

Exploring Engagement: Indigenous Communities and Natural History Museum Paleontology

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Abstract

In the fields of museology and paleontology, there is growing interest in collaborating with Indigenous communities in North America as professionals understand and acknowledge the colonial history of paleontology, which includes extractive and exclusionary practices. Because collaboration with Indigenous communities in paleontological museum practice is still new, there is a lack of research about what professionals are currently doing and how they started collaborating. The purpose of this research is to explore what types of museum professionals are engaging with communities, what that engagement looks like, and what factors and barriers influence decision-making and actions. Many professionals are aware of this growing interest and want to start or continue engagement with Indigenous communities, but there are many barriers that make collaboration difficult.

Acknowledgement:

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Introduction

Long ago, a Nitsitapii woman named Weasel Woman was gathering food at “Falling off without Excuse”, an eroding riverbank in her ancestral lands. As she walked, she heard a voice coming from a buffalo rock or buffalo-calling stone, called an Iniskim. The stone told the woman about a special ceremony that could be performed with the buffalo-calling stone, to draw the buffalo towards a buffalo jump, a pisskam. The Weasel Woman went back to the camp with the Iniskim and told the hunters and spiritual leaders of this ceremony. After the Weasel Women taught her people this ceremony, tribes began to collect Iniskim, known in paleontology as bison-shaped Baculite fossils. These sacred stones were used in ceremonies in order to have successful buffalo hunts. Fossils were collected to be placed in sacred bundles, placed in medicine bundles for healing purposes, used for luck, and for other powers. The Iniskim tradition goes back at least a thousand years, based on oral traditions and archaeological discoveries. People continue to use Iniskim to have successful lives (Adapted from versions by: Mayor, 2005; Glenbow Museum; Edmonds and Clark, 2021; Kristensen, 2018; Blackfoot Digital Library; Mootookakio’ssin, 2020).

Native American communities have lived in North America for time immemorial, or at least 23,000 years (NPS, 2025), interacting with the land, uncovering fossils, and incorporating them into oral traditions and ceremonies. These lands and fossils have also been a source of information to the field of paleontology since the 18th century, when the discipline was developing in North America. One of the most well-known and controversial contemporary fossil discoveries, Sue the *Tyrannosaurus-rex*, was found on land owned in part by the Cheyenne River Tribe (Jones, 2019). Paleontology has also been tied to natural history museums (NHMs),

as fossils have been stored, researched, and exhibited in North American institutions since the early 1800's (Rich, 2024). While there is overlap between Indigenous lands, paleontological research, and NHMs, there is little to no guidance on how these entities work with one another.

Language is used to communicate and connect, but it can also be used to harm and “other” people, which is why terminology is important to consider. For the purpose of this study, the word Indigenous will refer to communities that currently live and have generational relationships to the land now known as North America, including Native American, Native Alaskan, Inuit, and First Nation peoples. The “I” in Indigenous is capitalized as a sign of respect for the identities, governments, and rights of Peoples that have historically been marginalized and illegitimized.

History of Paleontology and Indigenous Communities

Paleontology is the study of past life based on the fossil record, which allows researchers to study past flora and fauna, environments, and climates, and infer how life adapts to changes over time. In museums, dinosaurs and other fossils draw visitors as popular exhibits for young children and adults alike. But many people are unaware that the field of paleontology has a colonial and racist history, involving the extraction of fossils, exclusion of communities, and erasure of communities impacted by the discipline (Kempf et al., 2023; Ashby and Machin, 2021; Raja et al., 2022; Monarrez et al., 2021; Elbein, 2021). In the United States, early paleontologists and naturalists, including Joseph Leidy, O.C. Marsh, Edward Drinker Cope, and Georges Cuvier, advanced their careers by exploiting the fossil resources from Native American land, relying on Indigenous Knowledge (IK) and Native American guides to find and extract

these resources, often failing to give them proper credit or document their involvement (Bradley, 2014; Monarrez, et al., 2021; Elliot, 2023; Kempf, et al., 2023). For example, the first mastodon molar studied in Europe was discovered by Abenaki Indian guides in 1739, but they were not given credit (Mayor, 2022). Over a hundred years later, in 1873, O.C. Marsh and a group of Yale students knowingly entered and extracted fossils from Sioux hunting grounds without Sioux permission (Bradley, 2014), demonstrating how longstanding and pervasive these practices were.

Researchers and institutions today are realizing that the colonial history of paleontology collections and research needs to be addressed in order to have greater infrastructure, protection, and diversity, equity, accessibility and inclusion (DEAI) for the future of paleontology and NHM's (Smith et al., 2025). Many scholars have also pointed out that the continuation of colonial practices present in paleontology is not just a North American issue, but a global problem, as specimens from the Global South continue to be shipped to museums in the Global North for repository and research, instead of staying in the home nations that want to steward their own paleontology resources (Monarrez, et al. 2022; Cisneros, et al. 2022; Raja, et al. 2022; Lenharo and Rodrigues, 2022; Vogel, 2019; Smith, et al. 2025; Brache, 2025; Dunne et al., 2025).

Scholars have also argued that the field of paleontology and NHM needs to decolonize by addressing past and present injustices in research and collection of fossils from around the world (Cisneros et al., 2022; Lenharo and Rodrigues, 2022; Monarrez et al., 2022). Decolonization is the ongoing process of acknowledging the harmful colonial history of collecting and exhibiting in museums, while making significant changes to de-center Eurocentric perspectives through research, collaboration, and transparency with the public (Adapted from Merritt, 2019). Through

acknowledging this history and beginning to incorporate Indigenous communities into paleontological processes in field research and the different domains of natural history museum work, we can begin to decolonize paleontological collections in museums.

Why this matters for Indigenous Communities and Natural History Museums

Before the colonization of the Americas, Indigenous peoples understood that the land was once populated by long-extinct animals, but their oral histories about fossils and deep time were not understood or considered by Western researchers (Mayor, 2005; Elliot, 2023). Even when scientists saw the importance of IK for understanding the Earth and its past, it was not always accepted, as is the case with Georges Cuvier, whose works were often translated to exclude information about Indigenous communities (Mayor, 2022). Today, Indigenous peoples continue to have deep and generational relationships with the land and community, informing Indigenous Ways of Knowing and grounding beliefs, knowledge, and identity (Wilson, 2008; Littletree et al., 2020). This relationality relates to fossils, as significant aspects of land and time, many Indigenous Peoples consider fossils important or sacred materials that could fall under the Native American Graves Protection and Repatriation Act (NAGPRA) (Stantucci et al., 2021; Kempf et al., 2023; Mayor, 2005). That being said, Indigenous Peoples are diverse, and not every community has strong ties to fossils, nor does every community want to interact with museums. Part of accepting Indigenous sovereignty is understanding that communities have the right to share or not share Indigenous or Traditional Knowledge at their own discretion.

It is important for museums and the field of paleontology to acknowledge this history and start including new perspectives and people to remain relevant. There tends to be a lack of diversity in scientific disciplines, particularly in paleontology which impacts the research and interpretation of fossil materials and the pertinence of NHM's (Monarrez et al, 2021; Smith et al,

2025; Carter et al, 2022). Additionally, it is unclear how museums currently include the perspectives of Indigenous communities that have interacted with the fossils of North America for generations. There is an opportunity for NHMs to make paleontology research, exhibition, education, and programs more inclusive and diverse by collaborating with Indigenous communities. Several arguments can be made for changing this practice to one of greater access and collaboration:

1. NHMs manage data

Museums are repositories of knowledge, and much of that knowledge is managed in databases that are not always accessible to the public or to communities that might benefit from information held in these databases. It is also important to remember that while museums should aim to be accessible and transparent, museums also have a responsibility to respect the rights of Indigenous peoples to protect their Traditional Knowledge.

2. Decolonizing NHMs and creating community spaces

NHMs are inherently colonial, as materials collected and stored in museums originated as proof of European imperial dominance (Ashby and Machin, 2021). Today, more NHM's are acknowledging this history by having conversations about decolonization and participating in healing activities such as repatriation and community collaboration (Schweitzer, 2020). These practices and conversations are already increasingly common in cultural, art, and archaeological collections, and have the potential to expand to paleontology.

