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### Authors

Kansa, Eric C  
Kansa, Sarah W  
Anderson, David G  
et al.

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## **Access to Government Information and Inclusive Stewardship of North America’s Archaeological Heritage**

Eric C. Kansa, Sarah Whitcher Kansa, David G. Anderson, Joshua J. Wells, Kelsey Noack Myers, and Stephen Yerka

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### **Abstract:**

The Digital Index of North American Archaeology (DINAA) gazetteer works to enrich understanding of the human presence on the landscape of North America since the late Pleistocene by connecting hundreds of thousands of archaeological and historical sites to related tribal and other government bodies, museum, library, archive, and scientific datasets, as well as repositories of scientific literature. This chapter explores how open data, if applied appropriately in partnership with tribal authorities and experts, can help serve the interests of Indigenous peoples. Currently, Native American tribes face daunting obstacles in obtaining data documenting ancestral territories. Relevant data are often siloed within opaque and under-resourced government systems. DINAA makes key descriptive information about North America’s rich cultural heritage available for inspection, evaluation, and use by descendant communities, historically marginalized from administrative and political processes. This “open government” focus helps make cultural heritage management more accountable to wider constituencies. Making these data linked and accessible can be part of larger efforts to enable sovereign tribal nations to effectively manage and protect their ancestral cultural heritage.

## Introduction

This chapter explores some tensions and challenges in access to information about the heritage of Indigenous peoples. The notion that access to information is always good has seen rightful critique. Even if well-intentioned, arbitrary exposure of information about the histories of colonized peoples can further reinforce colonialism. At the same time, information asymmetries also reinforce colonialism. In the United States, as well as many other nations, governments at the national, regional (state), and local level administer laws and regulations about archaeological and historical sites. Tribal Nations also have legal administrative jurisdiction over archaeological and historical places, but typically work with far less funding and staffing. Information flows critical to the protection of Indigenous heritage requires coordination among various federal, state, and Tribal Nation officials. Yet such coordination and information sharing is typically haphazard, leaving often under-resourced offices of tribal historic preservation with little information needed for decision making.

Digital data plays a key role in these administrative processes. Extrapolating from available government records, there are at least two million recorded archaeological and historical sites across North America. In many cases, information about these sites is scattered across museum collections, published papers, and unpublished reports. Other government published documents describe regulatory decisions about these sites, especially decisions about repatriation, preservation, and legal custody. Efforts to collect and compile archaeological data have a long history, and information about archaeological sites and collections is maintained in every state and territory. However, this information is scattered and largely inaccessible, especially to descendent communities who may often lack access to government information systems or university libraries. Only rarely have these data been compiled and examined at large geographic scales, especially those crosscutting state lines.

In this context, the Digital Index of North American Archaeology (DINAA)<sup>1</sup> provides infrastructure for linking archaeological sites to other web-based resources that describe those places. Using transparency and access as a strategy to make stewardship of North American cultural heritage more inclusive, DINAA aggregates archaeological and historical data from state and tribal governmental authorities that manage United States cultural resources (Figures 9.1 and 9.2), providing the most comprehensive and detailed database documenting human settlement in North America currently available. The nation's investment in archaeology and historic preservation has produced a vast, widely dispersed, and variably curated literature. DINAA helps make the results of that effort, often overseen by State Historic Preservation Offices (SHPOs), Tribal Historic Preservation Officers (THPOs), collections managers and curators, and a vast research community, more accessible to scholars, land managers, and the public alike.

DINAA publishes (highly redacted and generalized, see below) aspects of these data for anonymous open access without login or intellectual property barriers. Is such openness appropriate in this context? After all, data about people—especially people who have undergone a traumatic colonial history and continued oppression—is sensitive and problematic. Data can be used abusively, especially in the hands of powerful government officials or private companies. It is not only bureaucracies that can use data abusively. For example, location information about

sites can be used by individual vandals, who may be motivated by hate and racism, to defile a place sacred to Indigenous peoples; furthermore, contested definitions of archaeological sites and their perceived importance, as instantiated in digital data, have the potential to spark tremendous political abuses and discord.<sup>2</sup>

How can an open access data program like DINAA work to avoid these risks? First, it is important to recognize that access barriers have their *own* risks that can compound the risks of managing sensitive data. Access barriers typically track personal logins and accounts of individual users as they access sensitive data. Appropriately authorizing the correct people, keeping their access credentials secure and secret, and responsibly managing data that tracks user behaviors all involve additional security risks and responsibilities. In other words, *user data is itself sensitive data*. Collecting user data in order to monitor access permissions or appropriate uses of data involves privacy risks. A program needs enough financial and technical resources to responsibly manage such risks. The funding constraints in archaeology make secure management of sensitive data doubly challenging.

