to be truly useful, these texts need to be machine searchable in a meaningful way. Often, one must be able to discern the historical relationships between places, events, and people to get a full picture of the significance of a resource. Arches is designed to enable describing and then searching for such relationships.

The default version of Arches allows organizations to record information for six different types of resources:

- Historic Resources: individual cultural resources such as historic buildings, structures, monuments, archaeological sites, and landscapes;
- Historic Resource Groups: historic districts and other groupings of historic resources;
- People/Organizations: significant people, architects, cultural groups, and organizations;
- Historical Events: historic battles, natural disasters, and cultural movements;
- Activities: preservation-related interventions as well as surveys; and
- Information Resources: photos, reports, videos, audio files, and 3-D models.

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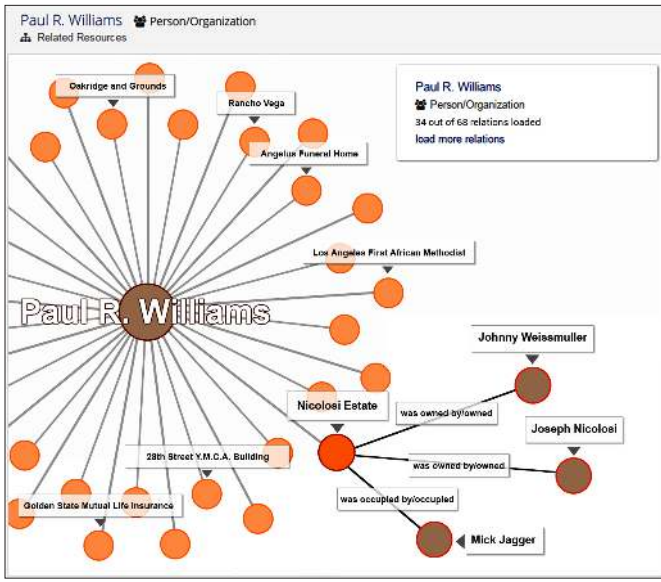

This Arches "Related Resource" graph highlights the relationships between various resources.

IMAGE COURTESY OF THE GETTY CONSERVATION INSTITUTE

In Arches, resource records of any type can be related to each other to document and define resource relationships. A simple example of this would be a resource record for an architect being related to the records of all the other buildings that they designed. Seeing these relationships often clarifies why a cultural resource or group of cultural resources is significant.

Spatial Information

To protect cultural resources, a preservation organization must not only know where a particular resource is located but should also be able to view spatial relationships between resources that are near each other and/or share common characteristics. Arches is geospatially enabled, giving organizations the ability to easily add multiple types of spatial data—such as points, lines, or polygons—for the same resource to one record by importing existing data; by entering coordinate or address information; or by drawing the location on a basemap using the Arches interface. Users can also search for information spatially by drawing search boundaries on the map and defining a buffer distance. For example, a planner can quickly search for all the cultural resources that might be affected by a planned development.

Differences in Terminology

The terminology used to describe cultural resources may differ based on region, culture, language, and even the person documenting the

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resource. For example, a "carriage house" might also be referred to as a "chaise house," "coach house," or "coach barn." All of these terms describe the same type of structure, but it might be difficult to come to a consensus about which term to use in an information system. Furthermore, even if a consensus was reached, the public could not be expected to know which term had been chosen.

The Arches platform includes the Reference Data Manager (RDM), a module that manages the terminology and values that appear in dropdown lists. Arches can store multiple terms as labels to describe the same concept, so a user can search for "carriage house," "chaise house," or even the Spanish "cochera," and Arches will return all the relevant resources. The RDM helps to ensure valid and consistent data entry and enhances searching.

Controlled Access to Information

Cultural resource data may include sensitive information, such as the location of sacred tribal sites or fragile archaeological sites, that must be withheld from unauthorized viewers. Thus, organizations may want to control what information particular users can view and/or edit.

The administrator of an Arches system can define users and user groups and assign permissions to each at the data-field level. For example, authorized preservation professionals may be given full access to make edits to all fields, while volunteers could be allowed to edit fewer fields or none at all.

System Customization and Arches Version 4

Because of cultural, regional, statutory, and other differences, a one-size-fits-all approach to cultural resource inventory software is not realistic. With this in mind, Arches is designed to be as generic as possible for the preservation field while offering maximum opportunities for customization. With Arches Version 4, unveiled in 2017, an administrator can determine what data fields to include in their organization's Arches implementation; the corresponding data entry forms and reports will be created dynamically without the need for specialized programming.