3. Museums are places of teaching and learning

One of the purposes of museums is to teach and learn from the public. There is an opportunity for the exchange of knowledge between Indigenous communities and museum professionals, as well as knowledge exchange with museum visitors.

Through increased engagement with Indigenous Peoples, NHMs can inspire change for the next generation of paleontologists, leading to more knowledgeable museums and a more diverse field of paleontology.

Current Practices

Interaction between NHM's and North American Indigenous communities became more common in the 1980's and 1990's, with the passing of NAGPRA in the United States and Canadian institutions beginning to work with and repatriate objects to First Nations peoples. Canada currently does not have national repatriation laws, instead leaving repatriation up to provinces and individual institutions, although the Canadian Museums Association recommends following UNDRIP (United Nations Declaration on the Rights of Indigenous Peoples) guidelines regarding repatriation efforts (Danyluk and MacKenzie, 2022). As a result of these regulations, Indigenous communities are now visiting cultural and archaeological collections for consultation, providing insights about cultural practices, identifying culturally significant objects, and more. While laws and professional guidelines have mandated and encouraged interaction for cultural collections, there are no similar legal requirements for paleontology researchers and NHM staff, leading to varying interests in working with Indigenous communities.

In the past ten years articles and conversations have emerged about this topic, with most discussions coming from paleontological societies in the past five years, and NHM involvement often only mentioned briefly (PS Short Course, 2024; PS Ethical Guidelines for Publication;

SVP Annual Meeting Guide 2018, 2021, 2023, 2024, 2025). The available literature argues that there are gaps in safeguarding paleontology resources on Native lands, as well as a lack of support, education, and institutional accessibility, which makes it difficult for communities to manage and research their own paleontological resources (Kempf et al., 2023; Bradley, 2014; Monarrez et al., 2021). These gaps exist in United States federal acts and laws that are vague or, contradictory, or are absent of information about Native American rights to govern fossils, including the Antiquities Act, Indian Mineral Leasing Act, American Indian Religious Freedom Act 42 U.S.C. § 1996, Archaeological Resource Protection Act (ARPA), NAGPRA, and the Paleontological Resource Protection Act (PRPA), 16 U.S.C 1C, and others (Kempf, et al., 2023; Bradley, 2014; NPS).

Since 2017, there have been ongoing land disputes over paleontological resources between the Pueblo of San Felipe and the Bureau of Land Management (BLM) because the Tribe has claimed that fossils excavated near the reservation are culturally significant and should be eligible under NAGPRA (Kempf et al., 2023). In early 2025, a memorandum from the United States Department of the Interior (USDI) Office of the Solicitor regarding this case stated that paleontological resources can be considered cultural items on a case-by-case basis (USDI, 2025), but no laws or policies have been put in place yet.

Some Tribes are also publishing paleontology policies and becoming increasingly active in pursuing access to or ownership of paleontological resources (IAM, 2012). In 2015, the Standing Rock Sioux Tribe approved a paleontological resource code to manage and protect paleontological materials within the exterior boundaries of the Standing Rock Indian Reservation (Standing Rock Sioux Tribe Paleontology Code, 2015). This also included a paleontology museum, called the Standing Rock Institute of Natural History, which closed in 2019 due to

funding and structural issues (Field Museum, 2022; WTTW). This was the first tribal nation in the US to have its own paleontology code, program, and museum.

While this topic is understudied, both in the field of paleontology and in NHMs, some institutions are beginning to engage with Native communities or make their collections and exhibits more accessible and relevant.

1. At the University of Wisconsin-Madison Geology Museum, researchers have been working with Native communities since around 2021.
 - The first part of this project involved working with the Wind River Reservation, home to the Eastern Shoshone and Northern Arapaho Tribes, to create non-Western nomenclature for fossils found on ancestral lands (SVP, 2023; Parrish, 2023). In 2025, a short documentary was released about this project (Parrish, 2025).
 - The second, ongoing, aspect of this project involves the collaboration of museum and student staff to teach Indigenous students about processing, researching, caring for, and exhibiting fossils in order to empower students, bridge gaps, decolonize paleontology, uplift Indigenous voices and inspire the next generation of paleontologists and museum professionals (UW fellowship award, 2024; SVP, 2024).
2. The Florida Natural History Museum has been part of a project exploring ethical open-source science to make paleontological data more accessible to Indigenous communities in response to the colonial history of inequitable data distribution (SVP, 2024).
3. In 2022, the Field Museum in Chicago opened the exhibit, *Native Truths: Our Voices, Our Stories*. A small section displayed fossils and discussed the history of illegal fossil

extraction in the Standing Rock Sioux area, as well as the now-closed Standing Rock Institute of Natural History (Field Museum, 2022).

4. The Royal Ontario Museum (ROM) exhibited artworks by Cree artist Kent Monkman, who used the ROM paleontology collections as inspiration for his works in the exhibition *Being Legendary*, choosing to exhibit fossils alongside his paintings (Monkman, 2020).

Frameworks and Principles

Frameworks and principles are tools, guidelines, models, and scaffolds developed to provide structure, guidance, and consistency for solving problems, making decisions, and establishing values for professionals, researchers, and institutions. For this study, I will be employing frameworks developed across the fields of museum studies, library and information science, and public programs. These frameworks will be used to analyze and discuss the results of the study.

The first model is the spectrum of community engagement. Several institutions have developed different handbooks and guidelines for community engagement, including the International Association for Public Participation Spectrum of Public Participation and the Institute for Museum and Library Services Community Catalyst Initiative. These approaches to public engagement aim to build strong relationships with communities to create change. Five common elements that these frameworks follow are to inform, consult, involve, collaborate, and empower communities (Figure 1). The lowest level of engagement is “inform”, where basic engagement occurs, and goes up to “empower”, where community partners are given the most freedom to make decisions (IMLS; Norton and Dowdall, 2017).

The next two principles, CARE and FAIR, are related to data accessibility. FAIR principles are more commonly known when discussing accessibility and usability of data, metadata, and databases. The acronym FAIR describes the criteria of data being findable, accessible, interoperable, and reusable (Figure 2; Wilkinson et al., 2016). Museums are becoming more concerned with making their databases accessible and FAIR, in an effort to promote transparency and educate the public.

More institutions are using FAIR principles to define best practices when implementing open-access databases (Dunne et al., 2024), but in doing so there is potential to neglect Indigenous rights (Jennings et al., 2023). This is where CARE principles come in, which are designed for Indigenous data governance, prioritizing Indigenous Peoples' rights and interests. CARE refers to collective benefit, authority to control, responsibility, and ethics (Figure 3). CARE was developed in response to ongoing colonialism relating to data control, as the Western biases that build today's data systems do not allow for Indigenous Knowledge systems (Carroll et al., 2020). Carroll et al. (2020) go into detail about what Indigenous Peoples' data are and why it is important to acknowledge and protect this information. CARE principles empower Indigenous Peoples by positioning data within Indigenous Knowledge Systems for the benefit of Indigenous Peoples through value-based relationships, rather than regulated consultation for increased ethical data stewardship (Jennings et al., 2023; Carroll et al., 2020; Dunne et al., 2025).

Many institutions are either using FAIR or CARE principles, but very few realize the potential of using both to achieve greater impact. Some scholars argue that despite the tension, CARE principles are designed to complement FAIR principles, and it is up to institutions to find where this intersection is, but data management can follow both of these principles effectively (Carroll et al., 2021; O'Brien et al., 2024; Figure 4). The FAIR+CARE Cultural Heritage

Network is an institution working to provide guidelines and models for integrating these two contradictory principles (The Alexandria Archive Institute). This topic is still new, and education about these principles and Indigenous data sovereignty is needed for these principles to be implemented together at their full potential (Carroll et al., 2021; Jennings et al., 2023).

Purpose:

The purpose of this study is to explore ways that North American natural history museums with paleontology collections engage with North American Indigenous communities and Indigenous ways of knowing within different domains of museum work concerning these collections.

This study is guided by these research questions:

1. What are the external and internal factors that influence NHM's to include Indigenous community perspectives or Ways of Knowing in relation to Paleontology?
2. To what extent are NHM engaging with Indigenous communities within the different domains of museum work? What does engagement look like?
3. To what extent are accessibility frameworks, such as CARE or FAIR, being applied to collections databases?
4. What types of barriers or opportunities do staff express in doing this work or wanting to do this work?