These perspectives inform DINAA's open access strategy. A central goal of DINAA's open access strategy is to reduce risks of harm. *The most effective approach to protecting sensitive data is to avoid the collection and storage of such sensitive data in the first place*. For that reason, Open Context, the data management platform that hosts DINAA, collects and stores no user data. It avoids such common tracking mechanisms like logins, cookies, Google analytics, and the like. More importantly, as we describe below, DINAA only manages highly redacted and low-precision data. There is no password protected version of DINAA with more sensitive data that can be exposed by accident or hacking—the project only manages redacted, “low risk” information and it is all made public. Finally, as described below, DINAA serves as an “index”, meaning it works as a finding aid that directs users to richer information resources stored elsewhere. Those other information resources can have additional protections and requirements, as judged necessary by the communities that manage them. Thus, in its capacity as an index, the DINAA project highlights how open access / open data can work collaboratively, in conjunction with systems and communities, especially Indigenous communities, that protect sensitive information.

This open data approach also contributes to recent collaborations among archaeologists, archivists, museum curators and American Indian tribal nations, tribal groups, traditional landowners, and other sovereign Indigenous groups, that attempt to better understand and address damage caused by colonialism. Executive Order 13175 - Consultation and Coordination With Indian Tribal Governments (November 6, 2000), initiated federal government policies that further promote such partnerships, leading to collaborative land management, cultural heritage preservation, research, education, and community development programs.<sup>3-17</sup> DINAA builds upon and further enables these partnerships by making key data more accessible for descendent communities and Native American officials that manage the historical preservation efforts of sovereign tribal nations.

## **Public Investments in Archaeology**

Archaeological data constitute the direct evidence of past human behaviors and are essential for identifying and describing patterns of change in past human societies. Recent estimates demonstrate the magnitude of public investments in archaeology.<sup>18</sup> Conservatively, the public invests over \$500 million per year to comply with historical and archaeological protection measures required by federal law. This level of investment nearly matches the total *combined* budgets in 2019 of the Institute of Museum and Library Services (roughly \$240 million), the National Endowment for the Humanities (roughly \$150 million), and the National Endowment for the Arts (roughly \$150 million); the National Science Foundation budget for archaeology annually, in fact, is only a tiny fraction of the total directed to the nation's cultural resource management (CRM) program. These surprising numbers demonstrate archaeology's relative importance in cultural heritage activity. Unfortunately, much of this work and investment goes largely unnoticed. Up to now, decades of effort directed to managing and protecting America's archaeological heritage has led to few publicly accessible impacts. Cultural resource management largely takes place within relatively opaque bureaucratic processes that regulate construction and development. CRM work has resulted in an estimated 350,000 reports nationwide as of 2004<sup>19</sup>, but because of limited access and cataloging, irreplaceable cultural heritage documentation in these "gray literature" reports goes ignored or at best underappreciated. Furthermore, because most CRM projects receive minimal attention, the vast majority of the reports produced see little external reuse in research or other publications that greater peer recognition and review would bring.

DINAA represents a required first step to encourage greater public knowledge and ideally accountability (*vis-à-vis* different public communities) for this tremendous public investment in cultural heritage. However, it would be naïve and unrealistic to impose a single data standard, expected to be broadly applicable for a continent full of archaeological sites collected by many different organizations for decades, and representing more than 13,500 years of differing cultures in widely varied environmental settings. Most of the state systems currently in place, in fact, encompass tens of thousands of sites and have been in place for more than half a century, leading to many separate database systems with unique constraints on data types and coding solutions. Often overworked and understaffed, those tasked with site file management lack the resources needed to completely restructure their datasets to meet external standards. In fact, the first of a series of DINAA workshops starting in 2014 gave many of our governmental data suppliers a rare chance for professional development alongside their counterparts from other jurisdictions.

### ***Site Security Measures***

DINAA develops crosswalks between data sets from different sources to facilitate discovery across broad regions. However, we recognize that security of archaeological sites must be protected for ethical and legal reasons. In the United States, the locations of archaeological sites are highly sensitive data and their release could have grave repercussions. It is difficult to develop adequate information security measures for public-facing websites and prevent accidental data releases or data theft through hacking and other leaks. Even if we deployed appropriate security measures, our systems would need extensive auditing for compliance to Archaeological Resource Protection Act (ARPA) regulations and our project team would be legally liable for any release of sensitive data. For these reasons, managing sensitive site location

data lies beyond the scope of the DINAA project, and no such information is released or even stored. To eliminate the risk of accidental or malicious disclosure of sensitive data, DINAA only stores and releases spatial coordinates at a reduced level of geographic precision. We negotiate the exact spatial resolution we use for public data with SHPO, THPO, and agency personnel; we expect it to be at the 20 km resolution used in the current iteration of DINAA (Figure 9.3), or no larger than county level, which was used in earlier efforts.<sup>20, 21</sup> Though not useful for compliance reviews, DINAA's 20 km resolution facilitates important research programs and Linked Open Data applications (Figure 9.4). DINAA also associates appropriate SHPO contact information with each data record to enable qualified investigators to request higher resolution data from state officials for use in more specific geospatial research.

