

VIRTUAL APPLICATIONS IN PUBLIC ARCHAEOLOGY:
DIGITAL PLATFORMS, ACCESS, AND THE EFFECTS OF A PANDEMIC

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ABSTRACT

VIRTUAL APPLICATIONS IN PUBLIC ARCHAEOLOGY: DIGITAL PLATFORMS, ACCESS, AND THE EFFECTS OF A PANDEMIC

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This thesis explores the effects of the COVID-19 pandemic on public archaeology and heritage education in the American Southwest. Digital tools such as 3D photogrammetry modeling, photo galleries, educational videos, and virtual tours are translating experiential archaeology into online visualization and education, encouraging multi-access public engagement. This research focuses on public national monuments in central northern Arizona and includes a statistical analysis of recreational visitation patterns pre and post COVID-19 lockdowns of 2020 and an evaluation of public forum reviews, summarizing pandemic impact during 2020 and 2021. The public can access practical digital solutions to pandemic closures and supplemental web-visualization content through the Walnut Canyon Nine Room Virtual Model Project and educational video curriculum at Elden Pueblo. This thesis uses statistical analysis, public reviews, and digital internship observations to argue that the COVID-19 pandemic negatively impacted routine hands-on public archaeology, but positively affected more use of digital platforms for public engagement; however, multivocal community concerns and technological ethics are necessary considerations in digital archaeology and heritage management.

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TABLE OF CONTENTS

Abstract	ii
Acknowledgements	iii
Table of Contents	iv
List of Tables	vi
List of Figures	vii
Dedication	vii
Chapter 1. Introduction and Terminology	1
Introduction.....	1
Methodology	4
Terminology.....	7
<i>Public Archaeology, Archaeo-tourism, and Interpretation</i>	7
<i>Digital Archaeology and Transmedia Storytelling</i>	12
<i>Technoscapes, Mediascapes, and the Global South</i>	15
<i>The Digital Divide</i>	16
Chapter 2. Public Archaeology	18
Interpretation.....	19
<i>Post-processual Approaches</i>	20
<i>Collaboration</i>	22
<i>Tourism</i>	24
National Park Service	26
Chapter 3. Digital Archaeology Internships	29
Elден Pueblo	32
The American Southwest Virtual Museum	35
The Walnut Canyon Nine Room Virtual Model Project	36
Chapter 4. Pandemic Effects: Quantitative Statistics on National Monument Visitation	39
Objective and Hypothesis	41
Methodology	43
Analysis and Results	48
Discussion	54
Chapter 5. Pandemic Effects: The Public Voice.....	57
A Summary of Online Public Reviews.....	57
<i>Wupatki National Monument</i>	60
<i>Walnut Canyon National Monument</i>	62
<i>Montezuma Castle National Monument</i>	64
<i>Tuzigoot National Monument</i>	66
General Commonalities Between Reviews	67

Chapter 6. Digital Ethics and Applications	71
Digital Humanities Ethics	71
Community Sharing	73
Conclusions.....	75
References Cited	80
Appendix A. Thesis Project Location Map.....	91
Appendix B. Visitor Info Pamphlet for The Nine Room Virtual Model Project.....	92
Appendix C. Screenshot Portions of the Nine Room Virtual Model Project	93

LIST OF TABLES

Table 1. Descriptive Statistics of Monthly Rates by Location49
Table 2. Descriptive Statistics of Seasonal Totals across all Locations by Season49
Table 3. Independent Samples T-test of Seasonal Variable on All Sites Total Visitation Rates .51
Table 4. Independent Samples T-test of COVID Variable on All Sites Total Visitation Rates ...52
Table 5. One-way ANOVA Results of Annual Predictor on Four Locations and All Sites53

LIST OF FIGURES

Appendix A

Figure 1. National monument locations included in statistical analysis and public review research study are indicated by red points; larger outline circles represent digital internship locations91

Appendix B

Figure 2. Educational pamphlet available to visitors who walked the Island Trail of Walnut Canyon during field photography hours for the Nine Room Virtual Model Project92

Chapter 4.

Figure 3. Visitation Mean Bar Chart for Wupatki (clustered by season)46

Figure 4. Visitation Mean Bar Chart for Walnut Canyon (clustered by season)46

Figure 5. Visitation Mean Bar Chart for Montezuma Castle (clustered by season)47

Figure 6. Visitation Mean Bar Chart for Tuzigoot (clustered by season)47

Appendix C

Figure 7. Complete exterior view of the photogrammetry model of the Walnut Canyon Nine Room cliff dwelling site.....93

Figure 8. Drawn diagram of Nine Room site room letter designation (courtesy of NPS).....93

Figure 9. Model exterior view of Rooms A and B, facing northeast.....93

Figure 10. Model view of Room D interior from east wing, facing northwest94

Figure 11. Model interior of Room E, facing southeast94

Figure 12. Anvil (ceramic forming tool) from Walnut Canyon95

Figure 13. Ceramic bowl from Wupatki95

Figure 14. Ceramic cup from Wupatki95

Figure 15. Mano (groundstone) from Walnut Canyon95

Figure 16. Small ceramic pitcher from Wupatki95

Figure 17. Ceramic bowl from Wupatki95

DEDICATION

This thesis project is dedicated to the memory of Theodore (Ted) Lloyd (October 26, 1958-

December 15, 2020), a loving and supportive father.

Chapter 1. Introduction and Terminology

Introduction

To encourage multi-access public engagement with ancient heritage sites, heritage managers use digital tools such as photogrammetry, three-dimensional (3D) modeling, virtual tours, video-conferencing presentations, and other web content that translates experiential archaeological display into online visualization and education. These modes of display have grown in popularity as production of digital displays are cheaper and easily accessible in Western and urban contexts. In recent decades, professionals realized the value of digital applications and interactive display, incorporating them into financial budgets to diversify multi-media learning platforms. The need and consideration for these digital platforms has been expanded and expedited recently due to the COVID-Sars-2 Coronavirus (COVID-19) global health crises (pandemic). Pandemic lockdowns negatively impacted millions of hands-on scientific and cultural learning venues such as museums, visitor centers, and interpretive sites worldwide by forcing closures and program cancellations. In venues like the children's education program at Elden Pueblo and many museums, the pandemic necessitated a distinct push for more creativity and development with online outreach, interaction, and education. Digital platforms suddenly became more necessary, whereas before the pandemic, these platforms were merely supplemental ideas that agencies and organizations were planning to implement eventually, as resources allowed. Many of those ideas came to fruition as a result of pandemic public closures and social distancing lockdown procedures that occurred in 2020 thru 2022. This thesis uses previous academic expertise, internship observations, statistical analysis, and public reviews, to argue that the COVID-19 pandemic negatively impacted routine hands-on public archaeology in Arizona, but positively affected more use of digital platforms for public engagement; however,

multivocal community concerns and digital ethics are necessary considerations in digital archaeology and heritage management discussions.

Digital and virtual applications in public archaeology necessitate cultural interpretive theory and a general understanding of which aspects of archaeology and heritage the public want to experience, combined with accurate inference, responsible portrayal, and a provoking challenge to colonial stereotypes. A great deal of recent research and promotion explains the benefits of newly emerging digital technological outlets in archaeological analysis and presentation, however several challenges must be academically considered and addressed. How does one appropriately interpret monumental archaeology to digitally reconstruct past lifeways for archaeo-tourism? As the current globalist age promotes more technological dependence, how should we implement virtual platforms to promote wide-spread education and heritage engagement without amplifying the digital divide between demographics? National geographies are separated between urban and rural, white and non-white, and rich and poor citizens that make up diverse demographics who use technology in different ways and to varied extents. Should these demographics be unilaterally forced to interact with technology and digital platforms to stay globally relevant in the Western view? Decades of publications are dedicated to addressing these issues, which require consultation within more specified topics of transformative methodologies in public archaeology.

Through internships with Elden Pueblo and the National Park Service (NPS), I participated in the development of virtual displays and web content for archaeological tourism and education, such as a video tour for Elden Pueblo with Project Archaeology (Lloyd and Deem 2021; Project Archaeology 2021) and the Nine Room Virtual Model project at Walnut Canyon National Monument (Pawlowicz 2022). This study includes explanation of these digital

archaeology internships and how aspects of these projects provided resolutions to pandemic restrictions and effects. It also includes a statistical analysis of means comparison across four NPS national monuments from 2017 to 2021, in order to determine whether pandemic restrictions significantly impacted visitation patterns after April 2020, compared to recent, previous years. Did the visiting public still come see these archaeological monuments during the height of the COVID pandemic? Lastly, this study summarizes the tones of online public reviews from platforms TripAdvisor, Yelp, and Google by identifying patterns of positive or negative reactions to each reviewer's experience at the four National Monument locations within the study area during the height of the COVID-19 pandemic implementations and restrictions. What was the public response to COVID restrictions and available learning material at these venues?

Required life alterations in 2020 proved how necessary digital platforms are within contexts such as careers, education, tourism, and home-life. During the height of the COVID-19 pandemic, American society realized how dependent it has become on digital platforms as we adjusted our lives connecting digitally to friends, family, and work from the safety of our homes. Promotion of digital archaeology allows broader access to archaeological education to those with computers and internet connection. Digital delivery can offer a spectacular way to reconstruct the past and allow the public to visualize heritage and cultural values in innovative ways as supplementary material to physical experience and engagement. That said, this use of digital platforms should never replace in-person engagement with the places themselves. Experiencing structures, artifacts, and indigenous cultural voices in context provides memorable impact that digital platforms, alone, do not accommodate. This issue of balance between digital and in-person engagement begs ethical consideration of the shift toward digital archaeology that may be contributing to the digital divide in North American vulnerable population communities and the

lives of individuals that do not have equal access to internet bandwidth speed and everchanging computerized devices. The trajectory of public archaeology was moving toward these technological outlets before the global pandemic, however, 2020 rapidly changed the context in which public archaeo-tourism operates. Public archaeology responded with expedited technological accessibility in 2020 to supplement physical experience of public sites, and will continue to grow toward this goal, but is it promoting appropriate balance between both physical and digital access to archaeological education?

Methodology

The practical aspects of this thesis project started with a working internship for the Elden Pueblo Project, managed by the Coconino National Forest, in February 2021. More digital platforms for public archaeological education were required during this post-pandemic period. I was employed to draft a script for a 15-minute video presentation as part of a curriculum series produced by Project Archaeology for primary and secondary school teachers to use in classroom settings. At this time during the COVID-19 pandemic, most primary and secondary schools were operating class sessions over conference call platforms and engaging at-home students with digital material. I spent three months working with Coconino National Forest personnel, Elden Pueblo tour guides, and archived interpretive material to draft a presentation script for this film about archaeology at Elden Pueblo that applied to a section of curriculum named “Investigating Shelters—Observation, Evidence, and Inference.” I used a local videographer to present practice videos and determine some staging and suggested shot angles for the official film. Arizona State Parks provided a professional videographer for Project Archaeology to film all the curriculum segments in Arizona. On May 26, 2021, I presented and narrated this script around the pueblo structures for “Investigating Shelters”, which was published to participating schools shortly after

filming. This short educational video is also available to the public via YouTube.com (Lloyd and Deem 2021; Project Archaeology 2021).

The second practical aspect of this study includes the making of a photogrammetry model for NPS at Walnut Canyon National Monument. During the summer and fall of 2021, I assisted consultant Dr. Leszek Pawlowicz with initial planning and the field portion of photograph collection for the Nine Room Virtual Project. We used two Canon EOS 6D DSLR cameras over the course of several field visits to cliff dwelling site WACA162 (NA739), which consists of nine excavated rooms and one unexcavated alcove that visitors can access along the Island Trail in the canyon. Thousands of overlapping photographs of the inside and outside of the site were reviewed and edited to produce a 3D photogrammetry model using Agisoft Metashape software. Safety precautions such as harnessing and masking prevented fatal falls and exposure to COVID-19 and Hantavirus. The finished Nine Room model is available to the public online via Sketchfab (Pawlowicz 2022). Additionally, Dr. Pawlowicz and I worked with the Museum of Northern Arizona in December 2021 and took over 1,400 multi-angle photographs of multiple artifacts, for additional photogrammetry models. The artifacts are part of collections from Wupatki National Monument but are representative of similar Sinagua cultural material discovered at Walnut Canyon. All these models will provide supplemental digital content for NPS: Flagstaff National Monuments to use as they see fit for public engagement and will be linked to the Southwest Virtual Museum.

There are two research aspects of this study: an analytical statistical test on visitation patterns and a summary of visitor online reviews at four Arizona archaeological monuments. Four national monuments were chosen for this study because they fall into similar categories (Appendix A). All four venues are managed by NPS, located in northern-central Arizona, and

contain archaeological monuments that represent the Sinagua culture who occupied this region between 800 BC and 1400 AD (Downum 2012). For the statistical analysis, monthly recreational visitor totals were collected from free-access public-domain website, [https://irma.nps.gov/STATS/ Reports/Park](https://irma.nps.gov/STATS/Reports/Park) (2021) across five years (2017-2021) for all four locations, and then added up an “all sites total” column. Months were divided into four variables: on-season (March - October) and off-season (November - February), and pre and post COVID (March 2020), to run a comparative trend analysis. IBM Statistical Product and Service Solutions (SPSS) software was used to run independent sample *t*-tests and a one-way analysis of variance (ANOVA) test to determine differences between annual rates, seasonal groups, and monthly visitation totals before and after (pre/post) COVID-19 restrictions went into effect. All total visitation rates (monthly, seasonally, and across all sites) are continuous outcome variables manipulated in the tests by categorical variables: annual, seasonal, and pre/post COVID-19 procedures.

The second part of the research study summarizes the public voice about individual experiences via public online reviews posted on TripAdvisor, Yelp, and Google for all four national monument venues included in this study. After searching and selecting each monument location, I sorted review lists by newest to oldest for easy access to recent reviews written between 2019 and 2022. I then filtered all reviews by search terms “visitor center”, “learn”, and “COVID” to limit reviews to public interaction and engagement with the educational aspects of these archaeological monuments during the period when COVID restrictions were heightened. I pasted a sample size of 83 individual reviews into my data notes based on varied, relevant content that spanned random intervals per platform because TripAdvisor contained more reviews than Yelp, and Google more content than both the former two websites across the temporal and

keyword filters. Chapter Five presents examples of key reviews and a subjective summary of positive and negative tones across the sample set.