Methods:

This study employs an exploratory research design, which aims to collect preliminary data on a specific topic through analysis of “quantitative or numerical data of trend, attitudes, or

opinions” in a sample population (Creswell, 2023). The survey is designed to collect data on the experiences of museum professionals working in the field across North America. Data was collected electronically through Google Survey over the course of two months. Participants could choose for their institution to remain anonymous, and most did. Any specific institutions mentioned in the results and discussion did not wish to remain anonymous. The survey includes 36 questions (See Appendix B) and consists primarily of multiple-choice questions. The survey was reviewed by the University of Washington Human Subject Division Institutional Review Board (IRB), which determined that the study was exempt from federal human subjects regulations and could proceed.

Initial sites recruited to participate in the survey had to meet the criteria of being a natural history or paleontology museum and had to be collecting, researching, or exhibiting paleontological materials. The goal of this exploratory study was to understand who is working with communities and how. To understand the full extent of this, I recruited professionals who work in various domains of museum work, including curation, collections care, exhibits, education, public programs, research, etc.

The survey was sent to potential participants and institutions via email and through networking. The survey was also added to an AAM forum post and shared with the Society for the Preservation of Natural History Collections (SPNHC) forum. The survey was sent to 71 institutions across the United States and Canada. Participants were encouraged to further distribute the survey to colleagues and organizations through snowball sampling.

Demographics:

Of the 71 institutions that were recruited, 36 institutions responded, with 51 individual responses, giving the survey a 50.7% institutional response rate, and about 25% museum professional response rate. The exact response rate is hard to calculate because snowball sampling was used to recruit participants. 61% of professionals work in curatorial or collections departments, with 39% of professionals working in education, programs, outreach, research, exhibits, and administration positions. Some participants work in smaller organizations and fill multiple roles across departments; in these cases, they were categorized by their job title, which was typically under curation. Additionally, 84% of participants reside in the United States, and 16% reside in Canada, which can be attributed to the proportionately larger number of NHMs in the US. 38% of participants work at small to medium institutions, 62% work at large institutions, and 50% of institutions steward both paleontological and cultural collections.

Results and Analysis

Research Question 1: External and Internal Factors.

a. Awareness and Interest

Table 1: Responses to “Are you aware of the interest and/or ongoing work in the paleontology field to collaborate with Indigenous communities? Do you have any interest in Indigenous community collaboration on a personal level? Is there any interest in Indigenous community collaboration on an institutional level?”

Awareness and Interest	Frequency
Aware of field-wide interest?	Yes: 80.4% No: 19.6%
Personal Interest	Yes: 74.5% No: 5.9%

	Maybe: 19.6%
Institutional interest	Yes: 74.5% No: 3.9% Unknown: 17.6%

These three questions indicate that there is significant personal, institutional, and perceived field-wide interest, followed by a number of professionals who are unaware of their personal and institutional interest and the growing field-wide interest.

b. Significant External and Internal Factors

Table 2: Responses to “What are the factors influencing your decision to collaborate with Indigenous communities? (Select up to three).”

	Institutional mission, values, or beliefs	Personal values or beliefs	Community interest and relationship factors	Growing fieldwide interest	Other: time, budget, legal requirements
Count	n: 40	n: 35	n: 28	n: 20	n: 8

The main factors that influence people's decisions are related to values and beliefs, and interest from communities.

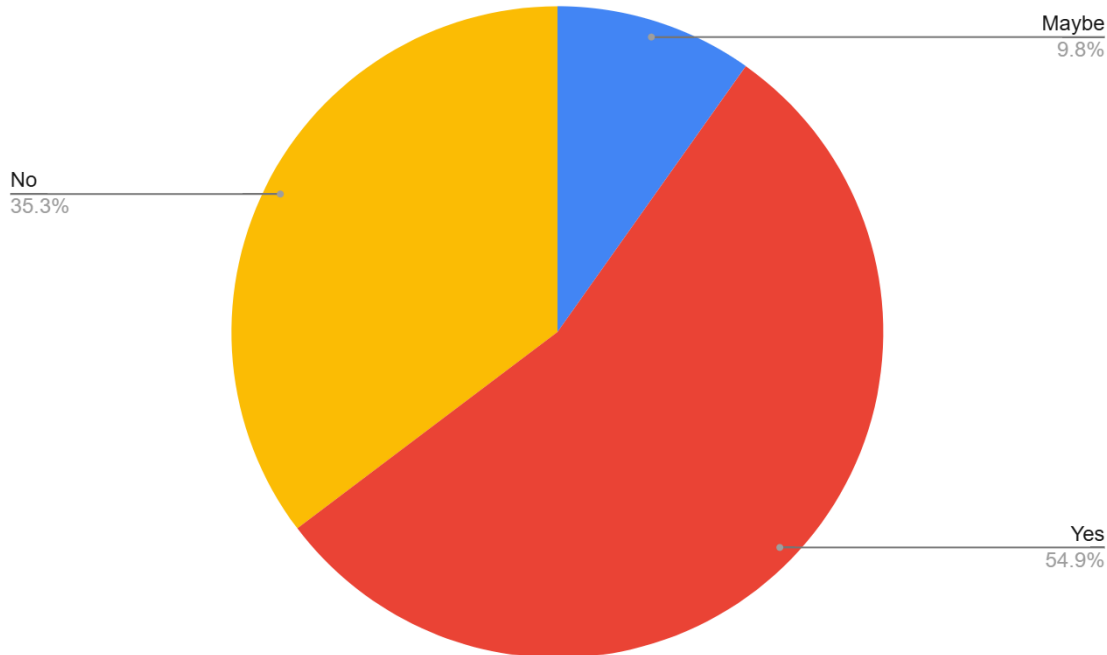
Research Question 2: Extent and engagement activities

a. State of engagement.

64.7% of participants are currently working with and/or including Indigenous communities or IK into their work, with all of them wanting to continue working with communities. 35.3% of participants are not currently working with Indigenous communities. Of

applicable responses (N: 30), 70% have interacted with communities' multiple times, 17% interacting consistently, and 13% interacting occasionally or variably by Tribe.

Chart 1: Responses to “Have you been made aware of other professionals or institutions with paleontological collections that are currently interacting with Indigenous communities?”



Over half of the respondents identified that they are aware of other people or institutions that are doing this type of work; however, many of the people and institutions listed were repeating or containing vague answers. So, there are likely a handful of institutions that are doing this work, which has been described in the introduction, and more that will be addressed later in this section.

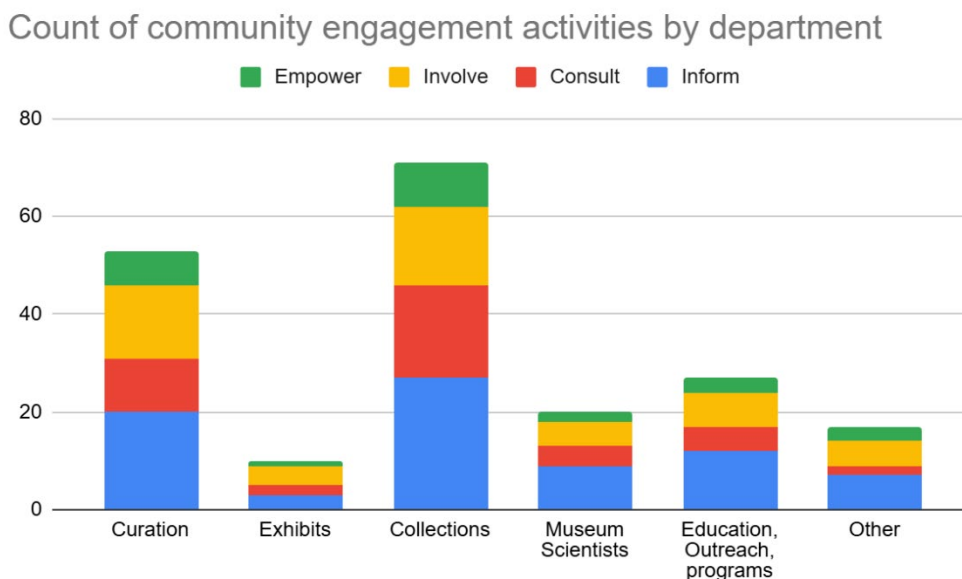
b. Who is being engaged?

