

Co-Creation of Knowledge by the Hopi Tribe and Archaeologists

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Investigation of traditional cultural properties for compliance with Sections 106 and 110 of the National Historic Preservation Act (NHPA) presents challenges for the Hopi Tribe and archaeologists. The significance of traditional cultural properties is derived from the role those places play in traditional beliefs and practices, so Hopi tribal members need to be actively involved in research that documents and evaluates these historic properties. Information derived from Hopi religious and traditional practices needs to be integrated with archaeological data and transformed into new knowledge that

encompasses the terms of the NHPA. It is important for all parties to understand the epistemological basis for this co-creation of knowledge and agree on how that knowledge is used in historic preservation. In this article, we explore the co-creation of knowledge on a recent project on the Hopi Reservation to share what we have learned about how the Hopi Tribe and archaeologists collaborate to produce knowledge that is useful to tribal members and valuable for an anthropological understanding of heritage and cultural landscapes.

ABSTRACT

For two decades, the Hopi Cultural Preservation Office has worked with archaeologists to co-create knowledge about the past and document contemporary values associated with heritage sites. Much of this work has been accomplished within the framework of research mandated by the National Historic Preservation Act and National Environmental Policy Act. Here we describe a case study that illustrates the processes of this community-based participatory research, including research design, implementation of fieldwork, peer review of research findings, and reporting. The case study is a project conducted in 2014 by the Hopi Tribe in partnership with Anthropological Research, LLC, to investigate traditional cultural properties associated with an Arizona Public Service Company transmission line. The Hopi Tribe's collaborative research with archaeologists provides intellectual benefits for the management of archaeological resources and the humanistic and scientific understanding of the past.

Durante dos décadas, la Oficina de Preservación Cultural de la Comunidad Hopi (Hopi Cultural Preservation Office), ubicada en el norte de Arizona, ha trabajado con arqueólogos para aumentar el conocimiento sobre el pasado y documentar los valores contemporáneos asociados con sitios patrimoniales. Este trabajo se ha realizado en el marco de investigación dispuesto por el Acta Nacional de Preservación Histórica (National Historic Preservation Act and National Environmental Policy Act) y el Acta Nacional de Política Ambiental (National Environmental Policy Act). Nuestro estudio de caso ilustra los procesos de esta investigación participativa basada en la comunidad, incluyendo el diseño de la investigación, la ejecución del trabajo de campo, la revisión por pares de los resultados de la investigación y la presentación de informes. El presente caso de estudio es un proyecto llevado a cabo en 2014 por la tribu Hopi en colaboración con Anthropological Research, LLC, para investigar las propiedades culturales tradicionales asociadas con una línea de transmisión de Arizona Public Service Company. La investigación en colaboración con la tribu Hopi y los arqueólogos ofrece beneficios intelectuales para la gestión de los recursos arqueológicos y la comprensión humanística y científica del pasado.

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Co-creation is a movement whose use in archaeology stems from the citizen science model employed in participatory museumology (Simon 2010). As Simon describes,

Co-creative projects originate in partnership with participants rather than based solely on institutional needs. A community group may approach the museum seeking assistance to make a project possible, or the institution may invite outside participants to propose and work with staff on a project of mutual benefit. . . . While co-creative and collaborative processes are often quite similar, co-creative projects start with the community as well as institutional needs [Simon 2010].

Simon provides an example of this process in terms of museum exhibits. Rather than simply declaring that the museum wants to do an exhibit on potato farmers and asking farmers to assist, museum staff ask the farmers what ideas they have for an exhibit that they would like the museum to produce with them. Simon identifies the three main reasons that cultural institutions engage in co-creative projects. These are to give voice to and be responsive to the needs of local communities, to provide a place for community engagement and dialogue, and to help participants develop skills that support their personal and community goals. Simon argues that co-creative projects give more power to community participants than other forms of collaboration.

Bollwerk and her colleagues (2015) explain that co-creation has two dimensions. The “co” denotes sharing of power and authority, while the “creation” denotes doing things in new ways that improve on past practice. Bollwerk and her colleagues argue that co-creation is congruent with current trends in public archaeology that engage people and groups outside of the archaeological profession in efforts to collect, interpret, and disseminate archaeological data and results. As such, co-creation strives to implement the civic engagement called for by Chambers (2004) and Little and Shackel (2014) in which applied archaeology is directed at helping people make decisions related to heritage resources. Research done using a co-creation approach shares many philosophical tenets with community-based participatory research but has the distinction of sometimes being situated in institutions outside of traditional communities. Regardless of where co-creation projects are situated, Simon (2010) points out that they give voice to local communities and are responsive to their needs, helping individuals develop skills to support their community.

We find co-creation to be a useful method in ethnographic research conducted for historic preservation. As anthropologists, rather than approach a tribe saying that this is the research we want to do, we let the tribe know we are interested in working with them. The tribe then identifies the project they want done and invites us to assist them with the research needed to attain their goals. We find it relatively easy to align our own research goals with those of the tribe to co-create intellectually useful and stimulating projects that simultaneously benefit archaeology and the tribe.

When applied in a cultural resource management context, a co-creation methodology can produce new knowledge about heritage resources and document the cultural values that com-

munity members attach to those resources. This information is needed by tribes engaged in consultation with federal and state agencies during compliance activities associated with Section 106 of the NHPA. The Hopi Tribe embraces the research opportunities presented by the NHPA to conduct collaborative projects with archaeologists to generate information needed for Section 106 compliance and to document Hopi heritage and history (Ferguson 1996; Hopkins, Koyiyumptewa, Kuwanwisiwma, and Ferguson 2014).