Terminology

Public Archaeology, Archaeo-tourism, and Interpretation

Public archaeology broadly applies to “archaeological projects funded by the public,” and encompasses aspects of cultural resource management, heritage education, museum studies, interpretive venues and site tours, anthropological ethics, collaboration, and community involvement (SAA 2021:1). This additional, generalized definition is eloquently put by Lorna Richardson:

Much of the literature on the subject defines Public Archaeology as an examination of the relationship between archaeology and the public, where the ‘public’ is represented both by the state—working in the public interest to protect, excavate and investigate society’s archaeology on their behalf—and by the notional ‘general public’—meaning those who are not professional archaeologists (Richardson 2013:1).

Several outreach organizations across America embody a deeper definition of public archaeology in their mission statements by promoting the preservation of quickly deteriorating sites, facilitating stewardship, and partnering with heritage and tourism venues to engage the public with this cause (Florida Atlantic University 2023; Florida Public Archaeology Network 2023; Project Archaeology 2021). Public archaeology experts recommend multiple theoretical approach models that are complexly intertwined with museum studies and experiential education, which both fall under interpretive heritage management governed by academic, state, and federal institutions. This study summarizes a broad view of the evolution of theory behind

public archaeology since the 1980s and recent discussion points emphasizing community stakeholder considerations up to the COVID-19 pandemic, but this is far from an exhaustive account of public archaeological theory.

When these heritage sites provide revenue for the local economy due to increased public tourism, this form of public archaeology is known as “archaeo-tourism.” In the American Southwest this generally refers to historic or prehistoric archaeologically recorded sites on federally managed lands (such as NPS) supplemented by interpretive accommodations to educate the paying public about the cultural context and engage them to meaningfully experience the heritage encompassed by these preserved sites (Stine and Stine 2014). NPS: Flagstaff Area National Monuments distinguishes certain non-confidential sites, accessible to public tours, as “front-country sites.” These are usually the grandest, most visually impressive examples of archaeological monumental architecture within a park and are therefore called national monuments, managed and conserved in compliance with the Organic Act of 1916 (Stine and Stine 2014; Ziesler and Pettebone 2018). Surrounding archaeological sites that are kept confidential from the public and largely protected from too much public access where possible, are designated “back-country sites”, and are managed by NPS in compliance with the National Historic Preservation Act (NHPA) Section 106. Though back-country sites may not be ostentatious examples of well-preserved, tourist-drawing architecture, they provide contextual data for research and interpretation that guides the presentation of these monuments and educational details to the public. Front-country monumental sites are controlled by staff, well-maintained trails, and signage, promoting an appreciation for these heritage examples. Ideally, this management strategy deters looting and vandalism, though it is not always absolutely prevented.

Public archaeology is also presented in NPS visitor centers that accompany monument sites, which specify detailed archaeological information in a curated context. Visitor centers are essentially small museums, focused on presenting educational media to park visitors that is narrowed specifically to the national monument, scientific aspects of the park, and local historical, geographical, biological, and cultural context (Stine and Stine 2014). The largest *global* venue for public archaeology is museums on local, state, and national levels that curate prehistoric and historic archaeological artifacts and present educational portrayals of protected monuments and historic properties. Museum studies is its own subfield within heritage management that only plays a role in this study where museum mediascape theory interconnects specifically with public archaeology. This intersection is termed “interpretation” (Kidd 2014), especially in federal venues such as NPS. Interpretive staff link archaeological research (and other sciences) to public education and engagement by collaborating with federal and contracted scientists to produce accurate signage and curated displays at visitor centers (Stine and Stine 2014). This functional role of interpretation in heritage management stems from a hermeneutical focus on theory where archaeologists interpret material data in the same way historians interpret texts (Hodder and Hutson 2003).

The theoretical undertones of hermeneutics, or the study of literary interpretation in archaeology and its application in public archaeology transformed with the introduction of the post-processual movement. British archaeologists, such as Ian Hodder, promoted this archaeological approach starting in the 1980s in an attempt to add more contextual multivocality and reflexive methodological perspectives in an admittance that archaeological interpretation is subjective (Preucel 2018; Hodder and Hutson 2003). In this subjectivity, interpreting history by simply characterizing objects in the archaeological record is not as holistic as “engaging in the

dialectic of people and things” with emphasis on exploring sub-cultural definitions of identity, gender, agency, power, structure, ideology, praxis, and materiality from a more post-modernist perspective (Preucel 2018:1; Hodder 1991:8-9). In the 1990s, Hodder more specifically addressed post-processual interpretation applied to public archaeology, using his excavations at popular Turkish tourist site Çatal Hüyük as an empirical example. He described post-processual hermeneutics as contextual interpretation of general knowledge with an emphasis on “part-whole relations” between the reflexive context of an etic researcher, the more emic descendant cultural context, and the historic context itself (Hodder 1991:8). ‘Etic’ refers to an outsider in cultural group contexts and ‘emic’ refers to an individual or perspective inherently within a designated cultural group. Hodder’s approach was an attempt to surpass rigid views of subjectivity versus objectivity and recognize that archaeology typically operates directly with data characterization, within the hypothesis-driven scientific method, where a broader scope of dialectic interpretations is required for farther-reaching perspectives (Hodder 1991:12-13). Though modern Turkish communities do not necessarily view themselves as direct descendent cultures of these archaeological contexts, they do have various historic connections to these places as well as political and economic interests. Hodder eventually embraced the need for local community control over the site at Çatal Hüyük, as they determined the best approaches for interpretation and archaeo-tourism for this project (CRP 2020). An example of dialectic perspectives in the American Southwest consists of collaborative work with nine to fourteen distinct indigenous tribes that contribute multi-vocal heritage interpretation in various regions of northern Arizona. These rich contributions include detailed explanations regarding ideological understanding of sacred landscapes, cultural memory, ritual, and metaphorical expressions of relationships among people, plants, animals, earth, and cycles of life (Hays-Gilpin 2021).

In the “post post-modernist” and “post post-processual” approaches of today, theoretical discussions regarding public archaeology include issues of power relations, collaborative participation, agency theory, democratic communications, decolonization, and nuances in critical versus multi-vocal approaches to public archaeology within neoliberalist contexts (Richardson 2013:2; Matsuda 2019:13-14). Theoretical applications regarding community, inclusion, and knowledge-exchange involves both reflexivity and transparency between academia and public “community-developed ontology” (Vitale 2016:148). Discussions about power relationships within community archaeology tend to argue toward a bottom-up approach or a focus on investigating the desires of and benefits for the community closest to the subject heritage. This includes letting that community control aspects of the study. This focus would give stakeholders more inclusivity and voice than a top-down approach, where the scholars and the academic community retain the majority of control over the heritage narrative. Just as these considerations apply to current collaborative archaeology, they should also apply to the future of digital archaeology where possible (Richardson 2013). Richardson argues that “[a]rchaeologists need to understand and explore further public consumption and interpretation of archaeology in the media... and that archaeology must engage with popular culture if it is to survive” (Richardson 2013:8). Current information exchange in popular culture is largely digital and web-based.

Within interpretive displays in museums, visitor centers, or in web content, the goals of archaeological reconstructions are to help the viewer understand the site, by understanding the expectations of the public viewers and community stakeholders. Archaeologists must seek to understand public expectations, while simultaneously acknowledging the role of subjectivity in archaeological inference (Pujol 2017; Kidd 2014). Pujol argues that virtual archaeological reconstructions should realistically portray crowded ancient dwelling areas that include

simulated people, artifacts, and animals in dynamic ways that allow for temporal depth and transformation from human perspective of a dwelling setting and the landscape (Pujol 2017). This necessitates deeper studies of public feedback from archaeological engagement, but also begs the question, whose opinions about archaeological presentation within the public sphere hold the highest priority? Who owns heritage and has more of a right to participate in its presentation when community consensus diverges? These frequently debated issues can only be addressed through a more complete understanding of the local opinions of public audience and community stakeholders. This motivates Chapter Five of this study “The Public Voice”, by summarizing both positive and negative aspects of the visitor experience described in online reviews. Despite great leaps forward, gaps of communication, perspective, and understanding between archaeologists, heritage management personnel, indigenous experts and collaborators, and the larger public are still prevalent today, and require consistent problem-solving.

Digital Archaeology and Transmedia Storytelling

The IGI Global web database for scientific reference material defines digital archaeology as follows:

[A] branch of archaeological science involving the application of information technology and digital media. It includes the use of digital photogrammetry, 3D reconstruction, virtual reality, geophysical prospection tools, and information systems, among other techniques. Virtual archaeology, cyberarchaeology, and computational archaeology, which covers computer-based analytical methods, can be considered subfields of digital archaeology (2021:1).

Multi-media communication for public education in a nuanced and exclusive social science applies to public digital archaeology and introduces potential issues and theoretical approach questions that align with discussions in museum studies. One of these issues is the rate of data synthetization by the average human mind, which favors large quantities of informational intake through technological images without qualitative processing of things such as in-depth cultural considerations. Internet immersion is becoming a relevant problem that affects perceptions of time, information management, and forms of social communication (Combi 2016). This is particularly applicable to open-minded approaches to sources, evidence, and inference surrounding digital representations.

Open discussions and understanding between multiple communities reduce the level of subjectivity within visualizations which are similar in perspective conveyance to the ways that photography portrays the subjective views of a photographer (Vitale 2016). Cultural heritage experts argue for the benefits of bidirectional approaches that include considering public annotations and review feedback to digital visualizations as they increase in institutional use and popularity (Vitale 2016). Other considerations include active rather than passive approaches to connecting history and heritage to public cyberspace through virtual curation that weaves between the scholarly community, museums, and public learning (Means 2015). Several archaeological National Monuments and museums in the Southwest have converted their closed museum exhibits in 2020 into online artifact image galleries. With more use of 3D modeling, virtual curation accommodates more co-creation efforts between community stakeholders, scholars, and heritage professionals (Means 2015).

Jenny Kidd describes digital mediascapes relating to museum studies, which are also applicable to public archaeology and the discussion surrounding dialectic perspectives. Kidd

applies modern theory from Massachusetts Institute of Technology (MIT) computer scientist Henry Jenkins, who coined the term “transmedia storytelling”:

Stories that unfold across multiple media platforms, with each medium making distinctive contributions to our understanding of the world, a more integrated approach to franchise development than models based on urtexts and ancillary products” (2006:293, 21).

While Jenkins applied this concept to narrative translation in the multi-media entertainment industry, Kidd aptly extends it as a constructivist model to multimedia display in modern interpretive venues (physical and online) to transform cultural hermeneutics into diversified modes of visitor participation with the cultural landscape (Kidd 2014). Diverse platforms accommodate all different kinds of learning for ranges of age groups. For example, the children’s learning program at Elden Pueblo (under non-pandemic circumstances) allows a space for children of different ages to experience auditory lectures and tactile experience excavating, screening, washing, and sorting a variety of artifacts right next to the Pueblo walls. They also get to practice using experimental archaeological replicas of hunting weaponry such as atlatls, bows, and rabbit sticks. Alternatively, the visitor experience at an Arizona national monument is mostly visual and necessitates a large amount of reading to acquire interpretive details about the structures and displayed artifacts they see. Lastly, museums tend to allow much more diversification of transmedia storytelling within cultural landscapes, because most can be either indoor, outdoor, or both. Many museums also have strong wireless internet servers that can maintain digital media and have the capacity to display information about multiple fields and subfields such as geology, biology, cultural heritage, art, and practically anything else that the museum chooses to contextualize in its exhibit.

Technoscapes, Mediascapes, and the Global South

When Arjun Appadurai coined the term “technoscapes” in 1990, he referred to the fluidity and speed of technological movement between cultural and political entities, overcoming geographical landscapes, and defining power relationships in a modern globalist environment (Appadurai 1990:297; Suchman 2011; Swaminathan 2014). Since then, “globalizing flowscapes” (Scarlett 2006:111) of technological processes through history are studied in socio-cultural and archaeological contexts as cultural exchange, immigrant labor specializations, and exported skills expanded into global impacts (Coleman 2010). Appadurai used the term “mediascape” to categorize any digital mode (or material platforms such as books, newsprint, magazines and journals) that produce and distribute information to broad local, regional, or national audiences (Appadurai 1990:299). The prevalent digital and social media that many regions rely on today through web platforms is also a form of western technoscape. Mediascapes are not necessarily based on reality but also contain scripted narratives promoting agendas, idealized illusions, expected cultural identities, or metaphors (Appadurai 1990:299; Coleman 2010).

Today, global technology merges with media, forming a digital “hybridized socio-technoscape” (Swaminathan 2014:92). This merge necessitates a reliance on digital media for communication, self-expression, political and economic information, creative work production, and further technological advancement, digitizing daily life in increasing cross-cultural contexts and isolating any that do not define their lives by constant use of these socio-technoscapes (Coleman 2010:490; Swaminathan 2014). Current world-wide races toward technological advancement and applications have become a modern version of colonialism where technological prowess dominates the hegemony of more traditional societies by creating

dependence on computerized technology for survival and relevance within a globalized world (Appadurai 1990:295-296, 307-308).

One significant, inevitable result of the global technoscape is an unbalanced advantage of technological access and control between dominant societies over marginalized societies. It is acutely exhibited in smaller nations with colonial histories, that now rely economically on tourism and archaeo-tourism (Janes 2009; Siegel et al. 2013). This imbalance creates what many social researchers refer to as a “digital divide” (Díaz-Domínguez 2020:171) in regions referred to as the “Global South.” The Global South is a conceptual phrase that replaced terms such as “Third World” or “developing nations”, referring to marginalized regions marked by large low-income populations, a history of colonial power struggles, and less-immediate access to technological advancements in medicine and digital tools (Díaz-Domínguez 2020; Dados and Connell 2012:1). Social scientists primarily use this term to geopolitically refer to indigenous regions of Africa, South America, Central America, and smaller nations in Asia, as opposed to the “Global North” referring to political super-powers and other nations that contain more control over global markets and geopolitical trends including most of North America, Europe, and some nations in the Middle East (Dados and Connell 2012).

The Digital Divide

The term “digital divide” refers to an inequality or imbalance of computer access and participation in digital platforms or certain technologies between geographical regions or demographics (Van Dijk 2006). It can apply to rural areas that lack the infrastructure to provide sufficient wireless bandwidth, or to cultural communities that choose not to participate in global technoscapes over preferred traditional lifeways. This exists intergenerationally within cultural subgroups as well. As American archaeology takes rapid, forward approaches toward

technological tools and digital platforms and output, we must recognize a difficult dilemma that applies to technological advancement within our modern world—the digital divide. This imbalance in access to digital technology develops a power relationship that contributes to a modern neoliberalist construct of historic colonialism (Van Dijk 2006; Díaz-Domínguez 2020).