The people who are being engaged with include community leaders, community members, Tribal councils, students, researchers, and other tribals organizations and personnel like Tribal

Historic Preservation Officers (THPOs). Of the applicable responses (N: 23), greater than 75% of engagement is with local communities. 8% work with communities within and outside of their region, 8% work solely outside of their region, and 8% work with communities whose ancestral home is in the region of the institution.

c. Activities

Chart 2: responses to “What types of community engagement activities are you, or your institutions, currently or previously involved in?”



The activities that fall under “inform” include providing information, outreach, open access or accessible databases for community members, and access to collections and facilities. “Consult” activities are consultations with community members. Activities that “involve” communities are those that bring Indigenous peoples into different domains of museum work and incorporate IK in research, exhibits, etc. Finally, “empowering” activities include supporting communities to make their own exhibits, educational programs, etc., and teaching

paleontological methods. Teaching paleontological methods could also fall under the “inform” category. However, several participants discussed teaching paleontological and museological skills in the hopes of supporting communities to excavate, research, and exhibit paleontology specimens in the future without Western NHMs, which appear like an empowering activity.

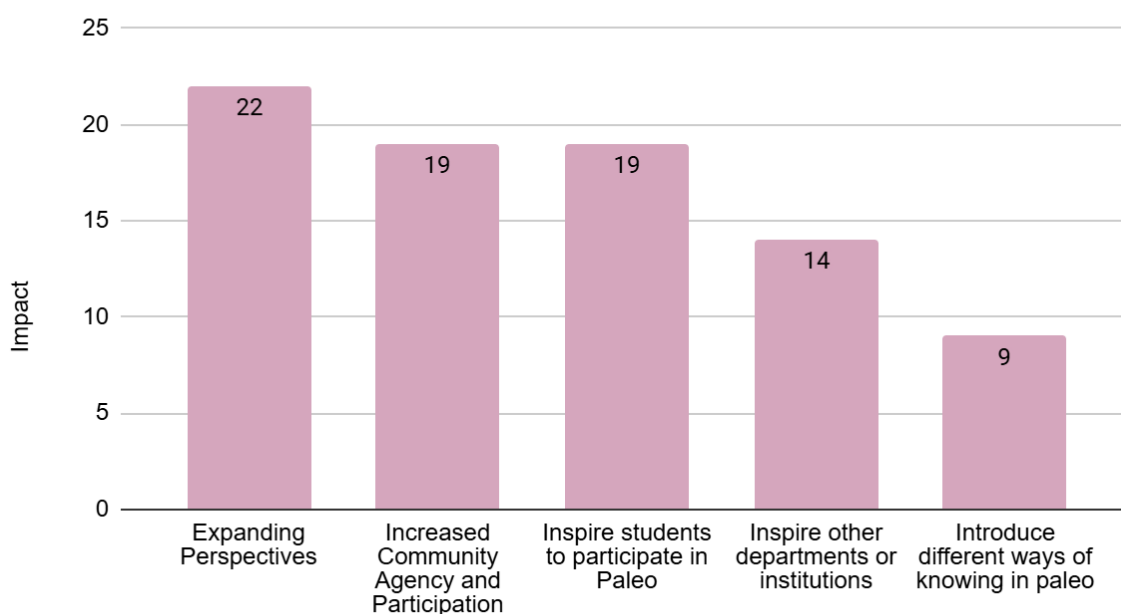
For this question, people could select as many responses as they wanted and add their own. After reviewing answers, 26 people responded with paleontology-specific answers from 22 institutions for a total of 198 activities. It is also noted that while curation has more participants, professionals working with collections identified more activities overall. Curators tend to be subject matter experts who focus on the intellectual content and research of museum materials, while collections staff tend to handle the day-to-day logistics of preservation and organization of caring for these items, however there can be overlap in curation and collections roles, particularly in smaller institutions.

Some repeating examples described by participants include: developing community and K-12 outreach and educational programs to inspire students to explore paleontology and supporting communities to collect, prepare, and exhibit fossils; consulting on updating or creating exhibits; including community members in field work and research; consulting to include native languages in binomial nomenclature; and finally sharing research findings and giving credit in research papers. A few institutions that did not wish to remain anonymous that are working with Indigenous communities in paleontology capacities include the University of Wisconsin Geology Museum, the Canadian Museum of Nature, the University of Alaska Museum of the North, and the Texas Vertebrate Paleontology Collection. A few communities that have been open to collaboration in the past include the Standing Rock Sioux Tribe, as well as Shoshone, Niitsitapi, Inupiat, and Inuit of Nunavut communities.

Individuals engaging with Indigenous communities in paleontological contexts were also asked what the perceived or actual impact of their work is to better understand some benefits of Indigenous collaboration.

Chart 3: Response to “What is the perceived or actual impact of the community collaboration? (Select up to three)” (N: 35)

Impact of Collaboration Reported by Professionals



Expanding perspectives can look like increasing awareness of different worldviews and ideas to researchers, museum staff, and the public. Similarly, introducing different ways of knowing in paleontology can look like naming fossils in different languages, or including oral traditions in research or specimen information (with Tribe’s permission). Increased community agency and participation, and inspiring students, might be indicated by an increase in communities and students wanting to learn more about paleontology digs, research, and museum work, or communities working to develop paleontology codes and Indigenous NHMs. Inspiring

other departments might look like sharing work with other departments and publishing about the work, as well as supporting others who want to start Indigenous collaboration.

Research Question 3: Data Accessibility and Frameworks

a. Data accessibility

Table 3: responses to “Is your institution’s database open access, or is your institution considering having an open access database?”

	Open access	Open with restrictions	In progress or plans	No open access or unsure
Frequency	35.3% (n: 18)	23.5% (n: 12)	27.4% (n: 14)	13.7% (n: 7)

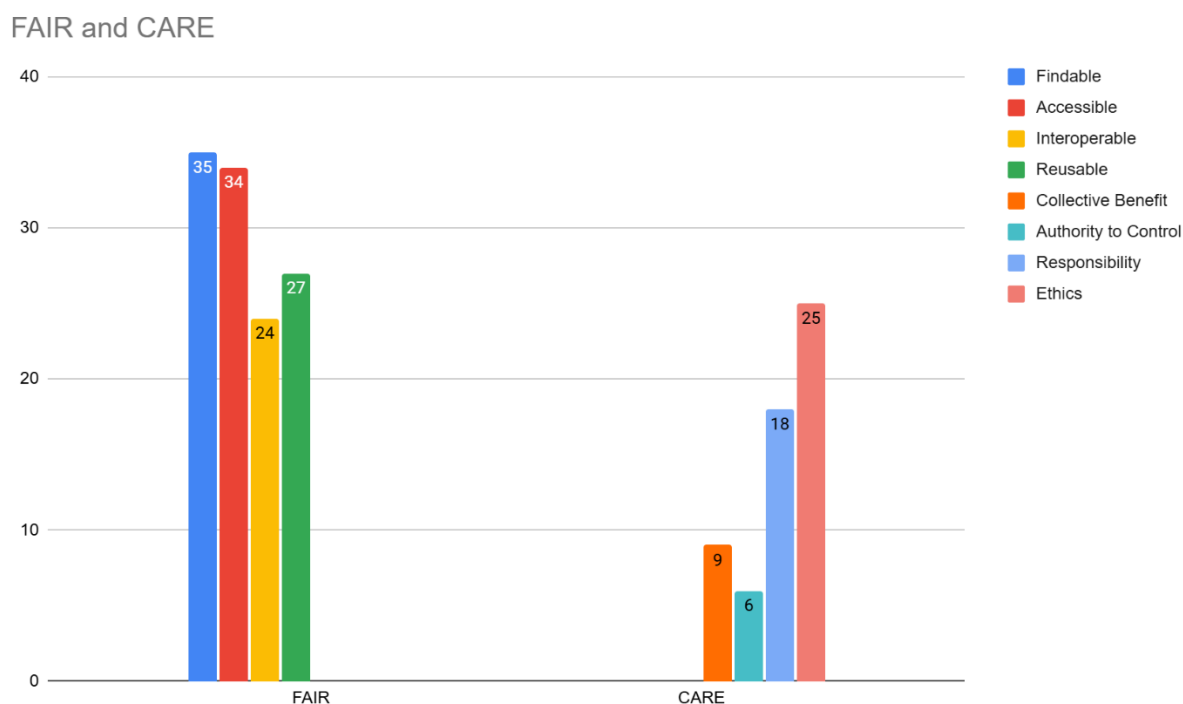
Data accessibility is an important part of museum work, as indicated by museum staff. Of the 51 respondents, only one person stated that data accessibility is not important at their institution. 51% of respondents (n: 26) reported that data accessibility is very important. Data accessibility increases, transparency, knowledge transmission, enhances visitor engagement, and promotes greater information preservation. The majority of respondents also stated that having open databases is important, as seen in the frequency of institutions' database accessibility. The restrictions mentioned include hiding locality and other sensitive information from the public, while continuing to offer information about collected materials.