The perspectives we share in this article are situated in our respective professional roles in historic preservation. Ferguson is a Professor of Anthropology at the University of Arizona in Tucson, where he also operates Anthropological Research, LLC, a research company dedicated to providing information needed for heritage management. Koyiyumptewa is a member of the Badger Clan at the Third Mesa village of Hotvela on the Hopi Reservation, where he is employed as the Tribal Archivist at the Hopi Cultural Preservation Office. He is also completing a Master's Degree in cultural anthropology at Northern Arizona University. Hopkins is Director of Research at Anthropological Research, LLC, in Tucson, Arizona, where she was the project director for the case study we discuss in this article.

CASE STUDY: APS EL DORADO TRANSMISSION LINE CORRIDOR SURVEY

The co-creation of knowledge by the Hopi Tribe and archaeologists for use in historic preservation is exemplified in a recent project undertaken for Arizona Public Service Company (APS). The El Dorado 500-kV transmission line was constructed across the Hopi Reservation in 1967 before Section 106 compliance standards were developed (Figure 1). The 25-year lease of the right-of-way for this transmission line expired in 1992, necessitating a renewal of the lease as part of a larger project involving the Four Corners Power Plant. On the Hopi Reservation, the Bureau of Indian Affairs (BIA) has a trust responsibility, or legally enforceable fiduciary obligation, to protect tribal land, assets, and resources while carrying out the mandates of federal law. The BIA thus has to approve real estate transactions, and this makes the lease renewal a federal undertaking requiring compliance with Section 106 of the NHPA.

As the project proponent, APS commissioned an archaeological survey to provide information needed for compliance with Section 110 of the NHPA (Laurila et al. 2011). APS undertook this archaeological survey proactively in collaboration with the Hopi Tribe's Cultural Preservation Office to support ongoing and future transmission line operations and maintenance activities, including vegetation management. This work was part of a much larger project that intensively surveyed the entirety of APS's transmission line system, encompassing more than 8,000 km of right-of-way corridors across Arizona and a portion of New Mexico. When the right-of-way renewal came up on the Hopi Reservation, the archaeological survey had already been completed, and it provided information to support the new undertaking associated with the lease renewal. APS later commissioned an ethnographic survey in support of the right-of-way renewal. We describe the ethnographic survey in this article,

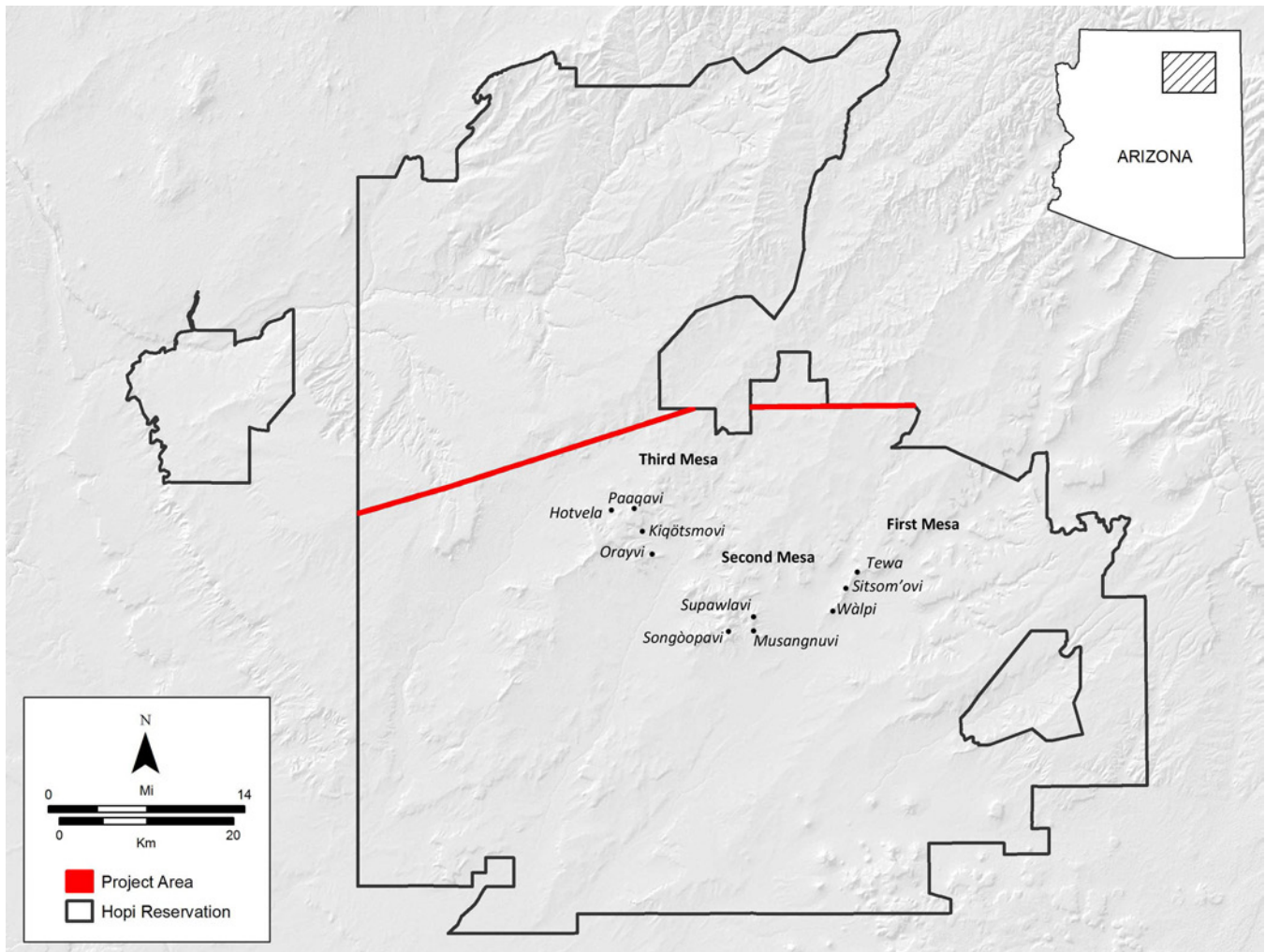


FIGURE 1. APS El Dorado 500-kV transmission line across the Hopi Reservation.

which was designed to identify traditional cultural properties and evaluate their eligibility for the National Register (Hopkins, Hedquist, Ferguson, and Koyiyumtewa 2014).