The twenty-first century is seeing digital dependence forced on more of the world for functionality, including the Global South and marginalized communities (Díaz-Domínguez 2020:171). Often a result of rural geography, deficient infrastructure, or community cultural perspectives, digital divides often include discriminatory bias and cultural assumptions (Díaz-Domínguez 2020; Young 2019). For example, some indigenous individuals who want to participate in digital portrayals of their culture, are not given appropriate opportunity to train on digital platforms or present their own technological products independently of collaborative assistance (Winter and Boudreau 2018). Collaborative efforts should endeavor to narrow or close this divide where possible and empower marginalized populations to stay true to their cultural values, whether or not that includes participation in certain global technoscapes. The main dilemma is that these questions about digital ethics are commonly overlooked by politicians, businesses, and scientists, as they run the technological race to avoid becoming outdated or redundant (Díaz-Domínguez 2020; Young 2019). This issue corresponds directly to an increase in technological applications in public archaeology and the expedition of digital technologies in general, required to safely continue ongoing functions in life, due to the COVID-19 pandemic during 2020 and 2021.

Chapter 2. Public Archaeology

Archaeologists consistently discuss the most relevant considerations between archaeology, interpretation, and public engagement, including multivocal collaboration efforts that bear witness to cultural stories in addition to scientific research. Multiple types of educational venues in northern Arizona play a role in public archaeology including NPS Flagstaff Area National Monument visitor centers, the Museum of Northern Arizona (MNA), and the children's program at Elden Pueblo. This chapter summarizes a brief background of public heritage management and educational approach for presenting archaeology to the public through these tourism venues. Archaeology is a woven combination of theory, scientific data, analysis, interpretation, historical accounts, and cultural stories. Public archaeology and archaeological tourism, informed by all these moving parts, present a conserved version of archaeology where the historical landscape and heritage value meet localized public education of the cultural past (Burillo 2018; Hays-Gilpin 2021).

Public heritage management and education is intrinsically valuable. The study of archaeology is intended to benefit many different people with diverse backgrounds because it provides an interpreted version of past landscapes that entail varied meanings to different communities, individuals, and identities (Basso 1996; Colwell-Chanthaphonh and Ferguson 2006). The story of the American Southwest is tainted by power struggles that span human history including resource protection and prioritization, familial defense, European colonial appropriations, antiquarianism, and modern United States political impacts—local, national, and global (Lister 1983; Lekson 2009). Archaeology was never immune to these impacts and transformed from social evolution and romanticized notions of 'the other' through theories and arguments, to collaboration and decolonial efforts (Fowler 2000). The past embodies violence,

genocide, revolt, economic class distinction and racism, but from these devastating harms, hope emerges today for mutual respect, edification through education, and improvement (Watt 2001). Improved futures arise through learning from past mistakes. We accomplish these improvements by teaching others, encouraging open-mindedness and participation in more beneficial activism than their predecessors. This is why ethical public archaeology and heritage management are so important despite historic trials that produced them and damages we continually attempt to repair (Hays-Gilpin 2021).

Interpretation

Interpretation is one primary way professionals convert archaeological material context into a relatable systemic context that the public can visualize, bridging a past cultural context and public perceptions about past lifeways (Colwell-Chanthaphonh and Ferguson 2006). Interpretive material should read vague but accurate, general but definitive, and in coherent language. It can also include examples of indigenous quotes and views about the spiritual aspects about a sacred landscape and explain some tribal linguistic terminology for architecture, artifacts, or nature (Stephens 1995). Instead of using alienating professional terms that ‘mystify’ archaeological contexts, interpretation should blend multiple cultural experiences of the landscape with what the public can see in front of them in the present (Colwell-Chanthaphonh and Ferguson 2006:40). Responsible interpretation also entails not sharing sensitive indigenous information with the public if a collaborative group asks that certain knowledge maintain confidentiality. Native perspectives, politics, and identification terminology differ between tribal groups, even if they are from adjacent regions and ancestrally claim the overlapping areas (Van Dyke 2020:10). Interpretive information can include emic explanations and stories about metaphysical features of the landscape and describe spiritual indigenous worldviews that define an archaeological

monument by more than just temporal linear descriptions (Colwell-Chanthaphonh and Ferguson 2006; Basso 1996). Many types of cross-cultural, professional, and local conversations are required before interpretive materials should be finalized for the public scope. It is the responsibility of local archaeologists to ensure cultural information is presented in a sensitive way and that the public are not misinterpreting (Colwell-Chanthaphonh and Ferguson 2006; Stephens 1995). Reviewing comment cards and online public reviews for a heritage venue are helpful to discover whether the public leave their experience with an accurate and sensitive understanding of the interpretive material.

Post-Processual Approaches to Public Archaeology

Any separation of an archaeological artifact or monument from the cultural anthropology encompassing it alienates the public from the most important aspect of past lifeways, a picture of how people lived, not only what they made (Gürsu 2019). If tourists are only engaging with structures and objects without cultural context, it detaches present society from past, promotes negative tones associated with terms like ‘ruins’ and ‘abandonment,’ and further divides present cultural groups from others (Gürsu 2019; Colwell-Chanthaphonh and Ferguson 2006). If visitors learn the ways in which indigenous groups continue to use and glean meaning from these sites today, perhaps they will experience archaeology through a more holistic multifaceted lens, rather than typical Western linear worldviews or stereotypes (Colwell-Chanthaphonh and Ferguson 2006). Cultural heritage is just as concerned with the present and the future as with the past, and heritage venues have the potential to unite diverse cultural groups under historical commonalities rather than foster negative identity politics in divisive ways (Holtorf 2020). Therefore, comprehensible, somewhat relatable interpretation is necessary to provide the best multifaceted context that the public can identify with beyond simply learning interesting facts.

Scholars Nick Merriman, Cornelius J. Holtorf, and Frank P. McManamon developed several approaches to address the most effective way to engage the public with anthropological context in heritage management venues (Merriman 2004; Holtorf 2007). Recently, Akira Matsuda (2019) organized and summarized these debated complex models into four easily defined categories. The *educational model* uses logical devices similar to academic settings where it provides detailed explanation about methodologies to help people retain facts about an archaeological context, promoting the importance of conservation (Matsuda 2019; Merriman 2004). Alternatively, a *public relations* approach focuses on modern populace support for branded archaeology that utilizes sensationalized interests that already exist in a community's cultural identity, or popular culture's imagination of the past to emphasize relational connections (Matsuda 2019; Holtorf 2007). The *pluralist approach* emphasizes that different types of interactive engagement and transmedia can help the public see multiple meanings within archaeological contexts. Lastly, the *critical approach* focuses on the socio-political circumstances that shaped the past between dominant and subjugated groups at various points in history, educating people about anti-colonial and anti-neoliberal causes through a lens of the past (Matsuda 2019). Despite which approach dominates a respective heritage venue, a professional manager should understand aspects of all four foci when demonstrating public benefits of the site to justify its conservation, research value, and potential economic value (Gürsu 2019; Matsuda 2019). Landing on any one or more particular approaches in a heritage venue will likely be decided by collaborative opinion and the nature of a specific location's social agendas, economic climate, and tourism levels. The success of a public heritage venue is fueled by both collaboration between members of a region, local financial tourism, and the desires of the public. Archaeology must reciprocally participate with popular culture to stay relevant and should avoid

misunderstanding its audience (Holtorf 2007; Merriman 2004; Richardson 2013). This makes tourists valuable stakeholders in the development of public archaeology (discussed more below).

Collaboration

Collaboration among archaeologists, agencies, interpretive specialists, educators, public local communities, indigenous professionals, and indigenous communities became a popular promotion in the 1990s that continues to launch discussion, especially in North America where many diverse indigenous groups make overlapping claim on lands, natural resources, and archaeological resources. Diverse multivocality is extremely relevant to interpretation so that emic representative voices are shaping the presentation of past lifeways more than potential etic romanticization of the past (Colwell 2017; Van Dyke 2009). Inclusive multivocality is a type of theory that equally recognizes opinions from all participating groups through open discussion and input about heritage portrayal and representation, combining ethnographic information with archaeological data, where active listening and self-reflexivity are primary methodologies (Colwell 2017; Jeppson 2011; Van Dyke 2009). Practical applications of productive collaboration require compromise between all the different interests of participating parties for example, it may result in using less intrusive, destructive recording techniques like ground-penetrating radar instead of total site excavation. This is one of many ways in which archaeology can respect the wishes of indigenous collaborators who do not want to see spiritually living places disturbed, in the name of developmental ‘progress’ or science (Van Dyke 2009; Van Dyke 2020).

This readdresses the concept that archaeological sites have a present-day role in modern cultural contexts, echoing significances of the past. The systemic context of American Southwest archaeology includes modern descendent tribal communities that still claim and interact with

these archaeological sites and sacred landscapes today. Many indigenous families revisit these spirit-imbued places in a traditional sense, as their ancestors valued these places through time immemorial, but also as a new changed generation, affected by colonialism (Colwell-Chanthaphonh and Ferguson 2006; Hauser et al. 2018; Thompson 2011). Alternatively, a common Western view of archaeology is that remnants and ruins of once thriving places informs an understanding of a certain period in the past. Interpreters must intentionally explain this misconception. Collaborative transmedia such as recorded interviews of indigenous people discussing their experience surrounding a place can reveal a more cyclical understanding of landscape versus decomposing structures (Hauser et al. 2018; Thompson 2011; Van Dyke 2020; Hays-Gilpin 2021). Simultaneously, this technique is more meaningful coming directly from an indigenous perspective than through interpreted media when possible (Van Dyke 2020).

Collaborative approaches entail their own extensive debates regarding how to participate efficiently and where power struggles begin and end within compromises between agendas, neoliberal politics, sensitivity, research goals, ethical benefits, risks, and public interests of all kinds (Jeppson 2011; Stephens 1995; Van Dyke 2020; Hays-Gilpin 2021). Certain topics such as colonial interruptions within a timeline should be portrayed with negative tones, and care must be exercised not to glorify or romanticize historic concepts, or unconsciously use controversial terms (Stephens 1995). Problems surrounding these and other topics can usually be solved in some form by demonstrating collaborative efforts and due diligence toward discussion and mutual respect between diverse interests (Hays-Gilpin 2021; Van Dyke 2020). Collaboration also includes response to feedback to and discussions with the local community, who learn from the transmedia or participate with heritage through volunteer work. Many in a community identify with local heritage and historical pride, even if their ancestry does not directly connect to the past

people responsible for the remaining material culture (Court and Thompson 2019). This is where local news, visitor comment cards, donor suggestions, online reviews, and social media fosters discussion surrounding what the public want or expect when experiencing these heritage venues. Chapter Five of this study presents a deeper case study where online public reviews are searched by key terms for holistic understanding of responses individuals and families glean from their visit.

Tourism

Tourism plays an inherent role in public heritage, because in most places throughout the world, heritage sites provide an important revenue stream directly connected to multiple economic branches of a community including vendor marketing (merchandise), employment and volunteer opportunities, the hotel and accommodations industry, recreational business, and the academic arena (Burtenshaw 2019; Court and Thompson 2019; Watkins and Beaver 2008). In many tourist destinations, archaeological monumental architecture is one of the main reasons why tourists choose to visit. This circumstance ties archaeology to commoditization, holding public archaeologists and heritage managers responsible for appropriate budgeting and pricing decisions and prioritizing public safety and satisfaction (Jameson 2008). Unfortunately, archaeology and economics are very different fields of study, which is why balanced collaboration between specialists and heritage managers is vital in archaeological tourist destinations (Burtenshaw 2019; Court and Thompson 2019; Watkins and Beaver 2008). Aspects of research may be sacrificed at times for the benefit of the public, to fund the conservation of a site or an entire park. Preservation is often prioritized above excavation and discovery of new archaeological data, and the goals of public archaeology transition from scientific data recovery to beneficial public relations and education (Jameson 2008; Meskell 2019). The ideal balance

benefits researchers, managers, a conserved environment, as well as peripheral locals, descendant communities, and the tourists traveling to experience these places (Jameson 2008; Court and Thompson 2019).

Most tourists do not simply travel to monumental heritage sites for a quick view and a photograph. People are attracted to these structural sites, representative of past lifeways and cultural significance, to learn and experience these places in awe-inspiring, multisensory ways. Southwest heritage expert Ruth VanDyke explains that “monumental architecture is both inscriptive and incorporative. Monuments may be meant to symbolize ideas, evoke associations, or elicit emotion. And, monuments are experienced through the body – they are seen, heard, and otherwise sensed” (2009:223). Digital transmedia cannot replace this empirical multisensory experience of visiting a monument in person. If heritage managers can convey ways in which landscape and monuments carry meaning to past builders and modern cultural descendant groups, then tourists can include that multivocal narrative into their own empirical encounter of the site (Watkins and Beaver 2008; Van Dyke 2009). Cultural knowledge is controlled in different ways depending on location, but in the American Southwest, indigenous populations interact with tourists often through crafted merchandise and some heritage sites, though there is room for improvement in increased indigenous participation with tourists in museums and parks environments (Watkins and Beaver 2008; Van Dyke 2020; Hays-Gilpin 2021). Indigenous groups are entitled to benefit in multiple fiscal ways from the financial revenue that tourism generates via their ancestral monuments and lands. Discussions concerning indigenous rights to tourism revenue are on-going in the geo-political sphere of local heritage management groups and agencies in North America and go beyond the scope of this project. However, there is continued room for improved activism toward inclusivity causes that supersede collaboration and

promote interdisciplinary training in heritage management among marginalized populations and descendent communities (Jameson 2008; Hays-Gilpin 2021).

The National Park Service

The National Park Service (NPS) was established by President Woodrow Wilson as a federal agency under the Department of the Interior as a response to the Organic Act of 1916 “[t]o promote, regulate, conserve, preserve, and certify public enjoyment” (Stine and Stine 2014:1; Quick History of the NPS 2022). The Antiquities Act of 1906 drove the conservation of cultural resources and archaeological monuments added to the NPS, which included 35 national parks and monuments previously established by 1916, including Yellowstone National Park, which was the first U.S. park officially recognized in 1873 (Quick History of the NPS 2022; Stoutamire 2016). The pueblo structures of the American Southwest motivated policy to deter looting, vandalism, and neglect across the Parks system by requiring permits for scientific research and collection only (Douglas 2021; Stine and Stine 2014; Lister 1983). The Historic Sites Act of 1935 and the National Historic Sites Act of 1966 expanded NPS regulation to national landmarks and promoted consultation with states, tribes, and preservation specialists. In 1990, the Native American Graves Protection and Repatriation Act (NAGPRA) allowed North American tribes to repatriate all sacred artifacts and human remains recovered from federal public lands (Stine and Stine 2014). NAGPRA forces archaeologists to engage in more collaboration, reflexivity, and discussion about best practices in federal archaeology, and there is no hermeneutical gray area in the policy to dissect or misinterpret (Lekson 2017; Watt 2001). Today, there are over 400 national parks and monuments scattered across all American states and territories that specifically “partner in community revitalization” through cultural history and recreation (Quick History of the NPS 2022:1).