b. Data principles, guidelines, and frameworks

Table 4: Response to “What are the types of principles, guidelines, or frameworks that guide your data management practice?” Open answer question (N:41)

	Institutional mission, collections policies, and core documents	Regional/ National Museum guidelines	NAGPRA, laws, policies, and Tribal agreements
Frequency	73%	61%	19.5%

Chart 4: Responses to “Based on FAIR principles, in what ways have you or your institution ensured that data can be accessed by researchers, communities, and the general public? (select all that apply)” and “Based on CARE principles, in what ways have you or your institution ensured that data are accessible for Indigenous communities? (select all that apply).”



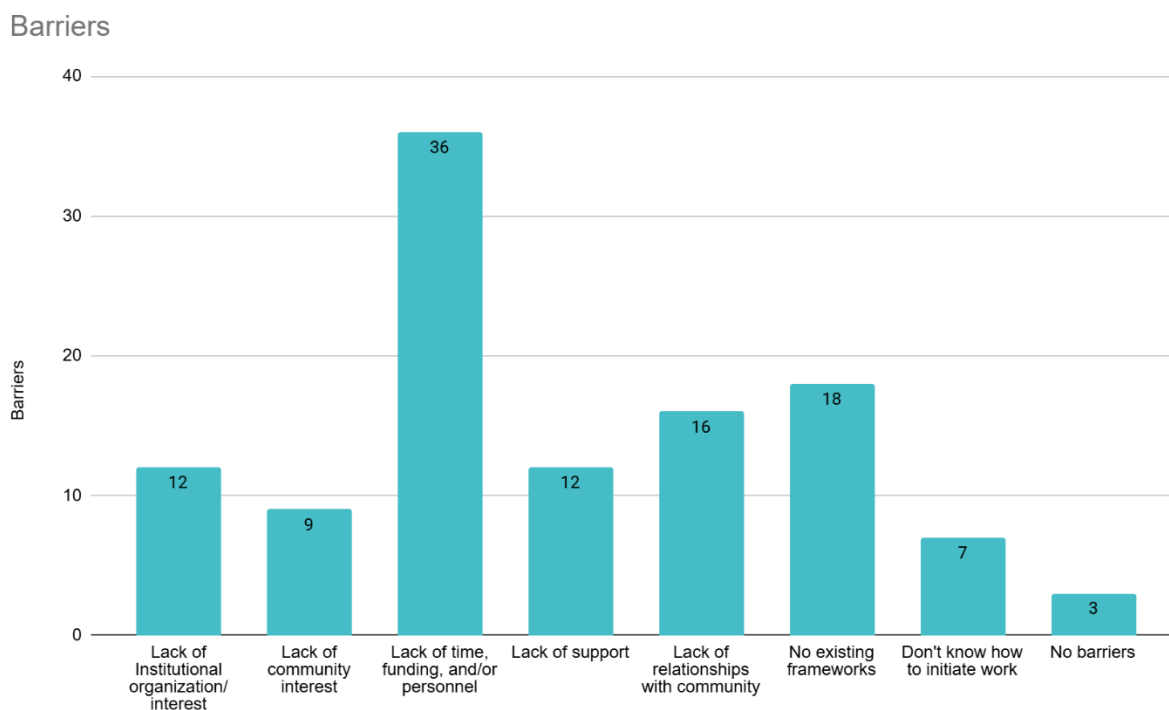
FAIR (N:37); CARE (N: 27)

Additionally, related to the CARE framework, 33% of respondents had begun to identify Indigenous data within their database, such as locality information in current or ancestral Indigenous lands.

Research Question 4: Barriers and Opportunities

a. Barriers

Chart 5: Responses to “What barriers have you identified that impede your ability to start collaborating or continue collaborating? (Select up to three)”

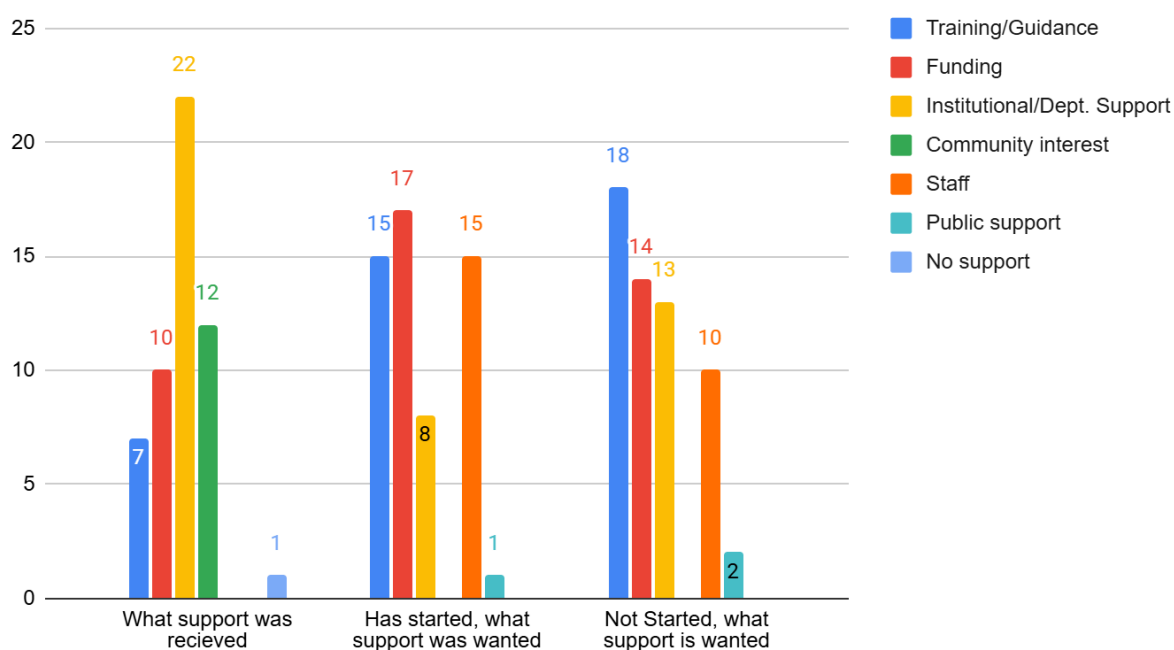


In the discussion section, the time, funding, and personnel barriers will be explored below in the context of the ‘support’ data. The answer “lack of support” may refer to people's general feeling of not being supported and might include several of these barriers. For example, people could be facing a lack of funding, no frameworks, and senior staff are not encouraging, leading to a general lack of support.

b. Support

Chart 6: Responses to “If you have not started, what support is wanted or needed?”, “If you have started, what support was wanted or needed?” and “If you have started, what support was received?”

Support received and wanted



Support received (N: 27); Support wanted (N: 25); Not started (N: 21). Support wanted and support received included data from all respondents, including those who discussed cultural or archaeological engagement with Indigenous communities, as the barriers and support factors can be relevant in most situations. Public support refers to the support from the general public to do this work. Because museums are public institutions that steward collections for the public, some institutions may want this support or approval from stakeholders.

c. Opportunities

Table 5: Responses to “Have any opportunities to collaborate with Indigenous communities come up in your work?”

	Yes	No	Maybe
Frequency	61% (n: 31)	35% (n: 18)	4% (n: 2)

Opportunities include upgrading exhibits (n: 2); Museums wanting to excavate fossils, teach paleo methods to communities, and similar programming (n: 5); updating labels and fossil names (n:2); NAGPRA, repatriation, or legal situations (n: 7); Community wanting to have a relationship with the museum (n: 4); and others have been described in Section 2.