The APS right-of-way consists of a 96-m-wide easement that extends for 54.7 km across the Hopi Reservation. At the request of the Hopi Tribe, the Area of Potential Effect (APE) for the ethnographic study was expanded an additional 200 m beyond the 96-m-wide right-of-way, resulting in a study corridor that was 269 m wide. The expansion of the APE for ethnographic research allowed the Hopi Tribe to better evaluate impacts of the proposed undertaking on important cultural resources.

In addition to providing information needed for compliance with the NHPA (National Park Service 2002), the ethnographic study also collected information for use in federal compliance with the National Environmental Policy Act (NEPA). The Office of Surface Mining, Department of the Interior, is preparing an Environmental Impact Statement (EIS) for the Four Corners Power Plant and Navajo Mine Energy Project, and NEPA regulations stipulate that the potential impacts of federal undertakings on historic and cultural resources must be considered. Pursuant to NEPA,

environmental studies need to analyze both historic properties as defined in the NHPA and other cultural and natural resources that may not meet the technical definition of traditional cultural properties but which nonetheless have cultural importance for Hopi people.

The goals of the Hopi Cultural Preservation Office in undertaking the APS El Dorado Transmission Line Corridor ethnographic survey were to: (1) document Hopi history as a means of heritage preservation; and (2) provide the technical services needed for compliance with federal historic preservation legislation. The project thus constituted applied archaeology in service of tribal needs to assist federal agencies with compliance with NHPA.

COMMUNITY-BASED PARTICIPATORY RESEARCH

The traditional cultural properties research undertaken to investigate the APS El Dorado Transmission Line Corridor was organized using the principles of community-based participatory

TABLE 1. Hopi Cultural Advisors Participating in Interviews.

Name	Clan	Village	Age	Date
Lloyd Ami, Sr.	Stick-Spider	Tewa	72	11/26/2013
Bradley Balenquah	Rattlesnake	Paaqavi	73	11/27/2013
Riley Balenquah	Rattlesnake	Paaqavi	71	11/27/2013
Floyd Lomakuyvaya	Bearstrap-Spider	Songòopavi	64	11/26/2013
Harlyn Monongye	Greasewood-Roadrunner	Hotvela	69	11/27/2013
Owen Numkena, Jr.	Corn-Water	Musangnuvi	76	11/25/2013
Jim Tawyesva, Sr.	Roadrunner	Wàlpi	74	11/26/2013

research, including recognizing the intellectual property rights of the sovereign Hopi Tribe, integrating knowledge and action for the mutual benefit of all research partners, and disseminating the findings and knowledge to all research participants (Atalay 2012; Atalay et al. 2014). As such, the APS project shares a number of similarities with collaborative research projects in the Southwest and around the world (Adler and Bruning 2008; Dowdall and Parish 2003; Heckenberger 2008; McDavid 2002; Meskell and Van Damme 2008; Shackel and Gadsby 2008; Swidler et al. 2000). In all of these projects, a group of co-researchers was formed, conditions for group learning were created, inquiry questions were researched, and group knowledge was constructed and disseminated (Bray et al. 2000). Collaborative projects provide ways for scholars to engage with local communities while maintaining the principles of scientific inquiry.

The APS project was initiated by the Hopi Cultural Preservation to serve its heritage preservation and cultural resource management goals. The Hopi Tribe set the research agenda, and the Hopi Cultural Preservation Office and Anthropological Research, LLC, established the specific research questions and project methods in a collaborative manner. The Hopi Cultural Preservation Office selected the tribal cultural experts to participate in interviews and fieldwork based on their knowledge of Hopi traditional history and the geographical areas to be investigated. Project research was conducted by Hopi staff of the Cultural Preservation Office working in collaboration with archaeologists from Anthropological Research, LLC, and this team co-wrote the project report. The tribal research participants reviewed a draft of the technical report to ensure the accuracy and appropriate use of the cultural information they had made available during the research. The Hopi Cultural Preservation Office retained control over intellectual property, including authorization of educational publications such as this article.

Inasmuch as a substantial focus of the research was directed towards identifying ancestral archaeological sites and articulating the cultural importance of these places in Hopi traditional beliefs and practices, the project was designed as a form of what Jesse Walter Fewkes (1900a:579) called “ethno-archaeology.” Fewkes understood that Hopi clan traditions provide a guide for archaeologists in identifying archaeological sites in northern Arizona and in forming an anthropological understanding of Hopi ritual, language, and secular customs. Fewkes (1900a:579) noted that, “This work ... can best be done under guidance of the Indians by an ethno-archaeologist, who can

bring as a preparation for his work an intimate knowledge of the present life of the Hopi villagers.” The research collaborations of the Hopi Cultural Preservation Office and Anthropological Research, LLC, strive to put this research agenda into practice.

PROJECT METHODOLOGY

The specific research goals for the APS El Dorado Transmission Line Corridor survey were to: (1) locate and document traditional cultural properties; (2) evaluate the age, integrity, and significance of traditional cultural properties in terms of National Register criteria; and (3) create a written record that helps preserve Hopi traditional history and heritage. The methods used to attain these goals included conducting seven oral history interviews of tribal members representing six clans from five villages (Table 1) and fieldwork with 14 tribal members representing 14 clans from seven villages (Table 2). In total, 17 tribal members representing 17 clans from eight villages participated in the research.