Because the NPS is a governing entity, there are varied enforcement power struggles between federal government and sovereign tribal governments. The agency plays a mediation role between indigenous understandings of sacred landscapes and the recreating, non-indigenous public (Douglas 2021; Watt 2001). This has required NPS personnel to elevate their explanations about a cultural sacred scape from a Western dichotomized or romanticized perspective to describing human/nature coexisting balance as a result of local Indigenous input (Fowler 2000; Watt 2001). Most of the visiting public does not fully grasp the cultural significance of a place and destruction, graffiti, and other forms of vandalism are typically performed in ignorance, considered victimless or un-enforceable crimes (Douglas 2021). Because the Park Service has its own law enforcement capabilities (Park Rangers), there is also conflict between the agency and law breakers or vandals. Interpretive NPS staff are responsible for conveying truths about cultural ritual, rock art symbolism, the meaning of sacred landscapes to current descendants, as well as violent and colonial scars left in these places to help the visiting public be aware of value that should not be diminished with vandalism (Douglas 2021; Stoutamire 2016).

Local museums function hand-in-hand with monumental heritage sites as supplemental, holistic educational venues that provide information about an area from the perspective of several different sciences including plant and wildlife biology, geology, paleontology, archaeology, history, and ethnographic studies (Kidd 2017; Means 2015). Visitor Centers within NPS are typically located at or near the monument they represent and are usually much smaller than the average museum, so interpretive staff must be selective about which educational information is presented within Visitor Center displays versus interpretive trail signage (Stine and Stine 2014; Stoutamire 2016; Stephens 1995). Both museums and visitor centers contain a diverse range of transmedia, such as physical diorama models, digital models, curated artifact

displays, artistic reconstructions, video presentations, touch and texture displays, diagrams and charts, multi-colored timelines, and more to engage the visiting public with learning material (Kidd 2017). Most visitors experience parks at their own independent pace, skimming or reading whichever interpretive material they choose to linger by. Interactive ranger-led park tours provide more control over information and answers to visitor questions, but these interactions can be rare depending on the ratio of interpretive staff to frequently large flows of tourists (Stephens 1995). The nature of the COVID-19 pandemic, with an emphasis on social distancing, likely broadened this preference for independent park perusal in the average visitor during 2020 and 2021, as people refrained from gathering in groups. Speed with which these monuments are experienced is also expressed in public online reviews, where visitors mention stopping at one of these smaller monuments for an hour or two, enroute to a larger park like the Grand Canyon. The Museum of Northern Arizona partners with the NPS: Flagstaff National Monuments, which encompasses Wupatki, Sunset Crater, and Walnut Canyon National Monuments, to curate past and current artifact collections recovered from within monument boundaries (Stoutamire 2016). Supplemental educational venues provide extra revenue with souvenir gift shops, but more importantly, they seek to fill any disconnect between public unawareness and the value and significance of these places through glimpses of past lifeways within a large span of cultural history (Kidd 2017; Means 2015).

Chapter 3. Digital Archaeology Internships

Online platforms changed in the 2010s from the static websites of the 1990s to more socially participatory, community-building arenas for exponentially increased human interaction (Richardson 2013). They have also changed the fundamental sphere of human communication through a digital interface. Digital/virtual laboratories are now commonplace among academic and contractual institutions (Richardson 2013; Means 2015). Collaboration is more convenient for those with easy online access through conferencing platforms, and web infrastructure is prevalently available in most urban centers, globally. Virtual curation, or 3D models of individual artifacts, enables collections analysis to be done on the other side of the world without shipping a single piece of the collection or flying to it (Richardson 2013; Means 2015). Today, millions of people create online content using only a smartphone. One of the most problematic issues with exponentially multivocal trends of a social media era within the digital age, is assessing the quality and validity of online content and gaging the expertise of the creator. As a different form of communication digital archaeology requires different production methodologies but similar theoretical approaches as physical interpretive material.

The field of archaeology currently uses many technological tools to achieve data collection and curation results, and several forms of digital platforms for archaeological data-sharing and transmedia display. Government, private, and academic archaeology projects largely depend on technological data-collection methodologies that include iPads, smartphones, high quality GPS receivers, high quality cameras, D-stretch photography, and aerial drones. Other types of more expensive field data-collection equipment include ground penetrating radar, LiDAR scanners, aquatic sonar devices, as well as laboratory equipment used for various dating and micro particle identification techniques, complex databases, and numerous other software

programs used for data analysis, management, and explanation (Bezzi et al. 2018; Magnani et al. 2019). This project is focused primarily on examples of data-sharing techniques and 3D web visualization within public archaeology. Data-sharing tools currently give archaeology a broader reach than ever before with machine-learning software, conference call platforms, video-recording presentation, social media followings, podcasts, webinars, and more. Archaeological display through 3D web visualization, using morphometrics like photogrammetry and reflectance transformation imaging, is more photorealistic and dynamic than previously illustrated artistic sketches and are used for virtual tours, virtual-reality displays, and presentations for colleagues, clients, and the wider interested public (Bezzi et al. 2018; Magnani et al. 2019). Photogrammetry is not limited to visual display only, but it also contributes to archaeological inference and interpretation through multi-angled contextual photo perspective and landscape analysis, which archaeologists can study for much longer periods on an office computer than out in the wilderness (Bezzi et al. 2018; Magnani et al. 2019).

Digital visuals are a form of illustration that can extend two-dimensional (2D) reconstructions to realistic three-dimensional (3D) representations, requiring theoretical discussions about the interpretive content presented in an archaeological image, as well as rendering methodology (Moser 2012; Magnani et al. 2019). There is a place for both reconstructed artistry or illustration and 3D, photorealistic graphic communication in educational venues, but it is commonly misconceived that digital representations are purely objective (Jameson 2008; Moser 2012). They entail innate inference reflected in the professional recordation process, contextual interpretations, public presentation style, and the viewpoints of the non-professional audience engaging with the transmedia (Moser 2012; Pujol-Tost 2017). Are educationally presented images inadvertently promoting any inaccurate stereotypes to the public

about ancient culture? Phenomenological approaches about perspective, presentation, and audience comprehension require highly participatory collaboration between experts and stakeholders for illustrative interpretation (Pujol-Tost 2017). Continued research is still required on the effects of virtual reality representations on public perceptions of the past, as it is still a fairly new methodology. Most recent virtual recreations of ancient sites include methods that consider and discuss several important virtual presentation options such as navigation technique through a model, view perspective from average eye-level versus birds-eye view, storyboard imagery, and the use of dynamic animations such as people and animals in addition to reconstructed artifacts and structures (Pujol-Tost 2017). This level of digital transmedia would appeal to large audiences, especially wired populations confined to their homes for safety in the midst of a global health crises.

During the height of the COVID-19 pandemic, many transitioned to work and schooling from home options for safety concerns and social distancing recommendations by the CDC. Suddenly, large amounts of technology were required for daily life and business function. According to some of my internship observations, the field of archaeology felt this transition as well, and used diverse forms of digital technology to continue functional heritage management through difficult pandemic conditions. Many museums had to close for up to two years, but some updated their websites with virtual tours and photo galleries of certain exhibits. Even when this meant providing free web-based images to the public without the benefit of admissions charges, institutional motivations to stay relevant added supplemental online content, regardless. The Elden Pueblo Project, managed as a federal public site temporarily ceased school field trips, student workshops, and public days during the summer season of 2020 but increased use of digital platforms during the off-season of 2020-2021 as a response to COVID restrictions. Alt

Alternatively, the Walnut Canyon Virtual Model Project was in pre-field planning stages just before the pandemic impacted the U.S. The project was delayed but considered even more important as digital content increased in necessity during this time. Digital archaeology's trajectory was rapidly investigating applications for various technologies to increase efficiency and innovation in the field, but the pandemic conditions necessitated technological use in several every-day scenarios just to maintain safe normalcy in unique conditions. In my own experience, 2020 forced me to transition to remote, online work and graduate schooling. I used delivery services to bring restaurant orders to my home instead of sitting down to eat in restaurants that remained closed for much of the year. All of the entertainment in my life came through online platforms for almost two years due to the closure of theaters, concerts, clubs, community events, or other organized social venues. Instead of using libraries or in-person study groups, all of my initial academic research for courses and this thesis project was conducted online. Discussions with my peers revealed similar experiences of heightened digital reliance during uncertain pandemic conditions. My internships during 2021 provide two examples of how digital reliance applies to public archaeology.

Elden Pueblo

In the Spring of 2021, I interned for the Elden Pueblo Program, a public educational pueblo site, located in east Flagstaff, AZ, maintained by the Coconino National Forest (CNF) and supported by the Arizona National History Association (ANHA). Under normal circumstances, the program hosts educational field trips from elementary and middle schools throughout Arizona during the school year and hosts scout training camps, tours, and public heritage days during the summer months (CNF and ANHA 2022). Unfortunately, the COVID-19 global health crises and pandemic brought normal programming to a halt in the spring of 2020,

and continued through much of 2021, forcing most schools to shift to online learning, and extracurricular learning venues, like Elden Pueblo, to get creative. A few digital platforms were developed for the program and the site before the pandemic, but several more platforms were required during 2020 and 2021 to maintain public engagement amid program cancellations due to COVID-19 safety concerns. Despite time-consuming difficulties, it was a pleasure to be a part of the Elden Pueblo Program's implementation of digital education and exposure during this tumultuous time, and I continued volunteering briefly with the program as it returned closer to normalcy through in-person, socially distanced summer 2021 programming.

Elden Pueblo is a large multi-story, multi-structure pueblo complex that boasts over 60 rooms, a community room, two rectangular kivas, a large plaza, adjacent pithouses, and an agricultural area within an ephemeral drainage where irrigation was controlled with check dams. The site represents the ancient Sinagua cultural tradition of the northern Southwest, and the construction and occupation of this pueblo from 1100 – 1275 CE delineates the Elden Phase in Sinagua chronology (CNF and ANHA 2022). Senior archaeologist for the CNF Peter Pilles emphasizes Hopi ancestral connections to Elden in the interpretive information, educational curriculum, and tours he oversees. This is partially because Jesse W. Fewkes, who conducted extensive ethnographic study with the Hopi, was also the first official archaeological excavator at Elden Pueblo in the 1920s (Bernardini and Adams 2017). Today, members of the Hopi Tribe participate with Elden Pueblo more than other local tribes, visiting the site for prayer vigils and leaving offerings in the pueblo niches. After discussions with other local colleagues, my only critique of the program material would be to update it with more diverse multivocal narratives about what this place means to additional local tribes (Leksens 2017; Van Dyke 2020). CNF maintains archaeological summaries and some Hopi ethnographic contributions on their website,

and even before the pandemic, the site (open 24 hours/7 days per week) has offered a self-guided interpretive tour via a QR scan code on the site's only physical interpretive sign, and numbered plaques around the pueblo that correspond to the tour information available on any smart device with web data-access. This tactic eliminated tour paper usage and the littering of the site with previous interpretive pamphlets.

During my internship, I assisted in filming puppet show videos that were inserted into an hour-long Elden Pueblo PowerPoint presentation, provided online to schools via conference call applications such as Zoom (Deem 2021). While the presentation included photos and drawings, the imbedded videos showing puppets interacting with the past lifeways of the ancient pueblo kept younger students more engaged. Additionally, with oversight from Peter Pilles and Lisa Deem (the program coordinator), I drafted a documentary-style script and presented it in front of the camera with a videographer from Arizona State Parks. The 15-minute video presentation, titled "Arizona Project Archaeology - Elden Pueblo Archaeological Site", contributes to a teachers' video training curriculum series from non-profit organization, Project Archaeology (Lloyd and Deem 2021; Project Archaeology 2021). This series won the Governor's Award in Education for Historic Preservation in 2021. This short educational video section about Elden Pueblo within the series is available to the public via YouTube.com. The above exemplified digital applications allowed the Elden Pueblo educational program to stay relevant and easily accessible through the COVID-19 pandemic and beyond. These problem-solving applications were essential during an uncertain time in our world's history, and this learning experience was a personal privilege. I continue to enjoy presenting in-person tours of local sites and hosted Northern Arizona University (NAU) graduate colleagues in a tour of Elden Pueblo in March of 2022. In a hindsight comparison, I can confidently say that hosting in-person tours and seeing

people interact with sites like Elden Pueblo is an irreplaceable aspect of public archaeology and much more enjoyable than online teaching or speaking to a camera.

The American Southwest Virtual Museum

The American Southwest Virtual Museum is a web-based platform that houses a large repository of virtual, digital displays and archaeological supplemental information for parks and monuments throughout the American Southwest (American Southwest Virtual Museum 2021). The website is the result of a partnership between Northern Arizona University, the Museum of Northern Arizona, and the National Parks Service that includes photo galleries, exhibits information, virtual tours, ceramic pottery guides, an interactive map, videos, and interpretive information about Southwest archaeology. Many collaborative student projects and collections research are available here for the public to interact with and learn from a multitude of linked online resources. Web-based resources for all four national monuments presented in this research study are available on the American Southwest Virtual Museum website for supplemental information to inform visitors before, after, or even in place of an in-person visit. While physical in-person experience of these places is preferred, many archaeological monuments are not always easily accessible or provide Americans with Disabilities Act (ADA) policy access due to the nature of rugged Arizona terrain. Therefore, any limitations to experiencing an Arizona archaeological monument in person, can be overcome to some extent with online photographs, 3D digital models, virtual tours, and online interpretive information (American Southwest Virtual Museum 2021). Website administrators intend to link the Walnut Canyon Nine Room Virtual Model to the Southwest Virtual Museum website for wider public availability.