### **DINAA's Approach to Data and Collaboration**

Since 2012, the DINAA team has contacted SHPOs, THPOs, state archaeologists, and site file managers in continental North America, describing the project goals and seeking input and participation.<sup>22, 23</sup> Our team has made these contacts on an annual or biannual basis, and the number of states participating by providing site information has been growing steadily as a result. This data expansion effort started in the eastern part of the continent and has grown to encompass the entire country. The DINAA team works with the archaeological site file databases held by SHPOs and allied federal and tribal agencies across North America, developing protocols for their linkage for research and management purposes. Site files contain data and metadata about the chronology, location, and function of sites, among other information used by government officials and the research community alike, and can include diagnostic artifact descriptions, radiocarbon data, and bibliographic citations.

DINAA currently documents 1,045,319 sites from 41 states (Figures 9.1 and 9.2), gathered either directly from agencies, through journal text-mining, or through links with museum collections and other online resources and repositories. We expect that total to rise dramatically, to approximately 2.5 million sites, when information managers in the remaining states join in the effort. As the utility and comprehensiveness of DINAA continues to grow, and as the results of efforts within the profession to make heritage information more generally available take hold, we expect DINAA to achieve its goal of encompassing most of the country. The public can download these records (with precise location and other sensitive data redacted, see below) free of charge, and free of intellectual property restrictions, via Open Context ([opencontext.org](http://opencontext.org)), an open access data publishing service (Figure 9.2). In most cases, the unique identifier for each site is the Smithsonian Trinomial (although some states use their own identifier system). These records cross-reference reports, museum collections, bibliographic references, and other online datasets that reference the same trinomials.

While DINAA continues to add new sites from across the continent, a recent increase has come through linkages with a wide range of sources, in addition to what is held in state site file systems, such as in reports in tDAR (the Digital Archaeological Record)<sup>24</sup>, radiocarbon dates (in the Canadian Archaeological Radiocarbon Database<sup>25-27</sup>, museum objects (in the Phoebe A. Hearst Museum of Anthropology), and research databases developed by individual scholars,

such as compilations of attributes for projectile points or about prehistoric structures, like those in the Eastern Woodlands Household Archaeology Data Project<sup>28</sup>, and the Paleoindian Database of the Americas (PIDBA)<sup>29, 30</sup>.

## **Community Input and Iterative Design**

Since its inception, DINAA has turned toward user communities for guidance on how to improve search, navigation, and data export features so that people can use the dataset with greater ease and confidence. Such feedback is vital to the project's overlapping ethical guidelines in the domains of archaeology and open government data. As an archaeological project we adhere to principles such as the SAA's Principles of Archaeological ethics, especially those principles regarding accountability and public outreach to tribal communities and affiliated peoples whose direct heritage is being addressed.<sup>31</sup> As an open government data project, we adhere to the principles of iterative communication with stakeholders in order to address positive benefits of scientific and cultural data sharing, but also to try to identify and minimize potential negative impacts.<sup>32-34</sup> DINAA project designers also recognize that neither the archaeological community, nor nation-state governments, have historically been particularly responsive to the needs of Indigenous peoples, and we consider this iterative work to be a first step in important efforts to decolonize archaeological data.

As a result of our *PLOS ONE* article on the impacts of sea level rise on U.S. archaeological resources (Figure 9.4)<sup>35</sup>, tribal government heritage officials within the Seminole Tribe of Florida contacted the DINAA team expressing interest in the DINAA database as an information source, and DINAA technologies as infrastructure to inform design choices within the tribal government. Thus, for the past three years DINAA has engaged in a long-running series of discussions with representative officials of the Seminole Tribe of Florida about potential tribal uses of the project results; these discussions also include more formalized interviews about the usability of the project interface and data structures. A series of interviews have helped us to better understand user needs to identify and prioritize user interface improvements on Open Context in order to make DINAA a more effective tool.

The Seminole traditional ancestral territory is located in the Southeastern states with some of the densest coverage by the DINAA database. This area also includes states containing heritage resources under threat from rising sea levels, highlighted in the *PLOS ONE* article. Because DINAA is managed as an open information project, with no intellectual property restrictions hindering reuse, the Seminole have embarked on experimental exercises to test the capacity of DINAA to interoperate with their governmental GIS systems, to assist tribal heritage planning on massive scales; they are also considering how DINAA technologies could be used to promote archaeological education and other heritage information to tribal members in ways that do not endanger protected archaeological site information and also respect cultural sensibilities regarding heritage resources. Seminole officials have chosen to maintain close contact with the DINAA project and have engaged in an ongoing series of conference calls as they investigate the potential of DINAA for their own purposes. These tests have also formed some of the basis for other use-testing interviews involving Seminole governmental heritage and geospatial experts, as

the project assesses the overall usability and user-friendliness of Web interfaces and data product organization.