The tribal members employed to conduct fieldwork were drawn from the Hopi Cultural Resources Advisory Task Team (CRATT), a body of cultural experts who represent the Hopi villages on the three mesas on the Hopi Reservation and advise the Cultural Preservation Office on matters of heritage management. Four tribal members employed by the Hopi Cultural Preservation Office and Natural Resource Office joined these cultural experts in fieldwork. Different teams of CRATT members were organized for fieldwork based on village and clan affiliation relevant to different portions of the study area. In general, CRATT members from the First Mesa villages of Wàlpi and Sitsom’ovi conducted fieldwork on the eastern portion of the study area, CRATT members from the Second Mesa villages of Songòopavi, Musangnuvi, and Supawlavi conducted fieldwork in the central portion of the study area; and CRATT members from the Third Mesa villages of Hotvela and Paaqavi conducted fieldwork in the western portion of the study area.

Interviews were conducted in the homes of tribal members, where Koyiyumptewa and Hopkins elicited information about the beliefs, knowledge, and cultural values related to the APS project area. The people interviewed ranged in age from 64 to 76 years. Interviews were conducted in Hopi and English, using a semi-structured, open-ended format beginning with standard questions to guide the discussion (Figure 2). The interviews

TABLE 2. Hopi Cultural Advisors Participating in Fieldwork.

Name	Clan	Village	Age	Date
Riley Balenquah	Rattlesnake	Paaqavi	71	1/8/2014
Aldric George	Sand	Hotvela	46	1/7/2014
Steven Honanie, Jr.	Sun	Songòopavi	59	12/3/2013
Marvin Lalo	Tobacco-Rabbit	Wàlpi	57	12/2/2013
Floyd Lomakuyvaya	Bearstrap-Spider	Songòopavi	64	12/3/2013
Clyde Lomayaktewa	Sunforehead-Eagle	Songòopavi	47	1/6/2014
Herbert Masayestewa, Jr.	Spider-Bluebird	Hotvela	72	1/7/2014; 1/8/2014
Marshall Masayesva	Reed	Paaqavi	23	1/8/2014
Harlyn Monongye	Greasewood-Roadrunner	Hotvela	69	1/7/2014; 1/8/2014
Owen Numkena, Jr.	Corn-Water	Musangnuvi	76	1/6/2014
Elmer J. Satala, Sr.	Butterfly	Sitsom'ovi	76	12/2/2013
Leonard Talaswaima	Squash	Supawlavi	67	1/6/2014
Max Taylor	Sun	Songòopavi	55	12/3/2013
Clark W. Tenakhongva	Rabbit-Tobacco	Hotvela	57	1/7/2014; 1/8/2014



FIGURE 2. Stewart Koyiyumtewa interviewing Jim Tawyesva, Sr., at his home in Keams Canyon on the Hopi Reservation. Photograph by Maren Hopkins, November 26, 2013.



FIGURE 3. Hopi Cultural Advisors conducting fieldwork at an ancestral archaeological site in the APS study area. Photograph by T. J. Ferguson, January 6, 2014.

were recorded using a digital voice recorder. The Hopi Cultural Preservation Office hired transcribers to translate and produce written manuscripts of many of the interviews. All interview documentation, including photographs, digital recordings, and manuscripts are archived at the Hopi Cultural Preservation Office.

Fieldwork with cultural advisors included visits to ancestral sites, springs, resource procurement sites, named places, eagle collection areas, and traditional pilgrimage routes (Figure 3). These heritage resources are traditional cultural properties because they are used in the retention and transmission of Hopi culture (Ferguson et al. 1993; Kuwanwisiwma and Ferguson 2009; Parker and King 1998). Springs and shrines have traditional importance because of their role in cultural practices. Landforms, along with their toponyms, embody cultural history and didactic meaning (Hedquist et al. 2014). Plant collection areas are critical in maintaining craft production like basketry and katsina doll carving. Eagle collecting areas are associated with clan history and provide raptors used in ceremonial practices. Archaeological sites, including petroglyphs, have cultural importance because they constitute the “footprints” of the ancestors—the places where Hopi ancestors left physical evidence of their past occupation and use of land. Hopi footprints are used in teaching young tribal members about their traditional history and cultural practices. The various types of Hopi traditional cultural properties function together in the materiality of Hopi cultural practices, playing an integral role in the retention and transmission of Hopi culture from one generation to the next.

The fieldwork was designed to identify specific locations in the APS project area with significance to the Hopi people, and to situate these locations within a broader cultural, historical, and geographical context. During fieldwork, cultural advisors were asked about their knowledge of Hopi history, land use, and cultural values associated with traditional cultural properties. They also provided information needed to evaluate the National

Register eligibility of historic properties, assess potential adverse effects from the undertaking, and provide management recommendations.

THEORETICAL ORIENTATION

As befits co-creative projects, Hopi research of traditional cultural properties is informed by combining academic theories of cultural landscape with a native Hopi theory of *itaakuku*, or the “footprints” left behind during clan migrations to Hopi. Cultural landscapes encompass both the land itself and how individuals perceive land given their personal cultural knowledge and beliefs (Bender 1993; Sauer 1963). Hopis view landscapes in relation to specific events and historic processes that have cultural relevance. Hopi people conceptualize the land as storied landscapes in verbal discourse that has historical and moral dimensions (Ferguson and Anyon 2001; Young 1987). Named places and landscapes provide metonyms of narrative that symbolize and recall the ancient past, bringing the past into the present. Cultural landscapes thus situate Hopis in historical time and space, and the phenomenological experience of landscapes provides Hopis with a means of understanding and sharing history. There is a political dimension to cultural landscapes because control of the underlying land is an instrument of political power (Rubertone 2000; Zedeño 1997). The juncture of history, politics, social relations, and cultural perceptions entailed in landscapes infuses the land with powerful emotional attachments.