The Walnut Canyon Nine Room Virtual Model

As part of a participatory internship with NPS: Flagstaff National Monuments, I assisted consultant Dr. Leszek Pawlowicz and NPS staff with a 3D photogrammetry model of a nine-room cliff dwelling site along the Island Trail of Walnut Canyon National Monument. During the summer and fall of 2021, Dr. Pawlowicz and myself, with NPS staff, planned and performed the field portion of photograph collection for the Nine Room Virtual Project. Over the course of several field visits, we used two Canon EOS 6D DSLR (Digital Single-Lens Reflex) cameras to intensely photograph cliff dwelling site WACA162 (NA739), which consists of nine excavated rooms and one unexcavated alcove. Visitors can access this site along the Island Trail in the canyon. Since monument visitors walked along the trail as we took photographs, I authored a visitor info pamphlet for the public to read when stopped near our project site for crowd-control purposes. While NPS staff fielded many questions about what we doing there, the pamphlet briefly explained what a photogrammetry model is and our purpose in creating one for site WACA162 (Appendix B). Safety concerns included COVID-19, addressed with masking and social distancing precautions, and Hantavirus, addressed with masking and limited time duration inside fully-enclosed rooms, which are closed off to the public. Though this site is available to the public via a paved trail, the canyon wall steeply declines just off-trail. Wide-angle photographs of the overhang facade required camera operation as far from the cliff overhang as safely possible, so with assistance from Park Ranger Cullen Kirk, a safety harness system was implemented on top of the site overhang to keep Dr. Pawlowicz safely on the sloped canyon edge while he positioned a camera on an extension pole at five different height levels, while I viewed and snapped the photographs from an iPad connected to the camera via Bluetooth.

We reviewed and edited approximately 5,000 overlapping photographs of the inside and outside of the cliff dwelling using Adobe Bridge to then produce a 3D photogrammetric model using Agisoft Metashape software. The finished Nine Room model is available to the public online via Sketchfab.com (Pawlowicz 2022) (Appendix C, Figures 7-11). Additionally, Dr. Pawlowicz and I worked with NPS collections curator Gwenn Gallenstein with the Museum of Northern Arizona in December 2021 to add artifact models to the project. Using a Powershot S110 digital camera, mini tripods, a turning platform, and the pre-set artifact photography station at the museum, we took over fourteen hundred multi-angle photographs of ten artifacts, including groundstone tools, ceramic bowls, and jars for additional photogrammetric models of each individual artifact (Appendix C, Figures 12-17). These artifact collections samples are from Wupatki National Monument but are representative of similar Sinagua cultural material discovered at Walnut Canyon and the greater Flagstaff area. All project archive material and photographs are stored on multiple hard drives at the NAU Digital Archaeology Laboratory in the Bilby Research Center. All project models will provide supplemental digital content for NPS: Flagstaff National Monuments to use as they see fit for public engagement and will be linked to the Southwest Virtual Museum.

The Nine Room Virtual Model project is currently a digital representation of the monument as seen today, though I did research archaeological interpretive contexts to envision a possible reconstructive image of the Walnut Canyon cliff dwellings with future potential of making a virtual reality reconstruction. In its current state, the Nine Room Virtual Model allows the public to digitally view and interact with an accurate representation of a cliff dwelling structure (derived directly from photographs), without potentially biased interpretation from the model creators influencing the public experience (Means 2015). While several surrounding tribes

were informed about the project during planning, none had the time or resources to collaborate on it at the time. If the project develops further into a virtual reconstruction of an interpreted past lifeway illustration, with people and perishable cultural material included in the display, I recommend substantial implementation of ethnographic collaboration and expertise from local indigenous archaeologists. Because fully enclosed rooms at this site are closed to public access, this model allows one to digitally look around the room and out the entrance to the viewscape of the canyon from inside these rooms, which visitors cannot experience in person. It also allows people who cannot access the site via its long, steep staircase and lack of ADA access to digitally interact with close-up views of the structure (Appendix C).

Chapter 4. Statistical Research on Pandemic Effects

Were members of the public consistently visiting archaeological monuments in Arizona during the most restrictive months of the COVID-19 pandemic in 2020 and 2021? This chapter presents analysis and insight from a quantitative statistical study on the significance and effect size of visitation patterns at four NPS national monument locations in northern-central Arizona from 2017 to 2021, assessing the significance of potential change before and after the initiation of COVID-19 pandemic lockdown restrictions at Wupatki National Monument, Walnut Canyon National Monument, Montezuma Castle National Monument, and Tuzigoot National Monument (Appendix A). The analysis supports suggestions in similar studies about COVID pandemic years that outdoor recreational venues did not suffer as much as indoor venues in the United States between 2020 and 2022, because outside is considered safer within the context of airborne virus risk. This study reflects that while a decrease in visitor numbers did apply during 2020, a substantial increase of visitors to these monuments in 2021 affected the statistical outcome of comparison across the five-year study period. Due to the computational software use in this analysis, it also falls under the digital subfield of computational public archaeology, analyzing the number of people visiting these archaeological educational public venues.

The COVID-19 pandemic disrupted individual lives as well as societal norms in 2020, and today in 2023, the world is still recovering from effects while continuing to deal with mutating variants and subvariants of the COVID-19 virus. Problem solving techniques resulted in closures of certain spaces, social distancing measures and masking requirements (Volenc et al. 2021). Outdoor recreational spaces such as national and state parks, however, provided less restricted venues. Many outdoor trails and monuments in the United States remained open to the public after initial pandemic lockdowns in April 2020 (Douglas 2021). Several recent studies are

researching visitation patterns from localized outdoor recreational areas to understand how visitation patterns at these venues were impacted during initial pandemic lockdowns and continuing safety concerns through 2020 to 2022 (Volenec et al. 2021; Douglas 2021). The National Park Service (NPS) has collected visitation data for over one hundred years through various processes and currently uses multiplying equations to estimate monthly totals of recreational visitors for each location (Ziesler and Pettebone 2018).

The analysis compares data grouped by location and seasonal delineation from monthly visitation totals across five years (2017 through 2021) and uses independent samples *t*-tests and one-way analysis of variance tests to analyze visitation patterns before and after pandemic lockdown events began in April 2020. The data set sample consists of visitation totals for the following four Arizona national monuments: Wupatki National Monument, Walnut Canyon National Monument, Montezuma Castle National Monument, and Tuzigoot National Monument. All data are available at public-access NPS website, <https://irma.nps.gov/STATS/Reports/Park/>. My sampling of these four parks narrows the study, geographically, to northern central Arizona to explore public interaction with NPS archaeological monuments. The four sampled locations were chosen because they all represent prehistoric Southwest Puebloan dwellings constructed and occupied by groups of the Sinagua people between 800 BC and 1400 AD (2800 – 600 c. BP) (Downum ed., 2012). They are also a robust representation of educational and recreational NPS venues in Arizona.

The NPS has tracked park visitation rates since 1904 because these data influence management programs, facility designs, staffing needs, transportation models, crowd-control strategies, scientific research, and monetary visitor spending effects (Ziesler and Pettebone 2018). There is a very strong relationship between understanding visitation rates and successful

NPS achievement of agency goals and compliance with the Organic Act of 1916, which outlines the conservational land priorities that must be upheld by federal agencies “for the enjoyment of future generations” (Ziesler and Pettebone 2018:52). Most parks generally adhere to a standardized, eleven-phase methodological protocol to measure public visitation rates with accuracy and validity (Snider et al. 2018). This management plan includes the development of a weekly visitation curve via access locations, modes of access, passengers, rates according to each day of the week, and seasonal variation (Snider et al. 2018; Ziesler and Pettebone 2018). After a weekly regression model is developed, it is verified with a two-week census, and the estimations are multiplied with a regression equation that provides monthly totals (Wupatki National Monument 1993; Snider et al. 2018).

Objective and Hypothesis

My primary objective of this quantitative study is to compare the means of visitation totals across all four locations to determine any significant difference in visitation totals before and after pandemic procedural changes in April 2020. A societal predisposition in much of the United States toward outdoor recreation is one cause of recent general increases in national park visitation during the twenty-first century (Volenec et al. 2021; Douglas 2021). Due to this recreational predisposition, I hypothesize for this study that there is no significant difference between visitation means pre (January 2017 to March 2020) and post (April 2020 to October 2021) implementation of COVID-19 restrictions. Despite these restrictions, I believe some inference from this study can confirm that much of the American population embraced the opportunity to recreate at local parks during pandemic lockdowns and ongoing pandemic restrictions, while indoor venues and international travel were no longer safe (Abbas et al. 2021; Douglas 2021; Volenec et al. 2021). This study does not include any medical statistics about the

airborne SARS-CoV-2 virus itself, but rather impacts of restrictive pandemic procedures on visitation rates at specific locations. The testable hypothesis of this study states that 2021 increases in park visitation may have compensated for park deficits in 2020 that resulted from a lack of high tourism volume during the initial period of the COVID-19 pandemic (Volenec et al. 2021). If true, this hypothesis renders the difference in visitation rates between pre and post COVID-19 restrictions implementation nonsignificant. Seasonal tourism patterns, already assumed by NPS as a significant predictor of visitation rates (Snider et al. 2018; Ziesler and Pettebone 2018), will provide a useful comparison litmus test standard for analysis.

The 2020 COVID-19 global outbreak initiated multi-national border lockdowns and heavily impacted global health, economics, and tourism and travel industries (Abbas et al. 2021). Since this significant event, pandemic cause-and-effects research on a global scale is more recently prevalent in social and economic studies (Abbas et al. 2021). The authors of a recent study, “Exploring the Impact of COVID-19 on Tourism: Transformational Potential and Implications for a Sustainable Recovery of the Travel and Leisure Industry,” use various countries world-wide to illustrate devastating financial impacts to tourism-based economies in 2020, that struggled to return to normal rates in 2021 and 2022 (Abbas et al. 2021). Estimates from 2019 indicate that travel and tourism industries have provided significant contributions to the global economy, dating back to steady increases since 2010. According to data from the World Tourism Organization, global tourist travel experienced a 56-60% decrease in most well-traveled regions just between January and May of 2020 (Abbas et al., 2021:4). With little to no improvement in 2021, Abbas et al. (2021) determines that long-term impacts from the COVID-19 pandemic will necessitate creative improvement strategies from tourism management, scientific medical solutions, and government intervention to return the tourism industry to it

former economic glory, before COVID-19. While global tourism was problem-solving such negatively reaching impacts from the pandemic overall, how does this effect specifically show up at a sample of Arizona national monuments? Can American recreational and outdoor education venues operate somewhat normally under these conditions, while the global travel and leisure industry struggles to survive (Abbas et al., 2021)?

Methodology

The NPS visitor counting methods discussed above are simplified within the four Arizona national monument locations of this study, because they are all day-use parks where visitors are accurately counted at contained, limited-access entrance kiosks for this estimation process (STATS - Park Reports 2021). Public-dominion website, <https://irma.nps.gov/STATS/Reports/Park> (2021), provides free public access to these secondary data collected by NPS and searchable by park or monument name, year, and month under the “Monthly Public Use” or “Visitation by Month” links. The website also offers general annual bar graphs (STATS - Park Reports 2021); however, this specific analysis study uses monthly visitation rates, grouped by season (on versus off) and COVID-19 restriction (pre versus post) across five years. This stage of analysis includes both descriptive and inferential statistics for this geographic region of Northern Arizona.

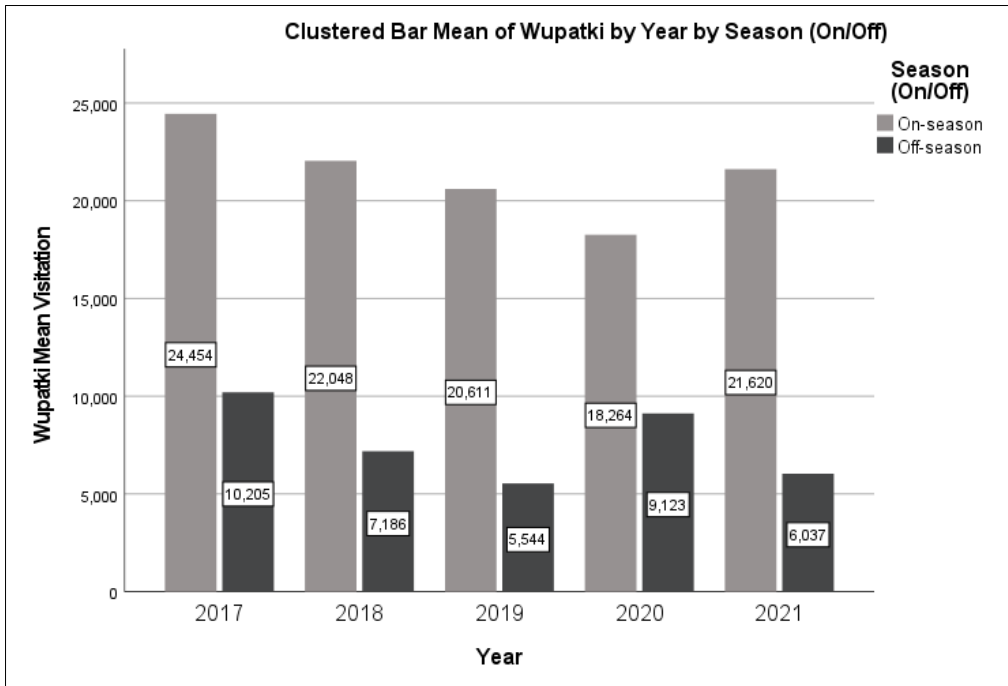
Raw secondary data were collected at the lowest possible unit of analysis from this website for each monument for both recreational visitors and non-recreational personnel that pass through the parks. Non-recreational personnel include vendors, employees, researchers, tribal lands representatives, maintenance and construction personnel, law enforcement or emergency services personnel, and extra-agency personnel such as US Forest Service employees (Ziesler and Pettebone 2018). A recreational visit encompasses everyone entering the park to

experience it recreationally or educationally, including sports recreationists, tourists and vacationers, professional tour companies, and school field trips. A cursory look at the collected data revealed that non-recreational totals at Wupatki and Walnut Canyon National Monuments remain very consistent across years because these smaller monuments contain a standardized rate of nonrecreational personnel who do business in or pass through the parks. Montezuma Castle and Tuzigoot National monuments are localized parks, that do not track non-recreational visits at all (STATS - Park Reports, 2021). Therefore, only monthly recreational totals were analyzed for each park, representing a systematic trend sample of the recreational visitor population to NPS national monuments in Arizona, where the time-period input spanned from January 2017 thru October 2021.

This systematically sampled dataset consists of 58 monthly totals per location and 232 total samples across all four locations (STATS - Park Reports, 2021). These totals were tallied independently within each park because each location has different visitor rates depending on geographical locale, ease of access, and demographic variables, which are not being included in this study (Snider et al. 2018; Ziesler and Pettebone 2018). Separately, a sum column consisting of an “all sites total” was also calculated for broader comparison analysis. Monthly, individual park totals were grouped by seasonal delineation per NPS expectations, where “on-season” consists of open park hours from March thru October and “off-season” consists of park hours between November thru February of the next year. This seasonal delineation off-sets annual totals but is essentially more accurate for park expectations, where typically every park experiences a higher flow of visitor traffic during the on-season months than the off-season months (Wupatki National Monument 1993; Ziesler and Pettebone 2018). This study will analyze and report on this NPS assumption for confirmation within the years sampled.