Collaboration with the Chippewa Cree THPO (with additional consultation with the Eastern Band of Cherokee Indians THPO) has been essential in crafting and promoting ethical and responsive best practices in developing and using DINAA. The Chippewa Cree THPO works within the larger Chippewa Cree Cultural Resources Preservation Office on Rocky Boy's Indian Reservation, and has developed a tribal cultural monitoring program and consultation database that utilizes the traditional knowledge of tribal members in meeting the requirements of NHPA Section 106 CFR Part 800 to allow commentary by stakeholders on the effects of undertaking on identified historic and culturally significant properties. During the initiation of tribal consultation, THPO representatives receive detailed archaeological survey reports for each project generated by cultural resource management firms, but these often lack general background information on the archaeological resources previously documented in each area by SHPOs. Co-author Myers (at that time working with the Chippewa Cree THPO) identified the following needs:

- State agencies often do not allow access to their databases without archaeological credentials, in effect, gatekeeping information from tribal communities. DINAA must reduce these barriers.
- Tribal community members need multiple routes to find information. Straightforward user interfaces, direct links from THPO webpages, and other measures may be required.
- Tribal interests extend over multiple state boundaries. The Chippewa Cree monitor a ten-state area and the Eastern Shoshone monitor a 16-state area. By aggregating across state lines, DINAA can facilitate discovery of needed information with good search and mapping features.
- Technical jargon and complexity will often limit use. DINAA needs to develop clear and accessible tutorials, especially videos and explanatory graphics.

In an ongoing series of annual DINAA workshops since 2014, the DINAA team has worked with potential partners about what DINAA is and how it operates, and to learn from each other and improve overall practice while growing DINAA. The 2019 DINAA Workshop in Berkeley, CA, brought together DINAA team members, researchers, museum and library representatives, tribal heritage experts, and data managers from partner states as well as potential DINAA partner states. The goals were (1) to discuss strategies for adding states not currently participating in DINAA, (2) to establish opportunities for training (such as establishing data carpentry courses), (3) to explore greater integration with archaeology in cultural resources management (CRM), (4) to discuss longer-term management of data, specifically with regard to tribal governance, and (5) to plan future data acquisition strategies. One conclusion of the meeting was to expand DINAA's efforts by compiling data from a variety of online sources, including museum collections records, journal articles, and research databases. One idea being explored is to take bibliographic records generated with public funds in the National Archaeological Data Base (NADB) and link the bibliographic information to specific site records. We also concluded that major next steps for funding should involve establishing a longer-term plan for supporting (1) regular engagement with a (compensated) DINAA governance board of tribal representatives and (2) ongoing face-to-face workshops with state and tribal data managers in order to do trainings, get feedback for



improvements to DINAA, and start to build a broader community of individuals who can work with Linked Open Data in U.S. archaeology and cultural heritage.

## Learning from Implementation

As a data management tool, DINAA has the potential to transform the way we think about and conduct basic archaeological research, data and heritage management, and public education in the United States and beyond. The integration of site file data at continental scales in an open and readily accessible informational infrastructure allows, for the first time, the exploration of the North American archaeological record across multiple temporal periods and geographic regions. The utility of such a resource was directly seen in a 2017 *PLOS ONE* paper that showed the effect of sea-level rise on known archaeological sites and properties listed as eligible for inclusion on the National Register of Historic Places.<sup>35</sup> For the first time, the entire site database from a substantial portion of the Gulf and Atlantic coasts of the United States was examined, showing the scale of the problem, and making recommendations for management and mitigation (Figure 9.4).

However, DINAA's greatest value for museums, libraries and the public centers on Linked Open Data (LOD) applications. Open Context, like other LOD systems, emphasizes the use of stable Web Uniform Resource Identifiers (URIs, i.e. stable URLs that serve as universally unique "primary key" identifiers) to identify concepts and other entities so they can be easily and precisely referenced and related across different data collections on the Web. DINAA uses Open Context and the EZID service to mint persistent URIs for each site files record. In archaeology and historical geography, the "site" is a key organizational entity. Minting stable Web URIs and offering rich temporal, geographic, and cultural metadata (also available in machine-readable JSON-LD format) about sites will therefore create significant LOD resources essential for broadly integrating museum, library, and scientific datasets.

DINAA cross-references diverse museum, library, and archival resources. However, using DINAA involves several challenges for organizations that may have limited technical support and staffing. In our experience, efforts to reuse data offer some of the best ways to discover problems in data and data services.<sup>36</sup> To build experience needed to guide uses of DINAA, we have undertaken the following activities:

1. **Expansion through text-mining:** As a way of expanding DINAA's indexing capabilities, and adding site information from areas where we do not yet have site file data, we developed text mining software to find references to sites reported using a Smithsonian/River Basin Survey trinomial site numbering format in published online journals and other data sources. An initial test found numerous references to archaeological sites in back issues of *American Antiquity*. In 2019 we began asking state information managers for lists of sites by county in their state, identified by their Smithsonian trinomial codes, so we can begin indexing items even in the absence of specific site information from their office. Ten states responded positively to this request, with the result that the DINAA team now has well over one million site numbers, of which 881,243 are already indexed (DINAA 2019).