Hopis view ancestral sites and places as monuments that verify migration traditions and land stewardship (Kuwanwisiwma and Ferguson 2009). The concept of *itaakuku*—literally, “our footprints”—is used as a historical metaphor to comprehend the past and give meaning to archaeological sites by marking the places where ancestors traveled and lived (Ferguson and Colwell-Chanthaphonh 2006:95). Hopis interpret the archaeo-

logical record differently from archaeologists, who define sites as discrete locales of material culture that can be physically bounded and geographically defined. In Hopi thought, archaeological sites are inextricably associated with the surrounding region. The culturally meaningful scale needed to interpret Hopi footprints thus exceeds the boundaries of archaeological sites as delineated by artifact scatters and architecture, encompassing larger landscapes. We find that conducting place-based interviews with Hopi cultural advisors, while visiting traditional cultural properties and landscapes, provides a potent means of eliciting historical and cultural information relevant to historic preservation and heritage management.

RESULTS OF THE STUDY

The traditional cultural property survey of the APS El Dorado Transmission Line Corridor was productive. During five days of fieldwork, the 14 cultural advisors we worked with identified 36 traditional cultural properties, and two additional sites that need further investigation to determine whether they are traditional cultural properties as defined in federal regulations (Table 3). Our scope of work called for assessing the eligibility of these historic properties for inclusion in the National Register of Historic Places, and we made recommendations about the significance of places based on the values articulated by Hopi cultural advisors. Historic properties are eligible for the National Register if they meet one of four eligibility criteria: (a) association with events that have made a significant contribution to the broad patterns of our history; (b) association with the lives of persons significant in our past; (c) embodiment of distinctive characteristics of a type, period, or method of construction, or the work of master, or possession of high artistic values; and (d) having yielded, or having the potential to yield, information important in prehistory or history (National Park Service 2002).

The historic properties we identified on the APS project included 26 ancestral archaeological sites, one spring, two pilgrimage trails, two mineral collection areas, and two shrines or religious offering places (Figure 4). Cultural advisors explained how these places help Hopi people retain and transmit their cultural identity from one generation to the next. To provide information needed by cultural resource managers, cultural advisors helped assess each traditional cultural property in relation to the age, integrity, and significance criteria of the National Register.

In several segments of the survey corridor, there are parallel grooves in the sandstone bedrock directly under the transmission line (Figure 5). The exact cause of these grooves has yet to be determined, although they may be related to precipitation dripping off power lines. APS is currently trying to identify how the grooves were formed. During fieldwork, cultural advisors considered how the grooves affected the cultural integrity of traditional cultural properties pursuant to NHPA and what environmental impacts they had pursuant to NEPA.

The potential adverse effects of the federal undertaking—renewing the lease for the transmission line—were discussed. Many segments of the existing roads used to access the transmission line are located outside the APS right-of-way, and cultural advisors expressed concern that traditional cultural properties may be located along the roads that were outside

of the survey area. They are apprehensive that grading access roads to maintain them may damage historic properties. APS is authorized to do work only within its existing right-of-way. Any ground-disturbing activity outside the right-of-way, such as road maintenance, requires coordination with Hopi as a new project.

A full accounting of the traditional cultural properties located during the project is found in the technical report prepared by the Hopi Cultural Preservation Office (Hopkins, Hedquist, Ferguson, and Koyiyumptewa 2014). In this article, we focus on the process of co-creating knowledge by combining Hopi and archaeological points of view.

THE PROCESS OF CO-CREATING KNOWLEDGE

For more than a decade, Hopi tribal members have been involved in a long-term project to develop an indigenous archaeology (Lomaomvaya and Ferguson 2003). Co-creation in collaborative projects and community-based participatory research are important elements in this effort. Our APS project is simply another step in developing an archaeology that serves the heritage management needs of the Hopi Tribe.

In anthropological archaeology, theories are proposed to explain empirical facts and they often involve hypotheses that can be confirmed or refuted by observations that account for known data. Hopis do not require archaeological theories to comprehend their past because they have independent and highly-valued traditional sources of knowledge that are the legacy of their ancestors. For Hopis, essential information about the past is found in esoteric cultural knowledge; scientific views of the past are valuable but secondary. Anthropological theories about past human behavior that provide elegant and rational explanations in a discourse intended for academics are less important than the secure knowledge the Hopi people have inherited from their ancestors. Nonetheless, Hopis are interested in working with archaeologists because archaeological research supplements information about the past by providing details that are not generally found in traditional sources of Hopi knowledge.

We have developed a model that depicts how Hopis and archaeologists co-create knowledge for use in heritage management (Figure 6). This model was derived from self-observation and interaction with the cultural advisors working with us as we collected and analyzed information on the APS project. We discussed what we were doing and how we were doing it with the cultural advisors working with us, and they provided feedback to clarify how they saw their role in the process. The model illustrates the structural similarities and differences between Hopi and anthropological forms of knowledge.

At the base of the model are the objects of joint study. For Hopis, these are the named places and traditional use areas that are the legacy of the ancestors, the *Motisinom* (First People) and *Hisatsinom* (Ancient People). For archaeologists, these are the artifacts and physical traces that were created in the past and that continue to exist in the present for archaeological study. The overlap of these categories constitutes the *Kuk'am* (foot-

TABLE 3. List of Hopi Traditional Cultural Properties Identified in the APS Project Area.