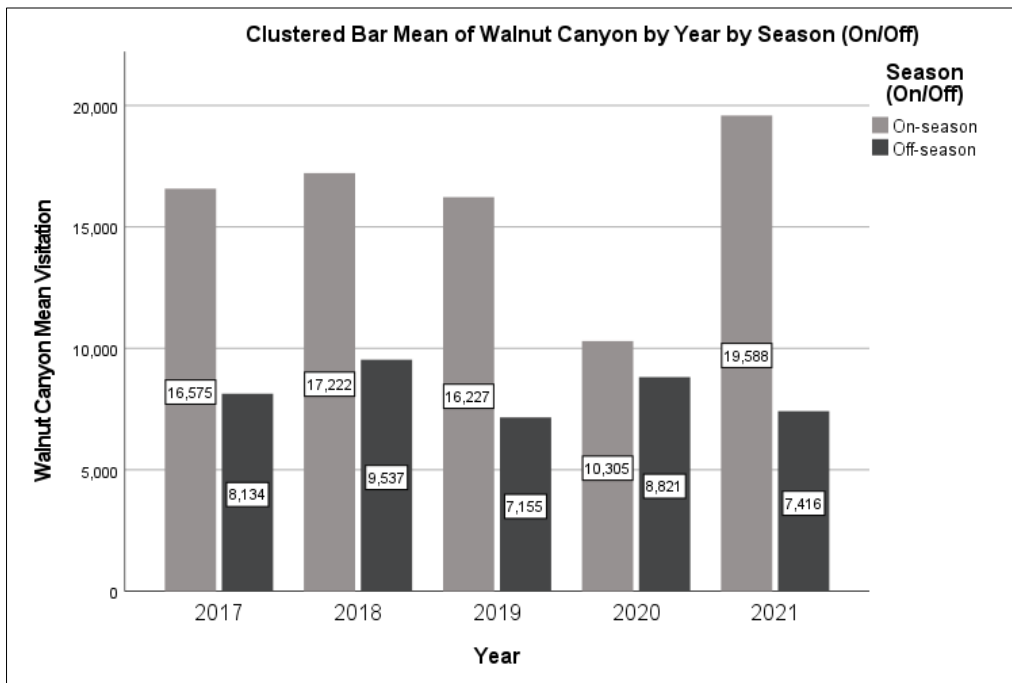
This deductive research design consists of a quantitative, aggregate data, trend analysis using frequencies, probability distribution, and variance. Trend analyses look at variations within informational patterns over a specified period (Gray et al. 2007). This study analyzes visitation rates over a period of five years, approximately three years and three months leading up to pandemic procedural change (in April 2020) and one-and-one-half years after the implementation of COVID-19 restrictions. Analysis of variance tests use the *F*-statistic ratio to test the fit of a linear regression model, testing for overall differences in group means (Field 2017:1681, 1696). Using IBM Statistical Product and Service Solutions (SPSS) software, this analysis uses independent sample *t*-tests and a one-way analysis of variance (ANOVA) test to determine differences between annual rates, seasonal groups, and monthly visitation totals before and after (pre/post) COVID-19 restrictions went into effect. In addition to the annual categorical variable spanning five years (2017, 2018, 2019, 2020, 2021), the sample totals were grouped according to two binary categorical variables: on-season versus off-season, and pre versus post COVID-19 pandemic protocol implementation. All total visitation rates (monthly, seasonally, and across all sites) are continuous outcome variables manipulated in the tests by categorical variables: annual, seasonal, and pre/post COVID-19 procedures (Figures 3-6). Instead of focusing on variation between the locations, this study details seasonal and annual variation within individual locations and across tallied totals.

Figure 3. Visitation Mean Bar Chart for Wupatki (clustered by season)



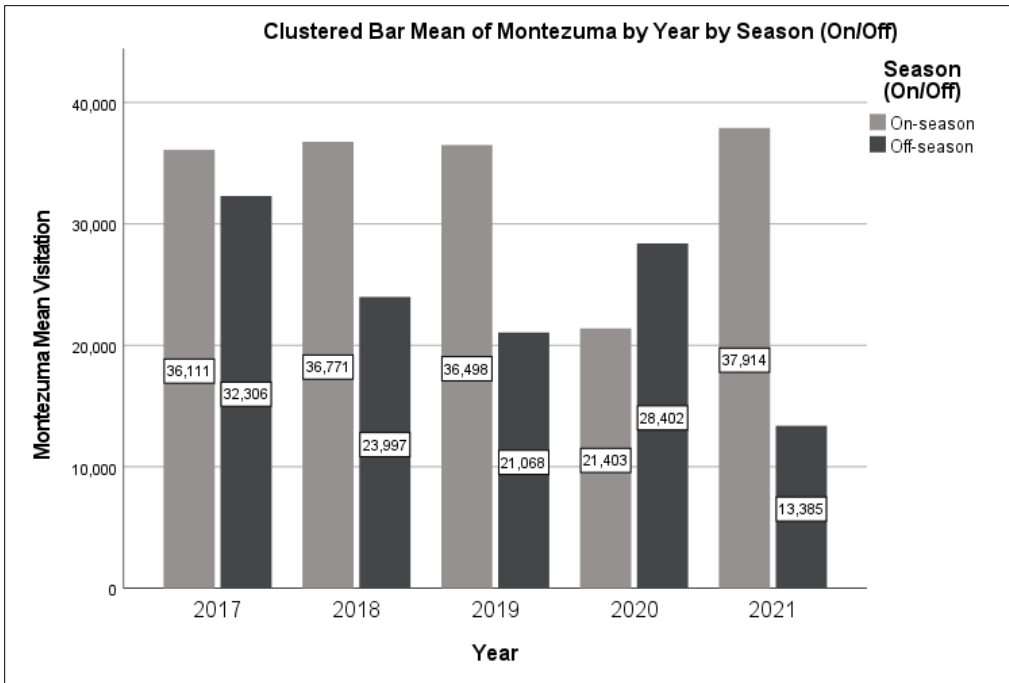
Note: means total for each bar is included by season by the annotation in the center of each bar.

Figure 4. Visitation Mean Bar Chart for Walnut Canyon (clustered by season)



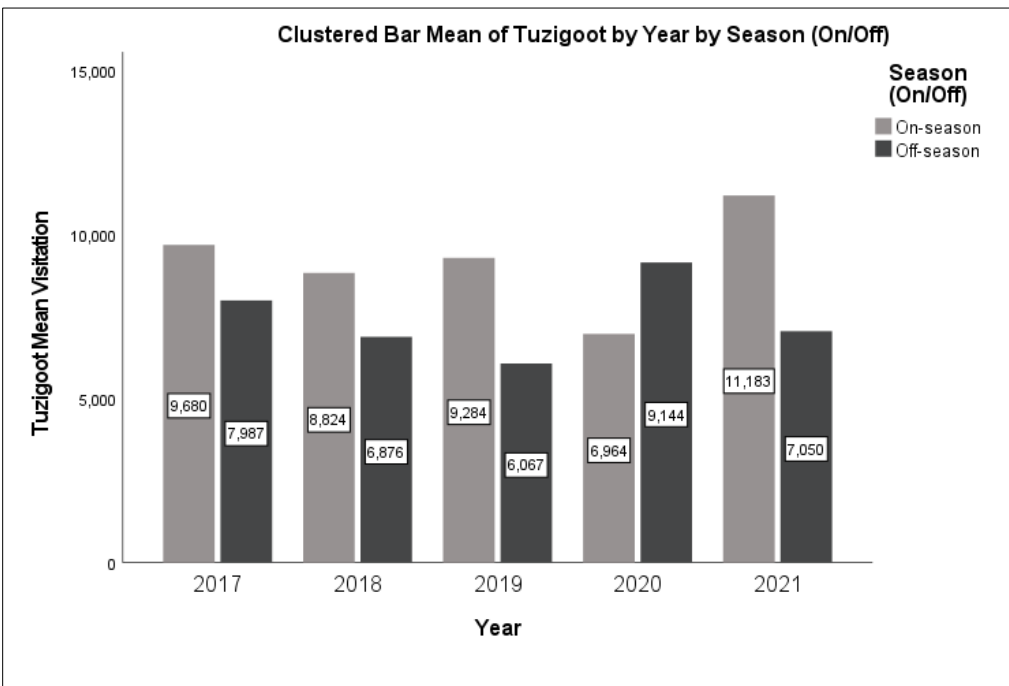
Note: means total for each bar is included by season by the annotation in the center of each bar.

Figure 5. Visitation Mean Bar Chart for Montezuma Castle (clustered by season)



Note: means total for each bar is included by season by the annotation in the center of each bar.

Figure 6. Visitation Mean Bar Chart for Tuzigoot (clustered by season)



Note: means total for each bar is included by season by the annotation in the center of each bar.

Analysis and Results

Descriptive statistics indicate average visitation ranges vary for each individual monument location (Table 1). The annual means of all four locations, grouped by season, are detailed in Figures 1 through 4 (above), with each seasonal means total annotated in the middle of its respective bar. As shown in the bar charts, the larger monuments that are easily accessible from main highways and do not require strenuous hiking (Wupatki and Montezuma Castle National Monuments) maintain generally larger on-season means than Walnut Canyon and the more remote Tuzigoot National Monument. However, off-season means between locations show relatively higher rates, respective to their annual means at Montezuma and Tuzigoot. The lower respective off-season rates at Walnut Canyon and Wupatki may be subject to the harsher, higher-elevation winter weather (Wupatki National Monument 1993).

Table 1 outlines that Wupatki National Monument maintains a monthly mean visitation rate of 17,138 visitors ($SD = 7,765.577$) from a minimum rate of 724 to a 28,645 maximum rate. This 724 minimum total for January of 2019 is the only three-digit total in Wupatki's dataset, not affected by the COVID-19 pandemic, and may be considered an outlier value, though diagnostic tests show it did not skew the data. Walnut Canyon National Monument maintains a monthly mean visitation rate of 13,657 visitors ($SD = 7,765.577$) from a minimum rate of 1,740, during the height of the COVID-19 pandemic closures, to a 26,633 maximum monthly rate. Montezuma Castle National Monument maintains a much higher monthly mean visitation rate of 31,368 visitors ($SD = 11,594.352$) from a minimum rate of 4,383 to a 55,435 maximum rate. Tuzigoot National Monument maintains the lowest monthly mean visitation rate of 8,714 visitors ($SD = 3,001.496$) from a minimum rate of 1,234 to a 15,090 maximum rate. Descriptive statistics

totalled monthly across all four sites yield a mean of 154,577 ($SD = 645,538.569$) from a minimum rate of 1,740 to a 4,982,746 maximum monthly rate (Table 1).

Table 1. Descriptive Statistics of Monthly Rates by Location

Location	Wupatki	Walnut Canyon	Montezuma	Tuzigoot	All Sites Totaled
Sample Size (<i>N</i>)	56	57	56	56	58
Missing Values	2	1	2	2	1
Mean	17138.20	13656.95	31368.29	8713.18	154577.47
Standard Deviation	7765.577	5851.784	11594.352	3001.496	645538.569
Monthly Minimum	724	1740	4384	1234	1740
Monthly Maximum	28645	26633	55435	15090	4982746

This dataset contained 58 monthly samples between 2017 and 2021; however, April and May of 2020 are missing data values due to closures of all park access to visitors during the initial height of COVID-19 pandemic federal lockdown protocols. As a result of these missing values, there are only 56 samples of valid values for Wupatki, Montezuma, and Tuzigoot except for Walnut Canyon, which was open for limited visitation access in May of 2020 (1,740 visitors), using 57 valid monthly samples. This Walnut Canyon exception in May 2020 was also identified as an outlier value in the data set but did not affect parametric assumptions. Missing data were excluded listwise and by case, analysis by analysis within respective SPSS tests (Table 1). Frequencies for total seasonal statistics indicate an on-season total mean across sites of 150,517 (Standard Error [SE] = 17709.370, $SD = 79198.708$) and an off-season total mean of 42,894 ($SE = 7623.619$, $SD = 34093.860$) within 20 samples for each season between 2017 and 2021 with no missing values (Table 2).

Table 2. Descriptive Statistics of Seasonal Totals across all Locations by Season

Season	On-season	Off-season
Sample Size (<i>N</i>)	20	20
Mean	150516.55	42894.35
Standard Error	17709.370	7623.619
Standard Deviation	79198.708	34093.860

The monthly rates dataset met all required parametric assumptions for a normal distribution, independence, and homogeneity of variance. The analysis used a standard 95% confidence interval ($p \leq .05$) for t -tests (Tables 3 and 4). Z-scores were calculated on the skewness and kurtosis values of Wupatki and Walnut Canyon, where outlier data were identified, compared against a ± 1.96 z-score critical value, to confirm that skewness and kurtosis were not overly concerning in the monthly dataset for these locations. Homogeneity of variance was tested using the significance of the Levene's statistic for both independent samples t -tests and the one-way ANOVA test on annual variation (Table 5). Because the one-way ANOVA test included five outcome variables, the significance threshold was lowered, via a Bonferroni correction, to a more conservative $p \leq .01$ value ($.05/5 = .01$) to reduce the familywise error rate. A Bonferroni correction was also applied to the post hoc tests of the one-way ANOVA for more conservative results. Pairwise comparisons described visitation differences across years. Robust tests of equality of means, Welch and Brown-Forsythe were also consulted for more conservative results within the annual significance probability.

The first t -test was a comparative methodology litmus test to confirm NPS's seasonal visitation delineation. It analyzed significance between mean differences for the seasonal grouping predictor variable (on-season versus off-season) on the totaled monthly all sites outcome variable. The significance value for the Levene's Test for Equality of variances is nonsignificant, meeting the assumption for homogeneity of variances ($F = .030, p = .862$). The significance value for the two-tailed independent t -test is significant at $p < .001$, indicating that the means difference between the on-season and off-season groups is statistically significant. On average, on-season visitation rates ($M = 79,712.13, SE = 3,299.29$) were higher across all locations than the off-season visitation rates ($M = 48,554.11, SE = 3,949.855$), $t(55) = -5.608, p$

< .001 (Table 3). The Pearson’s correlation coefficient and the Cohen’s *d* indicate a large effect size ($r > 0.50$, $d > 0.80$), therefore the *t*-test represents a large magnitude of observed effect between season and totaled monthly visitation rates across all locations, $r = 0.60$, $d = 1.51$. These results confirm the significance of the seasonal delineation attributed to certain months by NPS based on visitation tourism rates, which are higher during on-season months than off-season months (Snider et al. 2018; Ziesler and Pettebone 2018).