2. **Linking to external collections:** We established cross-referenced linkages between DINAA and the Federal Register, the primary source of US government regulatory determinations. The Federal Register references archaeological site records, and DINAA provides a powerful index illustrating the geographic and chronological scope of US government cultural heritage management. Similarly, in a collaboration with the Phoebe A. Hearst Museum of Anthropology, we indexed some 5,000 sites in California available in the Hearst's public online collection. DINAA can now more easily cross-reference with additional Hearst records because of improvements in the Hearst's collections management system resulting from this project. Furthermore, because the Hearst Museum's collections are documented in CollectionSpace, an open source museum information system that is used by several institutions that also curate significant North American collections (most notably the San Diego Museum of Man), extending CollectionSpace to use DINAA, as well as documenting cost-effective implementation methods, will help future institutional partnerships. While the technologies for connecting DINAA to other resources now function well, the greater challenge of determining what resources should be linked remains (see below).
3. **DINAA's Linked Open Data** approach through Open Context cross-references distributed collections on the Web, enabling users to find and access relevant data in other online datasets, using site numbers as the common identifier. To date, these linkages include:
  - a. **Links to and from tDAR:** DINAA cross references site records with tDAR metadata records. Open Context uses this information to interface with tDAR's API to display links to tDAR-archived reports and data relevant to site records in DINAA. Additionally, tDAR recently enhanced its spatial metadata records to include DINAA site file record URIs. This marks a major development in interoperability between American archaeological information systems.
  - b. **Eastern Woodlands Household Archaeology Database Project (EWHADP)**<sup>28</sup>: Andrew White, a researcher investigating household structures for Woodland period sites in the Midwest and South has incorporated DINAA identifiers in his online database. In doing so, his datasets are precisely related to DINAA data, and the DINAA search interface can be used to discover data about ancient households compiled and curated through his research efforts.
  - c. **VertNet/GBIF**<sup>37</sup>: VertNet is a major contributor to the Global Biodiversity Information Facility (GBIF). VertNet has started to use DINAA identifiers and data as spatial metadata for zooarchaeological specimens. This means DINAA now helps support research and information management in a much broader world of bioinformatics systems.
  - d. **Pelagios:** Pelagios aggregates gazetteer data and annotations that link cultural heritage content to gazetteers. In order to more broadly disseminated DINAA data and annotation, Open Context implemented Pelagios-recommended Linked Open Data standards so that DINAA data are now discoverable via the Peripleo-Pelagios network.<sup>38</sup> This broadens the community of researchers and software developers working with DINAA data and annotations.

As discussed, DINAA primarily serves as an index and finding aid that helps make resources scattered across the Web easier to discover. But even in this role, where DINAA relies upon partner institutions to properly and ethically curate collections, DINAA runs into ethical challenges. For example, at the workshop in August 2019, DINAA showed examples of linking site records to resources in the Hearst Museum’s online collection. An Indigenous archaeologist workshop participant followed links from DINAA to the Hearst’s online collection and saw materials inappropriate for public display. After raising this problem with the museum, the Hearst quickly took down the inappropriate materials. This incident highlights some issues. DINAA helped facilitate identification of materials that should not be public, leading to the improved curation of the Hearst collection. At the same time, however, this incident raises important questions about DINAA’s role in linking to outside resources. What resources should DINAA point toward? DINAA can and should link to public online resources maintained by Tribal Nations, but many tribal communities do not have much of an online presence. How can DINAA help highlight Indigenous voices documenting their own heritage while avoiding inappropriate or even abusive resources? Furthermore, DINAA has a continental scope and scale. Most programs that can serve as a model for good ethical practices in working in partnership with Indigenous communities occur on a local scale. How can such models for partnership work to responsibly meet the needs of several hundred diverse sovereign Tribal Nations across all of North America?

### **Conclusion: Inclusive Stewardship of North America’s Archaeological Heritage**

The DINAA project recognizes significant challenges in ethical data management, especially given the often-tragic histories of colonialism and appropriation of Indigenous land, arts, and culture<sup>39-43</sup>. Recently, the NEH and IMLS invested in projects like Mukurtu to address Indigenous information privacy needs. DINAA complements these prior investments and also looks to new efforts, such as the CARE Principles for Indigenous Data Governance (CARE)<sup>44</sup>, which builds on the widely-cited FAIR Guiding Principles for scientific data management and stewardship (Findable, Accessible, Interoperable, and Reusable)<sup>45</sup> by adding four key principles of Collective Benefit, Authority to Control, Responsibility, and Ethics. Empowering communities with respect to digital cultural heritage involves a host of issues beyond access controls and intellectual property claims (the focus of Mukurtu). Native American communities must also interface with sometimes opaque and unresponsive government agencies that hold relevant cultural heritage data. DINAA makes key information used in the management and preservation of North America’s rich cultural heritage available for inspection, evaluation, and use by descendant communities that have often been marginalized from administrative and political processes. In this sense, DINAA is an “open government” project that will make cultural heritage management more accountable to wider constituencies, especially descendant communities, and will improve the government-to-government relationships that are essential to cultural heritage management by sovereign tribal nations.