No.	Site No.	Description	NRHP Eligibility
1	001-2009 (HCPO)	Ancestral habitation	A, D
2	002-2009 (HCPO)	Ancestral artifact scatter	A, D
3	003-2009 (HCPO)	Ancestral artifact scatter	A, D
4	004-2009 (HCPO)	Tuqayva Spring	A, C, D
5	005-2009 (HCPO)	Ancestral artifact scatter	A, D
6	006-2009 (HCPO)	Ancestral artifact scatter and possible historic sheepherding features or hogan foundation	Undetermined
7	007-2009 (HCPO)	Possible historic sheepherding features or hogan foundation	Undetermined
8	008-2009 (HCPO)	Ancestral artifact scatter	A, D
9	009-2009 (HCPO)	Ancestral artifact scatter	A, D
10	010-2009 (HCPO)	Ancestral artifact scatter	A, D
11	011-2009 (HCPO)	Ancestral artifact scatter	A, D
12	012-2009 (HCPO)	Ancestral artifact scatter and feature	A, D
13	013-2009 (HCPO)	Ancestral artifact scatter	A, D
14	014-2009 (HCPO)	Ancestral habitation (Tawa'ovi)	A, D
15	015-2009 (HCPO)	Ancestral artifact scatter and feature	A, D
16	016-2009 (HCPO)	Ancestral artifact scatter and feature	A, D
17	017-2009 (HCPO)	Ancestral artifact scatter and feature	A, D
18	018-2009 (HCPO)	Historic or modern petroglyphs and feature	A, D
19	019-2009 (HCPO)	Unknown, historic, or modern petroglyphs, artifact scatter, and features	A, D
20	020-2009 (HCPO)	Ancestral artifact scatter and feature	A, D
21	021-2009 (HCPO)	Ancestral habitation	A, D
22	022-2009 (HCPO)	Rock shelter	A, D
23	023-2009 (HCPO)	Ancestral artifact scatter	A, D
24	024-2009 (HCPO)	Ancestral artifact scatter and feature	A, D
25	025-2009 (HCPO)	Ancestral artifact scatter, trail segment, offering place, and possible historic sheepherding features	A, B, C, D
26	026-2009 (HCPO)	Ancestral habitation; petroglyphs	A, D
27	027-2009 (HCPO)	Ancestral artifact scatter and feature	A, D
28	028-2009 (HCPO)	Ancestral artifact scatter	A, D
29	029-2009 (HCPO)	Ancestral habitation	A, D
30	Isolated Feature 4	Stone trail marker and offering place	A, B, C, D
31	001-2014 (HCPO)	Ancestral habitation with stone pillars	A, C, D
32	N/A	Third Mesa Kiisiw Pilgrimage Route	A, D
33	N/A	Hopi Salt Trail	A, D
34	N/A	Hotvela Piikyasngyam Eagle Collection Area	A, D
35	N/A	Hotvela Tepngyam Eagle Collection Area	A, D
36	N/A	Hotvela Kòokyangwngyam Eagle Collection Area	A, D
37	N/A	Mineral collection site (qöya'owa)	D
38	N/A	Mineral collection site (sikya'owa)	D



FIGURE 4. Clark W. Tenakhongva examining thirteenth-century ancestral Hopi pottery found at Tawa'ovi, a traditional cultural property encompassing ancient architecture and petroglyphs. Photograph by T. J. Ferguson, January 7, 2014.

prints)—or archaeological record—that Hopis and archaeologists jointly examine during field research.

On the left side of the model are the categories of *Hopin'voti* (Hopi knowledge) that each cultural advisor uses to make sense of what he observes during fieldwork. Each advisor has a unique set of knowledge formed from clan traditions, esoteric religious teachings, and family oral histories, all of which are mediated by personal life experience. The categories of Hopi knowledge include *navoti*, the traditional knowledge and cultural beliefs of the Hopi people; *wuqwnatovi*, or religious prophecy; *tutavo*, the teachings, advice, and instructions one receives; *maqastutavo*, or forewarnings, cautionary advice, and admonitions; *wimnatovi*, knowledge from esoteric religious practices; and *tuuuwtsi*, the stories, tales, legends, and fables one learns from didactic discourse. Cultural advisors use these forms of knowledge, both personal and collective, to identify and interpret named places and traditional use areas.

For instance, the eagle collecting areas of the Piikyasgyam (Young Corn Clan), Kookyangwngyam (Spider Clan), and Tepngyam (Greasewood Clan) had been identified in earlier research with clan members who drew upon *wimnavoti* garnered during their personal involvement with the ritual collection of eagles (Ferguson and Lomayestewa 2007; Fewkes 1900b). This information was reconfirmed by the cultural advisors who participated in the fieldwork for the APS project, based on their understanding of *navoti*. Similarly, the locations where *qöya'owa* (a white mineral) and *sikya'owa* (a yellow mineral) are traditionally collected for ritual use were identified by cultural advisors based on their knowledge of *wimnavoti* acquired during their personal participation in cultural practices (Figure 7).

Determining what Hopi knowledge is appropriate for sharing with non-tribal members was negotiated in a series of group discussions, both informally during fieldwork and formally in



FIGURE 5. Stewart B. Koyiyumptewa measuring depth of groove in sandstone underneath transmission line. Photograph by T. J. Ferguson, January 7, 2014.

review meetings with the Hopi Cultural Resources Task Team. This insures that culturally appropriate information is released for use in heritage management.

The creation of anthropological knowledge using archaeological and ethnographic methods is depicted on the right side of Figure 6. Archaeologists working on the APS project collected and interpreted data using standard archaeological methods of making observations about the archaeological record. This information was placed in a spatial and chronological framework shaped by archaeological theories that explain the development of past groups based on the distribution of material culture. Ethnographic research in our co-creative study, much of it done while visiting and talking about archaeological sites, was based on an analysis of the lived experiences of the cultural advisors with whom we worked. In this analysis, we took into account the social relations entailed in village, clan, and family ties, as well as the participation of cultural advisors in religious groups and other sodalities. We sought to differentiate between collective knowledge based on Hopi traditions and the oral history or personal experience of individual cultural advisors. The anthropological knowledge derived from applying archaeological and ethnological theories was then arrayed with Hopi knowledge appropriate for sharing to generate the co-created knowledge for heritage management, as presented in the technical report prepared for the project.