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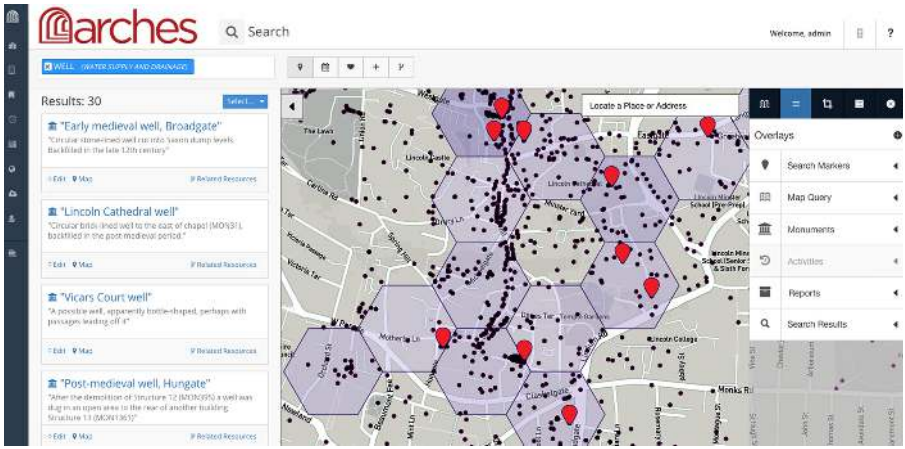

Arches Version 4 adds new functionality, including an integrated map and search page that allows users to find data by combining text-, concept-, spatial-, and temporal-based searching.

IMAGE COURTESY OF THE GETTY CONSERVATION INSTITUTE

Arches Version 4 also includes a number of other substantial software features that enhance users' ability to customize the system. The Arches Designer, for example, allows administrators to dynamically determine which data fields are included in their implementation as well as how those data are entered and displayed. The map server enables the incorporation of locally stored satellite imagery and other basemaps, such as historic maps. In 2018 the software platform will include a new integrated online-offline mobile data-collection app for field data collection, which will let survey managers customize their projects and define the scope, area, timeframe, and users for field data collection.

KEEPING UP WITH RAPID CHANGES IN TECHNOLOGY

A new generation of information technologies presents the preservation field with more effective ways of managing, enriching, and disseminating cultural resource data. However, keeping track of new technologies and applying them to preservation work can be challenging. Arches is a modern system that incorporates the latest technologies while remaining easy to use for those who are not experts in specialized software such as geographic information systems (GIS).

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The move to digital documentation allows substantially more cultural resource data to be recorded, but that introduces new challenges for managing and making usable larger amounts of data over the long term. Arches addresses these challenges by adhering to internationally recognized standards that apply to both data format and modeling of cultural heritage information. For example, Arches is compliant with the standards and specifications of the Open Geospatial Consortium, which ensures compatibility with desktop GIS systems (such as ESRI ArcGIS, Google Earth, or Quantum GIS), modern web browsers, and online mapping services.

Arches also incorporates the CIDOC Conceptual Reference Model (CRM), an International Organization for Standardization (ISO) standard that facilitates the exchange of information by defining cultural heritage information entities and the relationships between them. Essentially, the CRM allows Arches to automatically encode data in the system so that the information is machine-readable regardless of the software used; that is, the data are now portable and can be migrated to new systems and formats, protecting them for the future.

MAXIMIZING RESOURCES THROUGH AN OPEN SOURCE APPROACH

Effective inventory programs require not only modern information systems to securely manage and provide access to cultural resource data but also the money and staff time to keep those data up to date and relevant. This can often put a strain on resource-strapped preservation organizations.

With this in mind, Arches has been developed as an open source software platform, which means that its software code can be downloaded and modified by anyone. Arches' code is free, although preservation organizations must host the software themselves, on either a local or cloud server. Users are not subject to annual license fees and there are no limits on how many users can access any Arches implementation. And improvements to the software code must be made available to all, so they can be implemented by any institutions that find them useful; this helps prevent wasteful duplication of expensive software development