While DINAA itself is and will be freely accessible open data, it can empower tribal and related institutions managing sensitive, access-restricted data. Interoperability measures between tDAR and Open Context illustrate synergies between open data and access-restricted systems. Open Context’s login-free and highly granular data facilitate access and use of site data with location

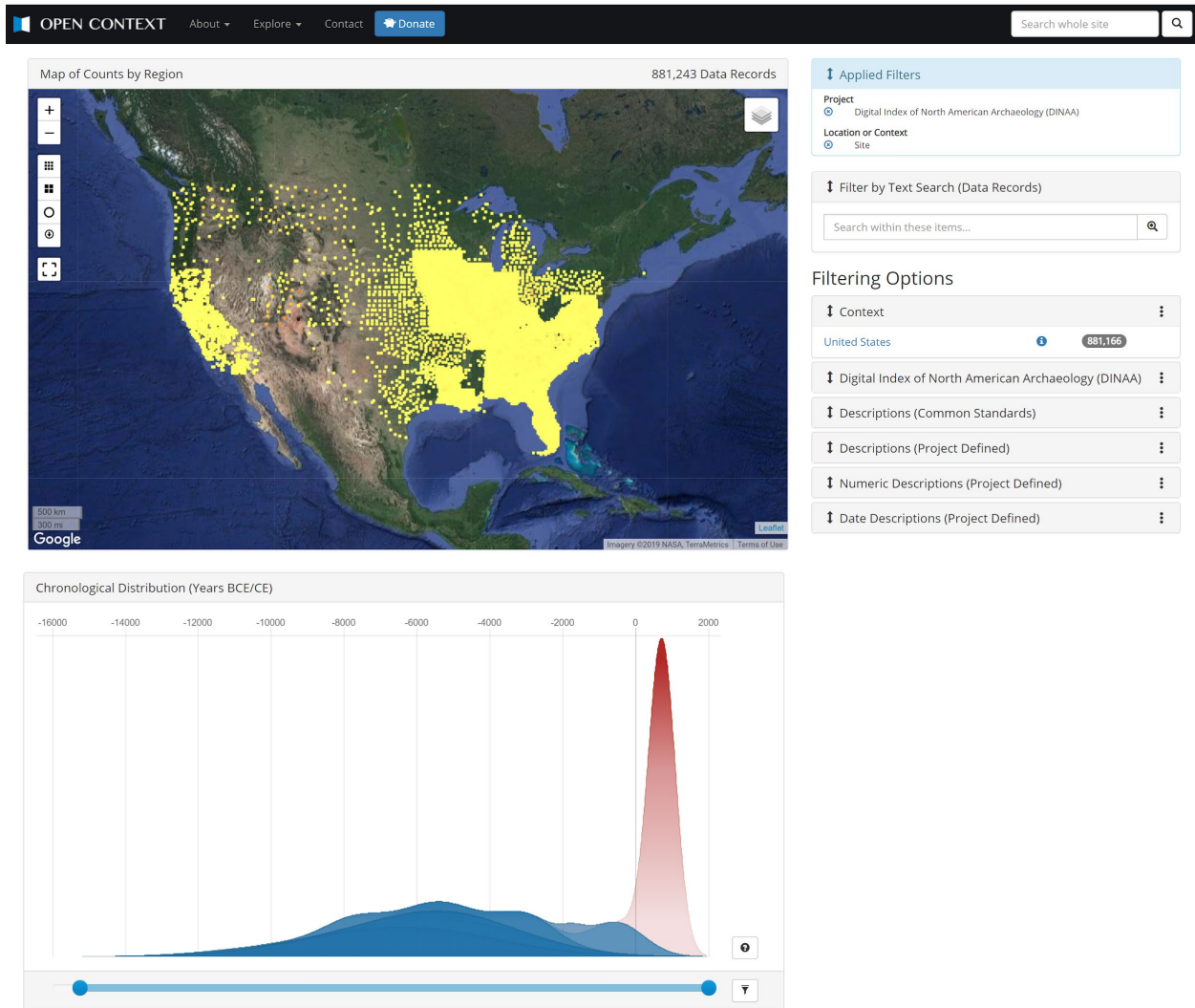
information redacted, for museums, educators, and research applications built on the Open Web. Moving forward, DINAA is transitioning from a “proof-of-concept” project where collaborations focused on the specific needs of heritage professionals representing three of the hundreds of Tribal Nations in North America. DINAA needs an ethical governance model appropriate for a continent-scale resource. This will require formation of a Native American Governance board where members that represent Tribal Nations can set policies for content, linking, notifications and takedowns, dispute resolution, and help identify ways that DINAA can maximize positive benefits in protecting, promoting and enriching Indigenous cultural heritage. There are many open questions on how to best form and finance this Governance Board, but the need for large scale digital resources responsive to the needs of Indigenous peoples will only grow.

**Figure 9.1:** Sites indexed or being incorporated into DINAA as of 30 September 2019 (n=881,166 sites indexed, 1,045,319 sites compiled in total).