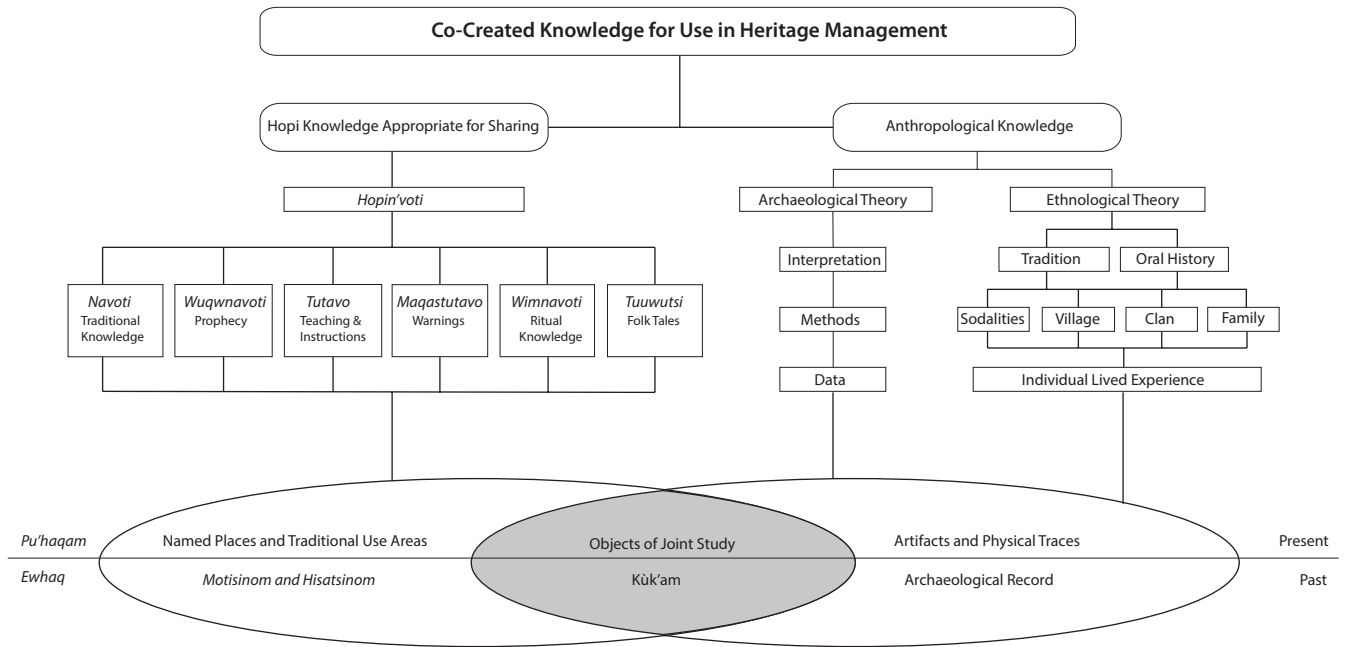


FIGURE 6. Model of co-created knowledge for use in heritage management.



FIGURE 7. Herbert Masayestewa at source of *sikya'owa*, a yellow mineral he collects for use in ceremonies. Photograph by Maren P. Hopkins, January 8, 2014.



FIGURE 8. Lee Wayne Lomayestewa of the Hopi Cultural Preservation Office uses a ceramic type manual to identify the age of pottery for cultural advisor Harlyn Monongye. Photograph by T. J. Ferguson, January 7, 2014.

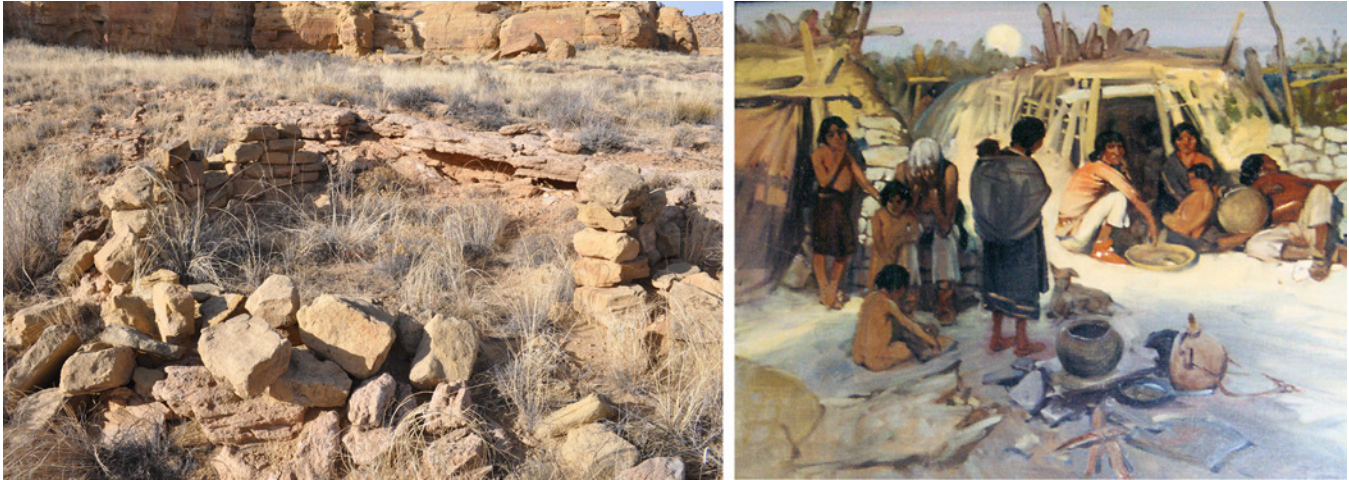


FIGURE 9. On left is a stone feature at Site 025-2009 interpreted as a Navajo Hogan during a previous archaeological survey, photographed by Maren Hopkins, January 7, 2014. On right is a Hopi *homoki* as illustrated in a painting by Harold Betts, courtesy of Hubbell Trading Post, National Park Service.

There is some interesting crossover in the methods that Hopis employ in co-creating knowledge. For instance, Hopi staff members of the Cultural Preservation Office use an unpublished field manual of ceramics developed by Wesley Bernadini to identify ceramic types observed in fieldwork (Figure 8). Design styles and cross-dating of ceramics provide the information needed to place ancestral sites into an absolute chronological framework that would otherwise not be possible. Using archaeological knowledge helps refine *Hopin'voti* and enable cultural advisors to better understand an archaeological frame of reference.