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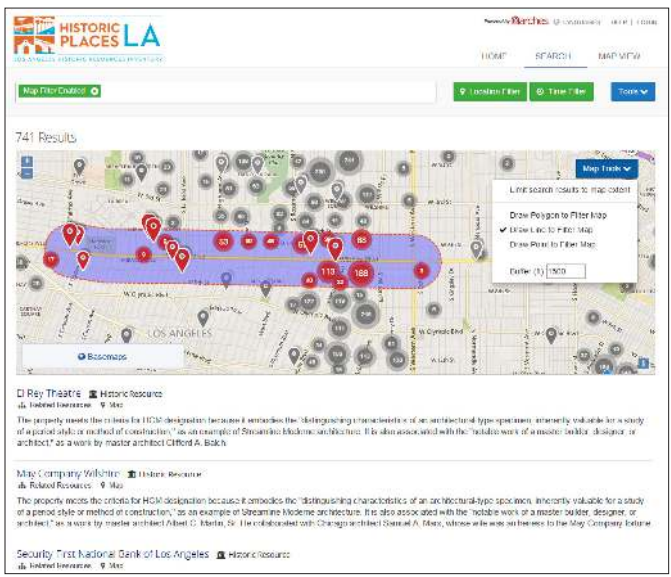
efforts by preservation organizations working alone. The open source approach applies only to the software code; as mentioned earlier, the data managed in an organization's Arches instance can be as open or closed as needed.

Institutions do not have to rely on proprietary software companies to release new features, but can instead develop their own. The Arches software platform is strengthened by its community of users interacting and helping each other through direct support and the development of features that benefit the entire preservation field.

ARCHES IN ACTION

Approximately 40 organizations around the world are currently using the Arches software platform to manage cultural resource inventory information.

- The City of Los Angeles is using Arches to power HistoricPlacesLA, the Los Angeles Historic Resources Inventory. The system contains cultural resource information from various sources—including the National Register of Historic Places, the California Register of Historic Resources, and the Los Angeles Historic-Cultural Monument designation program—but primarily derived from SurveyLA, which won a Richard H. Driehaus Foundation National Preservation Award in 2017. The information is open not only to city agencies but also to the public at large.



A spatial search in the Arches-powered HistoricPlacesLA, the Los Angeles Historic Resources Inventory.

IMAGE COURTESY OF THE GETTY CONSERVATION INSTITUTE

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- The Cane River National Heritage Area in Louisiana implemented Arches to both manage its resources and publish information about them. The Cane River Heritage Inventory and Map include historic basemaps of the area as well as audio recordings of oral histories.
- Established in 1851 for military veterans, the Armed Forces Retirement Home customized Arches to better manage the important cultural resources on its 272-acre historic residential campus in Washington, D.C.
- Currently preparing its Arches implementation for a public launch, Queen Anne's County, Maryland, is recording more than 300 years of its history through the people, places, and events that shaped the county, the state of Maryland, and the nation.
- Through a collaboration with the U.S. Department of State, the American Schools of Oriental Research (ASOR) is working to document damage to heritage caused by armed conflict in Syria, Islamic State–affected areas of Iraq, and Libya. This ASOR Cultural Heritage Initiatives project will use Arches to help manage and collect data, share information with other institutions working in the same region, and eventually plan for postwar conservation.
- Based at the universities of Oxford, Leicester, and Durham in England, the Endangered Archaeology in the Middle East and North Africa (EAMENA) project uses Arches to bring together data from satellite imagery and published reports. The EAMENA project compiles and shares information about threatened archaeological sites and landscapes across the Middle East and North Africa.
- A Manila-based nonprofit group, Grupo Kalinangan, has deployed Arches to create the Philippine Heritage Map, which includes survey information about cultural resources throughout the Philippines, supplied by both preservation professionals and volunteers.

The Kingdom of Bhutan as well as St. Kitts and Nevis also use Arches as the system for their respective national inventories. Implementations are now being prepared in the United States by

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the city and county of San Francisco and in the United Kingdom by Historic England for Greater London and by the city of Lincoln.

By focusing on a fundamental component of cultural resource management—inventories—and providing a robust system to manage and access inventory data at no cost, the Arches team hopes to help preservation organizations and professionals more effectively conserve cultural resources by being more efficient—not wasting precious resources on independently creating digital inventory systems from scratch.

In short, the Arches Heritage Inventory and Management System is a freely available modern software platform that captures the complexity of cultural resource information and uses the latest technologies to facilitate informed preservation decisions in the present and future. **FJ**

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TAKEAWAY

Explore the Arches Version 4 demo site.

VIDEO

Watch the 2017 Richard H. Driehaus Foundation National Preservation Award video for SurveyLA.

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