Table 3. Independent Samples T-test of Seasonal Variable on All Sites Total Visitation Rates

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	<i>t</i>	df	Sig. (<i>p</i>)		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One	Two			Lower	Upper
All Sites Total	Equal variances assumed	0.030	0.862	-5.608	55	<.001	<.001	-31158.017	5555.505	-42291.497	-20024.537

Using the first *t*-test as a solid comparative standard for the seasonal assumptions of visitation made by NPS, the second independent *t*-test analyzes significance of the null hypothesis. This analysis tested mean differences for the COVID-19 restrictions grouping predictor variable (pre-COVID versus post-COVID) on the totaled monthly all sites outcome variable. The significance value for the Levene’s Test for Equality of variances is nonsignificant, meeting the assumption for homogeneity of variances ($F = 1.328$, $p = .254$). The significance value for the two-tailed independent *t*-test is not significant at $p = .559$, indicating that the means difference between the pre and post COVID-19 restriction groups is statistically nonsignificant. On average, pre-COVID means of monthly visitation rates ($M = 71,161.54$, $SE = 3,614.9$) were not significantly higher across all locations than the post-COVID means of visitation rates ($M = 67,080.39$, $SE = 6,590.577$), $t(55) = .588$, $p = .559$ (Table 4). The Pearson’s correlation coefficient and the Cohen’s *d* indicate a very small effect size ($r < 0.10$, $d < 0.20$), therefore the

t-test represents a small magnitude of observed effect between COVID-19 restrictions implementations and the totaled monthly visitation rates across all locations, $r = 0.08$, $d = 0.15$. These results confirm that the implementation of COVID-19 restrictions was a nonsignificant predictor of monthly visitation rates; and this test has a very small effect size for inference.

Table 4. Independent Samples T-test of COVID Variable on All Sites Total Visitation Rates

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	<i>t</i>	df	Sig. (<i>p</i>)		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One	Two			Lower	Upper
All Sites Total	Equal variances assumed	1.328	0.254	0.588	55	0.280	0.559	-31158.017	5555.505	-42291.497	-20024.537

To further confirm the non-significant effect size of COVID-19 restriction implementations on visitation rates, a comparative one-way ANOVA test was used to test the annual means from 2017 to 2021 (categorical variable) across the four site locations and the all-sites total outcome variables. The pre/post COVID-19 restrictions variable primarily groups monthly rates from 2017 to 2019 under pre COVID-19, and most 2020 and 2021 monthly rates under post COVID-19. This test included *post hoc* multiple comparisons tests with a conservative Bonferroni correction, assuming equal variances. The significance of the Levene's test statistic for all resulting values in the one-way ANOVA test remained above the $p \geq .01$ significance value threshold to meet the assumption of homogeneity of variance (Table 6). The ANOVA test results are not significant assuming $p < .01$, indicating there is not a significant effect of year designation on totaled monthly visitation rates in any of the four locations or in the all-sites data. Annual grouping effect on visitation rates were not significant at Wupatki, $F(4, 51) = 0.777$, $p = .784$, $\eta^2 = .057$; nor at Walnut Canyon, $F(4, 52) = 2.444$, $p = .058$, $\eta^2 = .158$; nor at Montezuma, $F(4, 51) = 1.335$, $p = .270$, $\eta^2 = .095$; nor at Tuzigoot, $F(4, 51) = 1.216$, $p = .315$, η^2

= .087; nor across all sites totaled, $F(4, 52) = 2.374$, $p = .064$, $\eta^2 = .154$ (Table 5). *Post hoc* tests using the Bonferroni correction confirmed these results across each year within each location assuming $p < .01$. The Bonferroni *post hoc* test identified a lower mean significance within Walnut Canyon between 2020 and 2021, $p = 0.038$. Compared to all other Bonferroni significance values, this variation may warrant further investigation. Overall, these results confirm the null hypothesis that the mean outcome of annual groups 2017, 2018, 2019, 2020, and 2021, has no significant effect on visitation rates across the individual locations nor within the all-sites data. Since 2017 through 2019 annual groups were primarily pre-COVID, and the 2020 - 2021 annual groups were primarily post-COVID, these results further confirm a nonsignificant effect of COVID-19 restriction implementations on monthly visitation rates across locations.

Table 5. One-way ANOVA Results of Annual Predictor on Four Locations and All Sites

Location		Sum of Squares	df	Mean Square	F - Statistic	Sig. (<i>p</i>)	Effect Size (η^2)	Levene's Statistic Sig.
Wupatki	Between Grps	190559142.189	4	47639785.547	0.777	0.545	.057	.784
	Within Grps	3126171238.650	51	61297475.268				
	Total	3316730380.839	55					
Walnut Canyon	Between Grps	303482843.947	4	75870710.987	2.444	0.058	.158	.108
	Within Grps	1614146106.895	52	31041271.286				
	Total	1917628950.842	56					
Montezuma	Between Grps	700889028.012	4	175222257.003	1.335	0.270	.095	.639
	Within Grps	6692705897.417	51	131229527.400				
	Total	7393594925.429	55					
Tuzigoot	Between Grps	43150240.881	4	10787560.220	1.216	0.315	.087	.673
	Within Grps	452343475.333	51	8869479.908				
	Total	495493716.214	55					
All Sites	Between Grps	5074584943.802	4	1268646235.951	2.374	0.064	.154	.605
	Within Grps	27787905396.759	52	534382796.092				
	Total	32862490340.561	56					

Note: df = Degrees of Freedom; Sig. = Significance; Grps = Groups.

Discussion

The results of the comparative methodological litmus test (independent *t*-test) for seasonal groupings confirm what NPS already knows to be true; that on-season months (March through October) experience a significantly higher rate of visitation traffic than off-season months (November through February) (Snider et al. 2018; Ziesler and Pettebone 2018). Using this test as a solid comparative model, I conducted the same independent *t*-test with the broader, pre/post COVID-19 grouping variable. These results confirmed that on average, visitation rates during months prior to the COVID-19 closure in April 2020 were not significantly higher than the visitation rates of months after April 2020, where visitors experienced visitor center closures, masking requirements, and social distancing precautions. Additionally, the results of the one-way ANOVA test of annual groups among visitation means further confirmed that visitation rates in 2017, 2018, and 2019, did not have a significantly higher effect size than visitation rates in 2020 and 2021. Although a 2020 decrease is noticeable within the descriptive statistics and Figures 3 - 6, visitation increases in 2021 statistically balanced out the visitation decreases seen in 2020. These results confirm the null hypothesis, which is the same as the predicted hypothesis: that significant, long-term effects on visitation numbers from the COVID-19 pandemic were absent in these four national monument locations.

Combined data within the dataset was likely weighted and somewhat biased toward visitation rates in the three years leading up to the COVID-19 pandemic change, versus the two years after this change in protocol. There are also potential biases weighting data totals toward the very high visitation rates of Montezuma Castle National Monument compared to the much lower rates at Tuzigoot National Monument. A broader study that includes a more diverse array of national parks would provide more critical, applicable results that can be generalized to a

larger population. Adding demographic studies would contribute details about the visitor populations who are keeping these venues popular during these strange pandemic conditions. The results of this study, which is significantly narrowed to a small geographic area, denies the theories and assumptions underlying global tourism impacts of the COVID-19 pandemic put forth by Abbas et al. (2021), when applied specifically to NPS tourism in northern central Arizona. NPS parks and monuments play a vital role in United States recreational tourism (Volenec et al. 2021). Though the U.S. has inevitably felt some economic impacts through this pandemic, this study infers that on a localized level in the American Southwest, outdoor recreational venues may not have been as significantly impacted as expectations in the global tourism industry suggest (Abbas et al., 2021; Volenec et al. 2021; Douglas 2021). This study could have expanded into 2022 visitation data, however, multiple wildfires in the Flagstaff and Verde Valley areas that resulted in monument closures for several weeks and the resulting dips in visitation numbers would likely skew the data. This general research design can also be applied to a broader regional sample to provide more inferential statistics regarding NPS parks and tourism on a larger scale.

In conclusion, the specific implications of this study reveal that, despite pandemic impacts and temporary visitor center closures through 2020 and 2021, a relatively consistent rate of visitors to these four culturally significant monuments were still exposed to public archaeology. One might reasonably speculate that after initial lockdown closures and a limited summer in 2020, many individuals and families searched for recreational outdoor activities when the pandemic still had not ended. By the spring of 2021, the rapid rollout of COVID-19 vaccinations was likely one leading cause of significantly increased NPS visitation rates in 2021, boosting public morale and confidence to participate in more tourism. Whatever combination of

motivations inspired visitation increase during a time (2021) when COVID still regularly infected thousands, each number represented a visitor. Despite the fear of a pandemic and heightened safety restrictions, each visitor experienced these monumental structures in-person and up-close, gaining education about the rich cultural history from trail signage and interpretive staff. While many visitor centers remained closed through spring of 2022, interpretive signage, and online website features can fill in the educational gap left by the closures of these more detailed, on-site cultural education venues. Digital transmedia is presently available on NPS websites and the American Southwest Virtual Museum.

Chapter 5. Pandemic Effects: The Public Voice

A Summary of Online Public Reviews

This chapter provides a summary of public feedback through online review platforms, which provide useful references for public experience and opinion at these monuments before and after the pandemic. Now that we know visitors continued to visit these Arizona National Monuments during the COVID-19 pandemic (according to the results of Chapter 4), the next question is, “what was the public response to COVID restrictions and learning material at these venues during this time?” This exploratory look at public review commentary focuses on comments that mention visitor center presentation between 2019 and 2022, and any mention of visitor center closures after April 2020, as parks re-opened with limited visitor center access, implementing restrictions and social distancing measures. In January of 2022, I reviewed online public forum travel reviews written by tourists about their experiences with the following National Parks Service Monuments in Arizona: Wupatki National Monument, Walnut Canyon National Monument, Montezuma Castle National Monument, and Tuzigoot National Monument (Appendix A). Online travel reviews are a form of social media that describe and critique individual experiences of a place of business or recreation. Online reviews increased in use and popularity in the 21st century tourism industry as a way for the public to freely comment on a venue or business and an incentive for that venue to provide a highly rated customer experience, through a 1 to 5-star rating system. As a result of these reviews businesses and venues often make improvements where possible (Chong et al. 2018; Shin et al. 2019). Recently online reviews are referenced by additional members of the public to make decisions on where to take their business as they travel and know what to expect. Deciphering the semantics of subjective comments and wording people choose is a complex task (Shin et al. 2019), therefore this study

outlines a summarized overview about unique examples of reviews, but it does not consist of in-depth ethnographic analysis regarding the reviewers or generalizations about public populations at large. Online reviews provide tourism data about four interactive perspectives: the reviewer's perspective, the tourism managers' perspective, third party perspectives (such as online browsers like Google), and the point of view from the user referencing the posted reviews (Chong et al. 2018). Theoretical mediation and effects among these perspectives is a complex scope beyond the purpose of this summary. Most public review information can be divided into two categories: objective or "concrete" reviews that describe facts about a venue and opinionated "abstract" reviews that might include emotional language based on subjective experience (Shin et al. 2019: 579). Many reviews also combine these two aspects. Because the venues in this study are primarily outdoor, numerous factors such as season, weather, levels of sun exposure, or even local mosquito populations can influence subjective experience of these places. Both concrete and abstract reviews can include positive or negative voice imbued into individual statements despite objectivity level, however, risks versus benefits implications of an experience are typically more obvious in abstract reviews (Shin et al. 2019). Statistical analysis and debate on specific impact levels from public reviews varies and is outside the scope of this study, but should be considered for any future, more in-depth research (Chong et al. 2018; Shin et al. 2019). Instead, this summary focuses on comments people made about these recreational venues over the last few years immediately before, during, and following the height of the COVID-19 pandemic of 2020 and the implementation of restrictions across federal, state, and local venues.

On most review platforms, people can select an icon for whether or not a particular review was helpful, and an algorithm sorts them ranked by relevance (Chong et al. 2018; Shin et al. 2019). However, when referencing reviews one can also set a specific sorting preference (for

example newest to oldest reviews) and add preferred filters to narrow down content of interest. For this study, I used the following three common online review platforms to search for examples on each of the four monuments: TripAdvisor, Yelp, and Google. After searching and selecting each monument location, I sorted review lists by newest to oldest for easy access to recent reviews written between 2019 and 2022. I then filtered all reviews by search terms “visitor center,” “learn,” and “COVID” to limit reviews to public interaction and engagement with the educational aspects of these archaeological monuments during the period when COVID restrictions were heightened. I pasted a sample size of 83 individual reviews into my data notes based on varied, relevant content that spanned random intervals per platform because TripAdvisor contained more reviews than Yelp, and Google more content than both the former two websites across the temporal and keyword filters. I did ensure that all four monuments were included across all three review platforms. Quoted reviews are cited by the date they were posted and the only author identifier available on these websites, username. TripAdvisor and Yelp also include the city and state where the review author is from if they provide this information. The following summary presents examples of key reviews and a reflexive, subjective opinion of positive and negative tones across the sample set.

I noticed some general patterns and themes mentioned by multiple reviewers and some examples of both common and unique review types which I have quoted for reference. A certain level of interpretive hermeneutics and my own bias plays a role in this overview, but I attempt to keep summarizing statements clear, pointed, and surficial. A different researcher might view and explain these available online reviews with their own individual perspective, distinct from my own. Another noted limitation in this review summary is that only opinions from reviewers with easy access to online content via internet connectivity and compatible devices are included in

this sampled content. Visitors to these monuments who do not interact extensively with internet technology are likely not represented through this form of public comment. Most NPS visitor centers have a form of physical comment cards that visitors can use instead of posting digital reviews, but data from physical cards is not included in this overview. Ethical insights and considerations for this and similar issues surrounding digital humanities research is further discussed in Chapter Six.

Wupatki National Monument

Many reviews about Wupatki National Monument also mention Sunset Crater National Monument because the two parks are combined by access and entrance fees. The Visitor Center for the Wupatki portion of the monument (northeast of Sunset Crater) is located next to the parking lot, in front of the largest, most reconstructed pueblo at this monument, “Wupatki pueblo” (Wupatki National Monument 2022). Reviewers frequently recommend getting a brochure from the Visitor Center before commencing the self-guided tour of Wupatki pueblo, indicating that portable reading material which can be kept and taken home is valuable to much of the public. Brochures seem popular in general but were mentioned more often during the COVID closure of the Visitor Center. COVID restrictions during the Visitor Center closure as well as limited visitor access to displays and videos in 2021 at Wupatki were mentioned matter-of-factly and accepted as normal within widespread institutional practice. Only occasional review comments mentioned the pandemic as a particularly negative impact on their experience at Wupatki. One review briefly mentions COVID in a positive tone describing it as a crowd deterrent:

After visiting Walnut Canyon and Sunset Crater, we drove straight to Wupatki National Monument. I was pleasantly surprised at the very nice visitor center and what was behind

it. The sandstone Indian ruins were still intact including the recreation area where they played ball and listen to music. Also, there was a blow hole where air was coming up through a hole in the ground, very interesting. Then drove to a side ruin that was a tower. Again, no crowds due to Covid and winter (Paula M. 2021).