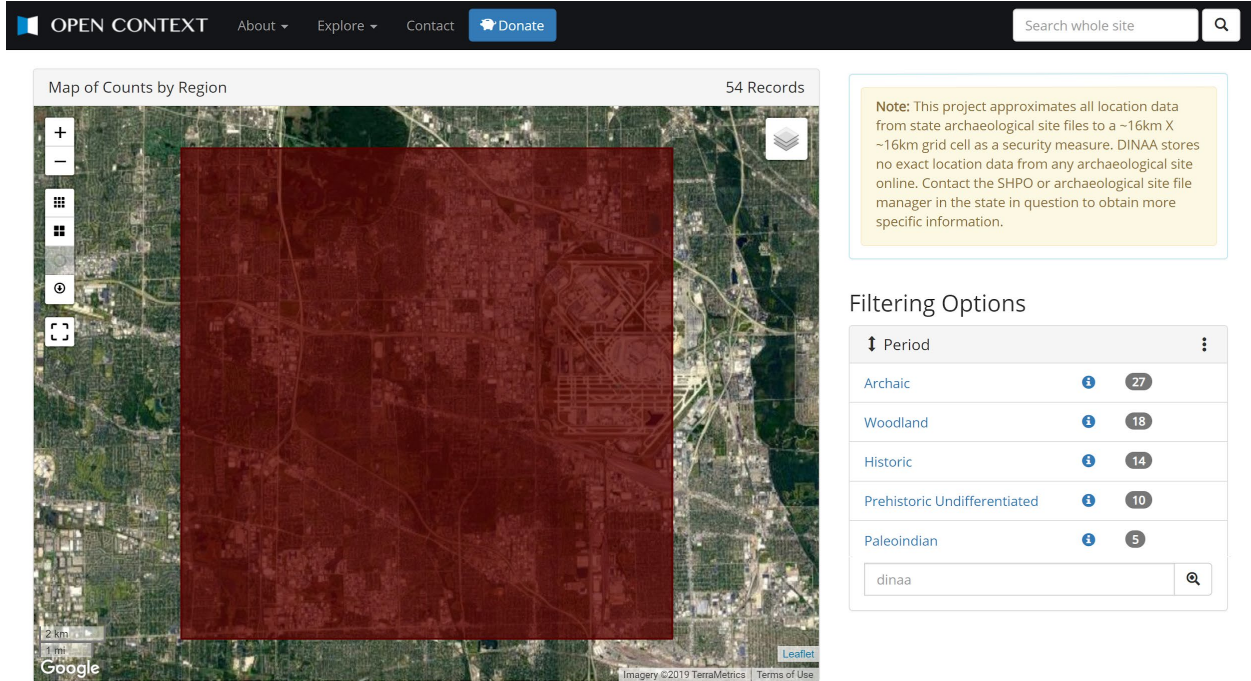
STATE	DATA COMPILED	NOTES**
*Alabama	27,594	
^Alaska	0	
^Arizona	0	
#Arkansas	49,325	
^California	4646	Indexed Sites are from Other Sources
^Colorado	464	Indexed Sites are from Other Sources
^Connecticut	0	
^Delaware	0	
*Florida	31,041	
*Georgia	53,191	
^Hawaii	n/a	Not Part of Current Project
^Idaho	13	Indexed Sites are from Other Sources
*Illinois	59,610	
*Indiana	41,473	
*Iowa	26,850	
#Kansas	15,610	
*Kentucky	18,811	
*Louisiana	19,096	
*Maine	0	Data Transfer in Progress
*Maryland	13,167	
^Massachusetts	1	Indexed Site is from Other Sources
#Michigan	24,985	
#Minnesota	13,037	
#Mississippi	33,539	
*Missouri	32,579	
#Montana	61,718	
#Nebraska	11,002	
#Nevada	126,491	
^New Hampshire	0	
*New Jersey	0	
^New Mexico	10	Indexed Sites are from Other Sources
^New York	0	
*#North Carolina	52,479	11,155 have full site data indexed in DINAA
^North Dakota	41	Indexed Sites are from Other Sources
*Ohio	48,291	
#Oklahoma	25,317	
^Oregon	117	Indexed Sites are from Other Sources
*Pennsylvania	21,815	
*Rhode Island	3695	Data Transfer In Progress
*South Carolina	28,261	
^South Dakota	162	Indexed Sites are from Other Sources
*Tennessee	25,395	
*Texas	3421	Partial Sample of Site Files
#Utah	96466	
*Vermont	0	Data Transfer In Progress
*Virginia	42,480	
#Washington	32,991	
^West Virginia	38	Indexed Sites are from Other Sources
^Wisconsin	57	Indexed Sites are from Other Sources
^Wyoming	40	Indexed Sites are from Other Sources
TOTALS	1,045,319	

\* DINAA Partner. State information managers have provided full site data  
# State information managers have provided a listing of site numbers by county to DINAA  
^ State information managers have provided no information to DINAA  
\*\* Other Sources refers to repositories other than state site files