Discussion and Implications:

This study explored the nature of community engagement between Indigenous communities and paleontology at natural history museums in North America. The data illustrates an overarching picture of the current state of engagement and contributes to the literature on engagement in paleontology for museum professionals. The data identified the prevalence of this topic, the state of collaboration, the use of data accessibility frameworks, and the barriers and opportunities expressed by museum professionals across North America.

There is a significant lack of information for museum professionals to reference when starting or continuing to collaborate with Indigenous communities in paleontology. People working in the museum field tend to publish inconsistently, which can lead to a silo-ing effect, where people are unaware of the types of work being done. While this research does not provide guidelines or frameworks, it will inform museum professionals about the extent and types of engagement, accessibility, common barriers, and the support staff need to do this kind of work.

i. Prevalence

Monarrez et al (2022), Kempf et al. (2023), and Elbein (2021) describe the harmful colonial and racist history of paleontology and how NHMs have a responsibility to acknowledge this history and decolonize paleontology. Monarrez et al. (2022) and Kempf et al. (2023), in particular, are cited in almost every source related to this topic. However, they do not indicate the scope of interest and current engagement, instead, aiming for their work to inform and inspire conversation amongst researchers and museum professionals.

Data from this study confirms that interest in this topic across the field of paleontology and museology is becoming increasingly common. More professionals reported awareness of this growing field-wide interest than initially anticipated and reported high personal and institutional interest. The awareness of this interest was surprising because, despite the popularity of the aforementioned sources, there is little information online regarding what museums and museum professionals think about this topic. The amount of perceived institutional interest was expected, as there is a field-wide trend towards increased community collaboration (Schweitzer, 2020). However, several professionals were unaware of this topic, indicating that this topic has not been introduced or discussed widely.

The personal and institutional interest also informs the prevalent external and internal factors that influence NHM workers. These factors are important to consider because they explain why museum professionals act and think the way they do. Museum workers are guided by ethics and values dictated by professional organizations and their institutions' missions (AAM). The importance of these codes of ethics and mission statements is evident in the data about influential factors to starting or continuing collaboration. Activities from museum staff need to support their institutional mission, and guidance from these materials may indicate trends for museums who want to collaborate with Indigenous communities, versus those that do not.

Museum's missions and museum codes may need to adapt to better support museum professionals who want to do this work.

ii. Activities

Museums and other knowledge institutions have long been hubs for communities to learn, be inspired, and connect to others, and today they are becoming more active in partnering with communities to become more inclusive, participatory, and relevant (IMLS, 2022). With the increase in museums working with communities, frameworks, such as the community engagement spectrum, are aiding institutions in making meaningful impacts through collaboration (IMLS). Some sources, such as Cisneros (2022) and Elbein (2021), discuss current practices in paleontology research across the world, but do not provide examples of museums in North America that are collaborating with Indigenous communities in paleontological contexts. The data compiled in this survey confirms that activity is happening, and at a wider scale than anticipated. Prior online research yielded minimal results, which was part of the inspiration for this study.

The types of engagement on the spectrum have also varied. It was expected that there would be lower levels of engagement, i.e. inform and consult, because those are easier to accomplish. IMLS (2022) discusses that it can be challenging for institutions to shift from lower levels of engagement to higher levels and the shift often depends on organizational alignment with collaborative values. However, there was a surprising number of participants that reported higher levels of engagement, i.e. involve and empower. This may indicate that professionals are aware that just informing communities, while helpful, is not enough engagement to be mutually beneficial or significantly impactful. IMLS (2022) states that building authentic partnerships and developing trust take time and require flexibility and adaptability at all levels. Some participants

that are not currently engaged with communities also stated that conversations are starting to occur within departments, with museum leaders, and with communities, but it takes time, as IMLS states.

Many participants also discuss working in an outreach or educational programming, such as teaching community members, K-12, and university students, which is reflected in the perceived and actual impacts that professionals report. It is no surprise that most kids love dinosaurs, and museums can be an accessible way to introduce children to science, including Indigenous students. So, museum staff have an opportunity to connect with a wider range of students and offer more catered experiences to inspire students to explore paleontology.

iii. CARE and FAIR

FAIR principles are already well known amongst people who work with data, as they have become best practice guidelines (Dunne et al., 2025; Wilkinson et al., 2016), but scholars are also beginning to realize that CARE principles can increase ethical data management (Carroll et al., 2021; Jennings et al., 2023; Kempf et al., 2023; O'Brien et al., 2024; Dunne et al., 2025). Data from the survey confirms that most participants could identify FAIR principles in their databases, and three-fourths of participants could identify the use of CARE principles in their databases.

The number of participants that can identify how their database uses both FAIR and CARE principles is unexpected. Many participants could only identify two of the CARE principles in their databases, which might indicate that those principles are unintentionally being used or are easily identifiable principles. One limitation of the study is that participants were not asked about their general knowledge of these principles before taking the survey, which could

indicate how many people are aware and use these principles intentionally, versus those who don't but could answer the question based on the descriptions. Additionally, the questions did not specifically ask how these principles are implemented or ensured.

Kempf et al (2023), a commonly cited source, states that following CARE principles should be considered best practice for paleontological data. Because many institutions are already using FAIR principles, there is an opportunity to implement both for both equitable and accessible data management. When these two principles are taken at face value, they may appear to be in tension with each other; however, several scholars, including Carroll et al (2021) and Dunne et al (2025) have discussed the implication of using both principles in paleontological data. The possible implementation of CARE and FAIR in scientific data is a new topic. It may be the role of museum professionals to reflect and explore integrating these principles into data management practices on an institutional level as more research on this topic emerges.

iv. Barriers and Support Needed

Monarrez et al. (2022) discusses the challenges of identifying cultural and structural barriers in the manifestations of racism and colonialism in paleontology academia, which requires scholars to consider what acceptable behavior and practices are to move towards a more inclusive field. The data in this study has identified some of the prevalent barriers that museum staff express, as well as the support that staff want or need to start or continue Indigenous collaboration. Lack of time, funding, and/or personnel are common barriers for any activity undertaken by nonprofit organizations, and were the largest barrier expressed in the study. Funding and staff in particular were two of the primary areas where support is needed. Other significant barriers and areas of desired support indicate that many museum professionals want frameworks, guidelines, or training to know how to start conversations and how to build

relationships, which is important for starting collaboration with Indigenous communities (Schweitzer, 2020). It is unclear whether institutional leadership is unaware of their staff's interest or unwilling to support staff in engagement activities, or if this reflects institutional budget limitations that are in conflict with institutional interests and priorities. Institutions, if willing, could provide training or other opportunities to support paleontology departments and wider museum staff. The School for Advanced Research's (SAR) Guidelines for Collaboration and the Protocols for Native American Archival Materials are helpful tools for museum staff and Indigenous communities, and focuses on cultural contexts (Indian Arts Research Center, 2019; First Archivist Circle, 2007). Rather than developing new guidelines, these or similar guidelines could be adapted for more scientific contexts, like paleontology.

Limitations:

A limitation of this survey is that a few questions and response options were overlapping or too vague, which makes it difficult to organize and analyze results more specifically. Additional questions to specify the types of barriers and activities would likely enhance the data in this study; however, these questions would likely need to be asked during interviews rather than a survey to get more detailed responses. Additionally, more data from a variety of staff might indicate whether this topic is mainly an interest for staff working with paleontological materials regularly, (i.e. curators, collections staff, and researchers), or if other staff (i.e. exhibits, education, programs, administration) are equally interested.

Recommendations for practitioners:

1. Consider bringing this topic to institutional leadership and initiate more discussions. I.e., if you want training or guidance on working with Indigenous communities, make sure

leadership knows. Additionally, get to know staff in other departments, if applicable, such as cultural collections, archaeology, and registration, who might have experience with NAGPRA and may be able to give advice or provide contacts.