By joining Hopi knowledge and anthropological knowledge, the Hopi Cultural Preservation Office generates the information needed to identify and evaluate traditional cultural properties. This helps the Hopi Tribe to effectively engage in federally mandated historic preservation and to preserve a written record of traditional information about Hopi heritage.

CHALLENGES IN THE USE OF HOPI KNOWLEDGE

There are challenges in the co-creation of knowledge. One challenge comes from the difficulty of translating esoteric concepts into English. This is compounded by ambiguities in what knowledge is appropriate to share with people who are not initiated into Hopi religious organizations. The best way we have found to overcome this challenge is to involve the cultural advisors in a peer review of the final project report to ensure that accurate information is presented and to redact any sensitive cultural information that is not needed by federal officials in the Section 106 compliance process.

A related challenge comes from needing to decide how much information about a traditional cultural property should be revealed in technical reports for cultural resources management. Safeguards are needed to prevent the release of esoteric religious information or locational information that may put sites at risk. One solution related to linear archaeological features

that we employed in the APS project was to map pilgrimage trails only where they intersected with the project APE. The pilgrimage trails were not mapped in their entirety, and the report locates only their intersection with the project right-of-way because that is the information APS needs to manage sites during maintenance activities.

THE INTERPRETIVE POWER OF CO-CREATED KNOWLEDGE

We illustrate the interpretive power of co-created knowledge with one example, although many more examples could be discussed in a longer article. A polygonal feature at Site 025-2009 was originally recorded as a Navajo hogan in an archaeological survey conducted in 2009 (Laurila et al. 2011). We think this is because conventional archaeological knowledge holds that Navajos lived in polygonal structures and that Hopis lived in rectangular houses. This pattern is often discussed and is established in the literature (Jett and Spencer 1981; Mindeleff 1891). As documented in Hopi oral history, however, Hopis built *homoki*, polygonal structures used for temporary housing during grazing activities or times of stress, such as the period following the Orayvi split in 1906 (Hopi Dictionary Project 1998:92; Whiteley 1988). In 1906, a number of Hopis abruptly moved out of the village of Orayvi to establish new villages at Hotvela and Paaqavi. These Hopis left Orayvi in the late fall and there was not sufficient time to construct pueblo structures. They consequently constructed *homoki* with masonry foundations and brush superstructures to provide temporary dwellings until they could construct Pueblo room blocks (Figure 9). Similar architectural features were also constructed on the range to support sheep herding in some parts of the Hopi Reservation.

While co-created knowledge is useful in suggesting an alternative interpretation of the archaeological feature at Site 025-2009 as a Hopi rather than Navajo structure, the Hopi cultural advisors we worked with are cautious. While they believe that this structure is a Hopi feature, they advised us that archaeologists should



FIGURE 10. Maren Hopkins and Leonard Talaswaima discussing how archaeological features at Site 001-2014 relate to Hopi history Photograph by T. J. Ferguson, January 7, 2014.

consider this as a hypothesis for testing. If adverse effects to the site from the federal undertaking cannot be avoided, Hopi advisors recommend that additional research be conducted to investigate the cultural associations of the site and its features.

CONCLUSION: THE VALUES OF CO-CREATED KNOWLEDGE

In conclusion, we think that the co-created knowledge produced by the Hopi Tribe and archaeologists for use in heritage preservation benefits all the participants (Figure 10). The Hopi Tribe benefits from the co-created knowledge by using it in the historic preservation process to try to protect important cultural sites and learn more about them. This is particularly important with respect to sites that are not specifically referred to in oral traditions but that are nonetheless considered to be Hopi footprints. The individual Hopi research participants benefit from the co-creative project by increasing their personal knowledge and experience of heritage sites and sharing this information with other tribal members. Archaeologists benefit from an increased understanding of Hopi views of archaeological sites and cultural places and knowledge of how these places are used to construct cultural landscapes. The co-created knowledge helps interpret archaeological sites and to build anthropological theory. Everyone who participated in the project—tribal members and non-Indian archaeologists—learned new things that are important to their understanding of Hopi heritage, and the project built individual capacities for continuing the development of indigenous archaeology in future work.

In evaluating co-creative projects, both process and product need to be assessed (Simon 2010). In the APS El Dorado

Transmission Line Corridor Survey project, the products are easy to assess. A technical report was completed and used by the Hopi Tribe in heritage management, and that work led to the publication of this article. However, we think that the process of conducting the research was as important as the products that resulted from the project. We know that the Hopi cultural advisors who participated in fieldwork returned home and shared the knowledge of what they learned with their families and, probably, with their peers during discussions in their kivas and other settings. While difficult to measure, in a society whose knowledge traditions are based in oral transmission, the discursive dissemination of what Hopi cultural advisors learned about the places that help constitute their heritage should not be discounted.

Our project met the fundamental goals of co-creation articulated by Simon (2010). We gave voice to the Hopi people, who articulated why traditional cultural properties in the project area were important. The project was responsive to the needs of the Hopi Tribe by producing a technical report that could be used in the Section 106 compliance process. The project helped individuals develop the skills needed to support their community, including the skills developed by the Hopis employed by the Hopi Cultural Preservation Office and the skills developed by a graduate student we employed to assist in the research. We think that the success of our APS project is due in part to the long-term working relationship between project archaeologists and tribal research participants. The foundation of trust needed for this type of research takes considerable time and effort to develop. While our project methodology may not be immediately transferrable to other projects, we nonetheless think it provides a model that other archaeologists and tribes can draw upon to structure research.

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Data Availability Statement.

All field notes and copies of photographs are archived at the Hopi Cultural Preservation Office, the Hopi Tribe. For access, call (928) 734-3611 or write to Director, Hopi Cultural Preservation Office, P.O. Box 123, Kykotsmovi, AZ 86039.

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