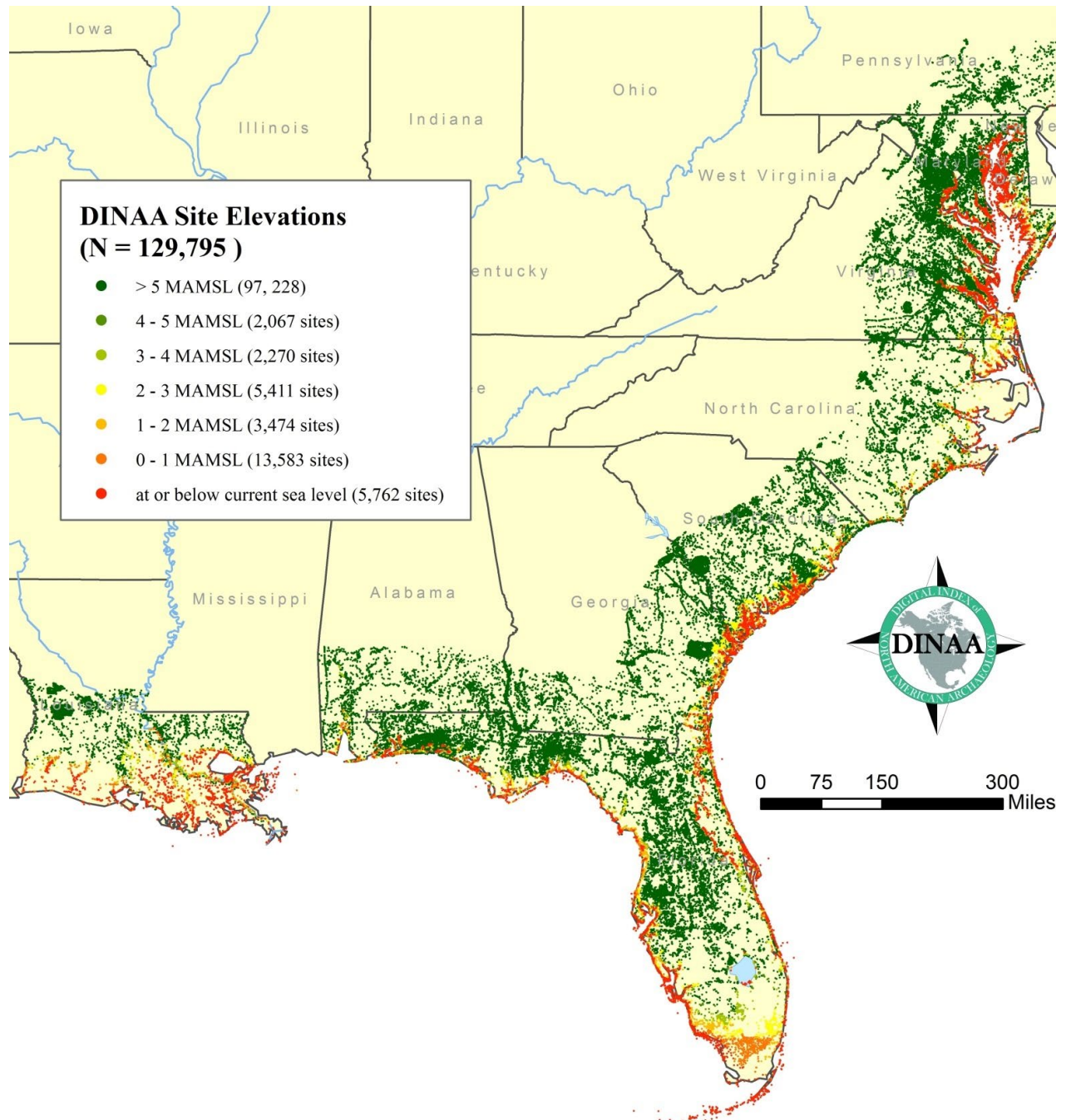
**Figure 9.2:** DINAA has compiled data from 1,045,319 sites as of September 30, 2019. The total includes information provided by state site file managers and State Historic Preservation Officers (SHPOs) in the Eastern United States, as well as information obtained from other repositories, including museum collections, online research databases, and through text mining of journals like *American Antiquity* and the *Midcontinental Journal of Archaeology*, and grey literature such as the *Federal Register* and the *Index of Texas Archaeology*. For current data, visit: <http://ux.opencontext.org/archaeology-site-data/dinaamap/>



**Figure 9.3:** DINAA map viewer showing the finest resolution of 20 x 20 km grid cell, in this example over O’Hare International Airport, Chicago. This particular grid cell represents 54 archaeological site records, including 5 Paleoindian, 27 Archaic, 18 Woodland, 14 Historic, and 10 undifferentiated pre-Contact components.



**Figure 9.4:** Map showing site density as it relates to potential loss from sea-level rise and grouped by elevation in meters above present mean sea level, illustrating all sites within a buffer of 200 km from the present coastline in gray.<sup>33</sup>





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## Endnotes

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