2. Contact Tribes or communities in your area (or main region of study) to see if they are interested in collaboration. THPO's are often a primary point of contact for federally recognized Tribes.
3. Inventory collections and cross-reference currently recognized and ancestral Indigenous lands to specimen localities. Similarly, go through database records to see what information could be considered Indigenous data. There are some helpful websites, such as <https://www.whose.land/en/>, native-land.ca, <https://treatysigners.us/>, and the Native Land Information System, which allows users to cross-reference locations, dates, and treaties for land information.
4. Do your own research on this topic and consider communicating with other NHM professionals.

Future Research:

Surveying NHM's is just the starting point, and more research is needed to develop frameworks and best practices for museums and Indigenous communities to use when starting to develop relationships and work with one another. Further research that is needed is to survey Indigenous communities to understand their views on collaborating with professionals in paleontology in NHM's as well as their needs or desires. After that, case studies can be done to deeply understand what collaboration looks like, why people want to collaborate, and the steps

needed to develop and maintain relationships, as well as steps needed to develop guidelines and frameworks for this work in paleontology.

This survey revealed that many museum professionals who work at natural history museums in paleontological contexts are interested in exploring collaboration with Indigenous communities but face barriers to this engagement. Engagement activities are occurring through collaboration and database management. The bottom line is that this aspect of paleontology and museum studies is new and people are continuing to develop ideas, research, and practices to support collaboration between Indigenous communities and NHMs. This work is not easy, and it is not fast, but it is important to start now, as institutions and communities work together and learn from each other to become more relevant, equitable, and diverse for future generations.

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Appendix A

Figures

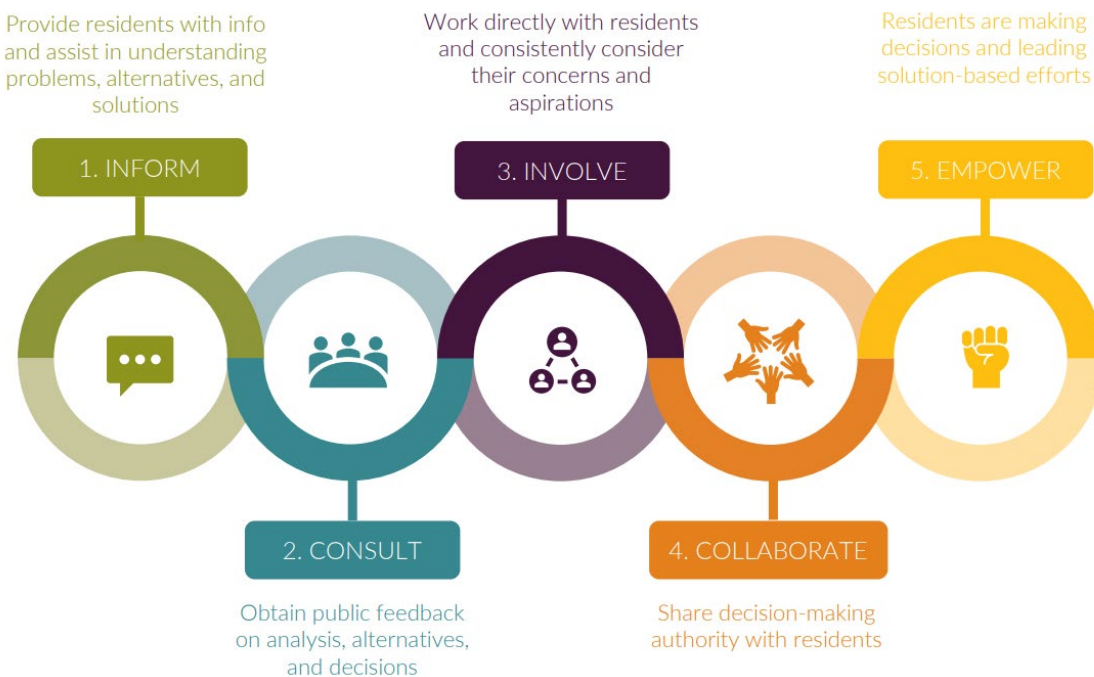


Figure 1: From IMLS. (2022). “Community Catalyst Initiative.” Institute for Museum and Library Services. <https://www.imls.gov/sites/default/files/2022-07/cci-evaluation-report.pdf>.

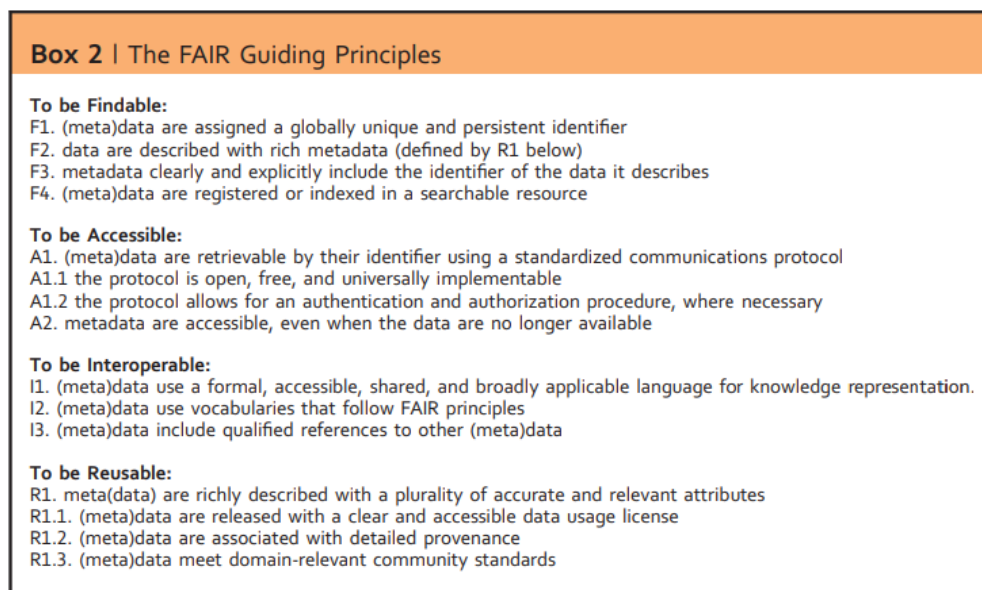


Figure 2: From Mark D. Wilkinson et al. (2016). "Comment: The Fair Guiding Principles for scientific data management and stewardship." *Scientific Data*. DOI: 10.1038/sdata.2016.18.

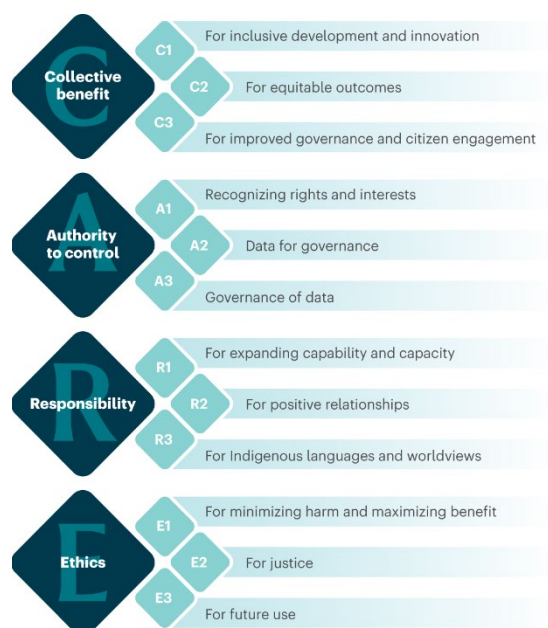


Figure 3: From Jennings, Lydia, et al. (2023). Applying the ‘CARE Principles for Indigenous Data Governance’ to ecology and biodiversity research. *Nature Ecology and Evolution*.

<https://doi.org/10.1038/s41559-023-02161-2>.

Practice ‘CARE’ in data collection	Engage ‘CARE’ in data stewardship	Implement ‘CARE’ in data community	Use ‘FAIR’ with ‘CARE’ in data applications
Define cultural metadata Record provenance in metadata	Use appropriate governance models Make data ‘FAIR’	Indigenous ethics inform access Use tools for transparency, integrity and provenance	Fairness, Accountability, Transparency Assess equity

“Implementation of the CARE Principles across the data lifecycle”

Figure 4: From Carroll, S. R., et al. (2021). Operationalizing the CARE and FAIR principles for Indigenous data futures. *Scientific Data* 8(1):108. <https://doi.org/10.1038/s41597-021-00892-0>.

Appendix B

Copy of electronic survey sent to participants

Survey of Natural History Paleontology

Thank you for taking the time to participate in this survey. This survey is exploring how museum professionals working with paleontology collections in natural history museums are interacting with Indigenous communities.

Participation in this study is voluntary, and you can choose to leave the study at any time. By completing the survey, you are consenting to participating in the study. This survey has five sections and should take 10 to 15 minutes to complete.

Your name, institution, department, and role will be collected for demographic information and to ensure that there are no repeat results. All data collected will only be seen by the researcher, and survey data will be destroyed after the study is completed. This study has been approved by the University of Washington research IRB. If you have any questions or concerns, please contact me at: nancywc@uw.edu.

Section 1: Demographic Information

This information will be used to determine trends and ensure that there are no repeat results. Names will not be included in the final report, and institutions may remain anonymous based on preference.

1. What is your name? (Open Answer)
2. What is your current role or title? (Open Answer)
3. What is the name of the institution you currently work at? (Open Answer)
4. Do you wish for your institution to remain anonymous? (Select one)
 - a) Yes
 - b) No
 - c) Other:
5. What department or domain of museum work are you a part of? I.e. paleontology research, exhibit design, education, outreach, collections management, etc. (Open Answer)
6. Where are you located? Please include Country and State or Province. (Open Answer)
7. Participation in this survey is voluntary, and you can leave at any time. By clicking 'yes', you are consenting to participate in this survey.
 - a) Yes, I consent
 - b) No, I do not consent and do not want to participate in this survey.

Section 2: Factors

This section will examine the possible factors that museum professionals identify as motivators or deterrents to collaborating with Indigenous communities.

1. Are you, as a museum professional, aware of the interest and/or ongoing work in the paleontology field to collaborate with Indigenous communities? (select one)
 - a) Yes
 - b) No

2. Do you have any interest in Indigenous community collaboration on a personal level?
(Select one)
 - a) Yes
 - b) No
 - c) Maybe/ Unsure
 - d) Other
3. What are the factors influencing your decision to collaborate with Indigenous communities? (Select up to three)
 - a) Personal belief or value
 - b) Organizational belief, value, or mission
 - c) Growing fieldwide interest
 - d) Community has expressed interest
 - e) I have not initiated collaboration, but I plan to
 - f) I have not initiated collaboration, and I do not plan to
 - g) Other
4. What other factors might influence your decision to work with Indigenous communities?
(Open answer)
5. Is there any interest in Indigenous community collaboration on an institutional level?
(Select one)
 - a) Yes
 - b) No
 - c) Maybe/ Unsure
 - d) Other

Section 3: Practices

In this section, we will explore current practices you or your institution is involved with.

1. Do you currently work with or include Indigenous communities or Indigenous Knowledge in your work? (Select one)
 - a) Yes
 - b) No
 - c) Other
2. If you are engaging with communities, do you wish to continue working with them?
(Select one)
 - a) Yes
 - b) No
 - c) Maybe
 - d) Other
 - e) Not Applicable
3. Please explain your answer to the previous question. (open answer)
4. What types of community engagement activities are you, or your institutions, currently or previously involved in? (select all that apply)
 - a) Providing information to community members
 - b) Including Indigenous Knowledge in research, exhibitions, collections management, etc...
 - c) Consulting with community members
 - d) Outreach to Indigenous communities

- e) Teaching paleontology methods to Indigenous communities
 - f) Incorporating Indigenous peoples in various domains of museum work
 - g) Supporting Indigenous communities to create their own exhibits, educational programs, exhibitions, etc.
 - h) Open-access or accessible database for community members
 - i) I am not engaged in any type of collaboration
 - j) Other
5. If you are working with communities, please provide details about what these projects or activities are. (Open answer)
 6. If you are working with communities, what is the frequency of interactions? (Select one)
 - a) Once
 - b) Multiple times
 - c) Consistently
 - d) Other
 - e) Not Applicable
 7. What is the community and/or tribe that you currently work with or want to work with? (Open Answer)
 8. Who in the community do you work with? (Select all that apply)
 - a) Tribal council
 - b) Tribal leader
 - c) Local community members
 - d) Researchers
 - e) Students
 - f) Other
 - g) Not Applicable
 9. What is the perceived or actual impact of the community collaboration? (Select up to three)
 - a) Expand perspectives
 - b) Introduce different ways of knowing into paleontology
 - c) Inspire other departments or institutions to collaborate with communities
 - d) Increase community agency and participation
 - e) Inspire students to participate in paleontology
 - f) Other
 - g) Not Applicable
 10. Have you been made aware of other professionals or institutions with paleontological collections that are currently interacting with Indigenous communities? (Select one)
 - a) Yes
 - b) No
 - c) Maybe
 - d) Other
 11. If yes, please include the names of the professionals or institutions. (open answer)

Section 4: Principles and Frameworks of Data Accessibility

In this section, we will explore principles and frameworks that currently influence practices and data accessibility.

- 1) What are the types of principles, guidelines, or frameworks that guide your data management practice? For example: professional code of conduct, institutional mission, etc. (Open answer.)
- 2) Is your institution's database open access, or is your institution considering having an open access database? (select one)
 - a) Yes, we currently have an open access database
 - b) No, but we plan to have an open access database soon
 - c) No
 - d) Maybe
 - e) Other
- 3) Based on the previous question, how important is data accessibility to you or your institution? (select one)
 - a) not important
 - b) slightly important
 - c) moderately important
 - d) Important
 - e) Very important
- 4) Based on [FAIR principles](#), in what ways have you or your institution ensured that data can be accessed by researchers, communities, and the general public? (select all that apply)
 - a) Data is findable
 - b) Data is accessible
 - c) Data is interoperable
 - d) Data is reusable
 - e) Other:
 - f) Not Applicable
- 5) Based on [CARE principles](#), in what ways have you or your institution ensured that data are accessible for Indigenous communities (select all that apply)
 - a) Data are for the collective benefit of Indigenous communities.
 - b) Indigenous communities have the authority to control information, or data, within our database.
 - c) The museum is responsible for building relationships with community members and shows how data is being collected and used for the benefit of communities.
 - d) The museum and staff have an ethical obligation to ensure that Indigenous Peoples' rights and well-being are upheld through data collection, storage, and use.
 - e) Other:
 - f) Not applicable
- 6) Have you, or your institution, determined if, or what kinds of, Indigenous data are stored in your database? I.e. existing datasets that overlap with culturally relevant or Tribal lands. (select one)
 - a) Yes
 - b) No
 - c) Maybe
 - d) Other
 - e) Not Applicable

Section 5: Barriers and Opportunities

In this section, we will explore barriers to doing this work.

1. What barriers have you identified that impede your ability to start collaborating or continue collaborating? (Select up to three)
 - a) Lack of personal interest
 - b) Lack of institutional organization or interest
 - c) Lack of community interest
 - d) Lack of time, funding, and/or personnel
 - e) Lack of support
 - f) I don't have relationships with community members.
 - g) No existing frameworks
 - h) I am interested, but I do not know how to initiate this work
 - i) There are no barriers
 - j) Other
2. If you have not worked with Indigenous communities, what kind of support would you need or want to get started? (Select up to three)
 - a) Funding
 - b) Staff
 - c) Organization/ Department support
 - d) Public support
 - e) Training/ Guidance
 - f) I don't plan to work with Indigenous communities
 - g) Other
 - h) Not Applicable
3. If you have started working with communities, what support do you wish you had received before and during collaborations? (Select up to three)
 - a) Funding
 - b) Staff
 - c) Public support
 - d) Organization/ Department support
 - e) Training/ Guidance
 - f) Other
 - g) Not Applicable
4. If you have started working with communities, what support did you receive in order to start? (Select up to three)
 - a) Funding
 - b) Community interest
 - c) Institutional backing
 - d) Training/ Guidance
 - e) I have not received any support
 - f) Other
 - g) Not Applicable
5. Have any opportunities to collaborate with Indigenous communities come up in your work? (select one)
 - a) Yes
 - b) No

- c) Maybe
 - d) Other
6. Please provide details about the circumstances of those opportunities. (Open Answer)

Section 6: Wrap Up

Thank you for taking the time to complete this survey.

1. Is there any other information that you want to share? (Open Answer)