Several positive reviews about Wupatki and Sunset Crater describe the awe inspired by Southwest landscapes and archaeological architecture that is unique to visitors from outside the region. Many visitors also experience these monuments as families, specifically emphasizing what their children enjoy about the experience. Many reviews include short cultural descriptions repeating what they learned on their visit from interpretive staff or reading material. Visitors express surprise about trying to imagine living in such a dry, somewhat hostile environment in prehistoric contexts, as there were long seasons when water was scarce around the Wupatki Sinagua pueblos (Downum ed. 2012). The cultural and historical facts that reviewers report would provide an interesting additional study regarding which forms of information visitors retain and repeat from their experiences. This is a good question for further study into interpretive specialization and technique but is outside the range of this study of reviewer comments based on pandemic impacts.

The range of reviews indicate how vastly diverse subjective opinion is amongst monument visitors. Two of the few negative-toned reviews about Wupatki National Monument posted during the pandemic, were actually rated as 5-star reviews that only described the COVID pandemic situation in a negative light, but describe the venue itself positively:

If you are near Flagstaff, this is a great and informative stop for 30 - 45 minutes.

Impressive ruins of a once thriving native American community. The ruins near the

visitor center (sadly, closed for COVID reasons, don't get me started) are really neat. But there are ruins in a box canyon north of the visitor center that are well worth the stop (Hecker, Dustin 2021).

Great hikes, unfortunately it was very windy, and due to Covid we did not get to spend much time at visitors center and museums. Will be back to spend at least a couple days camping and hiking. Monument staff were very friendly and helpful (Schuld, Bruce 2021).

Visitor Center descriptions for this venue are also generally positive as visitors describe educational value and transmedia such as artifact touching drawers for experiencing different textures of archaeological materials. The pandemic drastically affected any touching, sensory media in public educational contexts, due to a heightened sense of germ awareness surrounding public surfaces. Additional, negative tones in Wupatki reviews compare this monument with large parks such as Grand Canyon National Park and famous archaeological monuments like Mesa Grande and Chaco Canyon.

Walnut Canyon National Monument

Walnut Canyon National Monument is often portrayed as a surprising, spontaneous tourist experience, as it is not an extremely well-known, or highly advertised destination along the Interstate 40-Flagstaff corridor (Walnut Canyon National Monument 2022). Warnings about the long staircase leading to the Island Trail where visitors get the closest view of ancient cliff dwellings are common in public reviews. Most positive 5-star reviews that recommend a visit to Walnut Canyon read similar to the following, posted by a visitor from Texas, titled “You need to go! Amazing place”:

We kind of stumbled upon this national monument near Flagstaff and I can't recommend it enough. Incredible cave dwellings throughout the canyon, and you can even go into a few. Truly a place that made me want to know more about the people who lived here. Be advised there are steep stairs and some places without handrails, so take plenty of water and be ready to climb. Totally worth every step! Wish the visitor center had been open to see the artifacts but as of our visit it was closed (Stacy D Pantego 2020).

In 2020, the words "COVID" and "visitors center" were sparsely used together, but there was a sparse consensus in the reviews that the visitor center closure during the pandemic was negative, in some way, with many expressing disappointments. "Everything is a little different with Covid so you have to wear a mask all the time. Also, the rangers are outside of the visitors center. Only so many people are allowed in the bookstore at a time..." (msnyder79 2020). The following review from an Arizona local appeared to have been reduced from a 5-star to 4-star review due specifically to the visitor center closure, though the overall tone is still positive about the monument experience:

So bummed to see that the visitors center was closed due to Covid, but the bright side was we were still able to enter the park free of charge and walk around about a mile of the overlook. It had pretty good views of the dwellings. We were also able to see some ruins without having to hike down the 273 stairs/185 vertical feet of the center was open. This will give me time to workout and survive the way back up when we revisit the park. Thank you to one of the park rangers who made my sons day by getting him a packet and Jr Ranger badge. It's the little things (Janelle F. 2020).

Those disappointed by the visitor center closure in 2020 may not have been aware that reviews previous to the pandemic rarely praised the small visitor center, though some offer some positive response to the film that explained details and history about the monument. Museum-style exhibits are very limited. The view from various overlooks at Walnut Canyon and the first-hand experience of the cliff dwellings are the monuments most memorable features according to most public reviews in the last five years. These features, along with interpretive signage, were commented on with continued positivity during the pandemic of 2020 and into 2021.

Montezuma Castle National Monument

Located just off Interstate 17, a thoroughfare freeway that exits Phoenix north toward Flagstaff, Montezuma Castle and Montezuma Well National Monuments are easily accessed for brief educational tours and nature walks for tourist populations traveling through Arizona's Verde Valley. This convenient location makes this a popular stop enjoyed by locals and tourists exploring the Southwest, and a day pass here is also good for a same-day tour of Tuzigoot National Monument, located approximately 22 miles (or 35 minutes) northwest (Montezuma Castle National Monument 2022). Because the Montezuma cliff dwelling site, and the well are small, most visitor complaints or negative-toned comments refer to entrance fee prices for an experience that can be easily completed in a couple hours. The educational content about the river valley environment and lifeways of the southern Sinagua promotes mostly positive reviews that average of 4.5 stars across the three online forums. The visitor center and gift shop at Montezuma Castle went through sporadic closures during the COVID pandemic based on county COVID rate recommendations, but remained largely open in a limited occupancy capacity, while other National Monuments maintained stricter closures. The average 5-star reviews during the pandemic timeline are typified by the following reviews written by visitors from eastern states:

“Beautiful little National Park with an easy walk to the cave dwellings. Signage provides an excellent explanation of the Native Americans who lived there centuries ago. The visitor center also has more info and artifacts about the history. We also visited nearby Tuzigoot National Monument which is also well worth a visit” (262grl Allentown 2020).

This was amazing. It is so hard to imagine how they lived in this but it was so well laid out and they used the space so well. This is amazing that they used what they had. Some smart people. Due to COVID-19 we didn't get to go in the visitor center which made me a little sad. This is a must see for sure. They have a display model of what the inside would have looked like. (Loveharleyrider 2020).

COVID pandemic social distancing restrictions on most days provided a reprieve to overcrowding issues within the small venue, and on days when the visitor center and gift shop were closed for high county COVID numbers, visitors could still go see the cliff dwelling without paying any entrance fee. Some were appreciative of these small opportunities the pandemic provided with appropriate safety measures, while a few expressed dissatisfactions regarding enforced masking. This range between positive and negative tones is apparent through this complaint, “Nice place but rude, mask enforcing *federalies* in the gift shop. I get you have rules to enforce but seriously stop acting so self-righteous. Lady at register was polite but the older woman out back was rude as all get out” (Wasdyke J. 2021) compared to the following 5-star review:

It was a very informative and peaceful trip. I thought the park ranger was very informative with the information about the Castle and history. I thought it was beautiful and the creek near by was very peaceful. Loved that everyone wore masks and they monitored the amount of people in the gift shop. They had restrooms and even the sheriff

was helpful in the entrance with knowing about how many parking spots were still open. We will definitely visit again (Quezada, Y. 2021).

Tuzigoot National Monument

Located near Cottonwood, Arizona, Tuzigoot is a contained hillside pueblo site where visitors can walk around a large multi-structure complex constructed by the southern Sinagua with far-reaching views of the surrounding Verde Valley (Tuzigoot National Monument 2022). The Tuzigoot Museum holds an impressively large and diverse collections display of ceramics and textiles compared to the small visitor centers at the other venues discussed. This venue combines museum exhibit and signage media with the experience of walking around the pueblo complex on cement sidewalks, and also includes an interactive online platform with a digital tour, artistic reconstructions, and photographs of the site before and after excavation (Tuzigoot National Monument 2022). During most of the COVID pandemic, the museum allowed small numbers of masked visitors in at a time to learn about the artifact contexts of southern Sinagua archaeology, before hiking up to the structures. The venue received largely positive reviews both before and after the start of the COVID pandemic that can be summarized by the following 4 and 5-star examples:

Good place to learn about one of the ancient communities in the Verde Valley.

Informative displays in the visitors' center centering around everyday life and also aspects of trade that these people conducted with all of the other native peoples in the area. Beautiful ruins and vistas to enjoy every step of the visit (Stanfel, Dawn 2020).

My husband and I visited this site after being recommended to us by our bed and breakfast host. It was just a short drive for us and we were able to use our NPS pass to get

in. It was very interesting and we enjoyed our visit. Even including our time inside the visitor center, it only took about an hour to view everything (Stjohnbeachlover 2021).

Tuzigoot is commonly described as ‘small’, ‘local’, ‘pleasant’, and ‘educational’. Views and vistas from the hilltop are frequently praised and this venue does not receive many negative reviews ever. Even during the pandemic, negative intonation about COVID is not expressed on the review platforms I searched. Some reviews with negative tones explain how much of the pueblo has been “reconstructed” in historic and modern contexts, questioning its authenticity and archaeological integrity. In my own experience, other venues of this nature do not volunteer information about the reconstructed status of an archaeological structure to prevent this disillusionment of a prehistoric experience. However, Park personnel and educators will answer honestly if asked. Additional negative tones for Tuzigoot reviews generally only describe how small it is compared to other National Monuments and Parks making it a “quick” or “short” experience, but simultaneously prefaced with positive take-aways.

General Commonalities Among Reviews at All Four Monuments

All four national monuments retained average overall ratings across websites between 4.5 and 4.8 stars out of a possible 5-star highest rating. Few people visit and review monument venues like these with an intention to verbally eviscerate them, like they might after a poor consumer service experience elsewhere. There is an underlying assumption surrounding these venues that the public is privileged to experience them, because the government could choose to close off these archaeological monuments to public access for more holistic protection of these resources. Instead, the public gets the pleasure of paying to see and experience these places, therefore the general attitude of expectation is distinctly different from business reviews such as

hotels and restaurants. Additionally, while all national monuments are unique, there still exists a level of competition in the tone of some reviewers who would recommend spending the entrance fee at one monument over another, because in their opinion, more can be seen or experienced for the money spent. Since all NPS national monuments are managed by the same agency, this business competition does not actually exist on an economic level, but is an indicator of perceived value regarding visitor/tourist priorities. The following example review phrasing portrays this mindset, echoed in several reviews pre- and post-pandemic, though this one specifically refers to Wupatki, given a three-star rating: “A site worth preserving. Nice staff. Good junior ranger program. Numerous sites to visit with interesting history. Visitor center is pretty limited. Definitely worth checking out but wouldn't be my top NPS priority in [this] area given all the other interesting stuff” (Daniel K. 2019).

One common trend among reviews across all four locations in this region of northern-central Arizona, is that they are frequently compared to larger Southwest monuments such as Mesa Verde or Chaco Canyon and described by tourists who have visited these larger sites as being “smaller monuments,” providing a potentially underwhelming expectation to future visitors. These monuments are also distinguished from nearby large parks such as Grand Canyon National Park, as stops that only take a partial day or a few hours to experience, rather than all-day or multi-day parks. Another common trend in reviews is that even if a negative comment is made about one specific aspect of the visitation experience, it may not drastically impact the star-rating, which will often maintain a high rank (four or five) even if comments seem somewhat negative in tone. There is a somewhat negative, “unfortunate” tone when visitor center COVID closures are mentioned, but it is simultaneously a tone of safety acceptance, rather than opposition. Also, most of these mentions never contributed to ruining the visitation

experience, as most reviews maintained high ranks despite pandemic restrictions. “COVID” was also mentioned occasionally as an explanation for a lack of crowds in many of these monuments, suggesting that pandemic circumstances are a favorable time to visit these places and avoid dealing with full parking lots, long lines, and crowded picnic areas.

Generally, the goal of a visitation experience is touring the archaeological aspects of the monuments themselves. Visitor centers are a *supplemental* informational venue, contributing to the experience of viewing these structures in person and up close. People do not come to archaeological monuments with sole motivations to see the Visitor Center; they come to experience unique ancient architecture and learn some fundamental cultural background information along the way. Several reviews, however, mention that the visitor center experience is important, and when they were closed, many tourists felt they had lost out on a crucial part of the full experience. Many reviews praise knowledgeable interpretative staff and park rangers that improved visitor experiences with verbal educational information and personable interaction. Some visitors summarize impressively accurate cultural knowledge they learned from their visit in reviews, though there remain aspects of popular culture stereotypes prevalent in many review descriptions, such as the words “Indians” and “primitive.” Some reviews attempt to regurgitate information about the monument and can describe what it looks like, but fail to provide accurate cultural background, proving they did not retain the information as well as the sights. There is much room for improvement in promoting modern ideologies and terminology about past cultures in public archaeology but drawing visitors to educational venues or even a legitimate website, is a vital first step to aid modern views and understanding. This is why accurate, professional information should be available on as many platforms as possible for maximum outreach.

Despite the technological conveniences that dominate most daily lives of the modern traveler, there are consistently positive reviews that mention enjoyable experiences, knowledgeable staff, informative brochures, and a desire to return to these National Monuments or visit more in the area. As the research presented in Chapter Four explains, physical experiences of these outdoor architectural monuments were not significantly impacted by the COVID-19 pandemic, because socially distanced walking on interpretive trails outside did not pose a high risk of virus spread. Therefore, these venues likely offered a diverse array of activities available during the height of the pandemic when many restaurants, theaters, shopping venues, and amusement parks were closed, for those who desired to escape their homes and technology-driven lives.

Chapter 6. Digital Ethics and Applications

Digital Humanities Ethics

While digital forms of transmedia are facilitating a broader outreach of public archaeology than ever before, there are several ethical concerns within the digital humanities that warrant mention. Technological innovation has driven us toward a more globally connected interaction for centuries and modern digital tech brings immense amounts of instant information to one's fingertips, but at what cost? When physical experiences at indoor venues such as offices, restaurants, theaters, and other businesses were closed by COVID-19 lockdowns or limited by restrictions, those who had easy internet access used digital platforms to reconnect with the world from the safety of their homes, but how did the pandemic effect populations with subpar internet infrastructure? Some marginalized populations likely experienced further detachment from society due to the combination of the COVID pandemic and digital divide issues. Varied experiences throughout the pandemic extends beyond the focus of this study but should be considered for future anthropological research potential. While this thesis introduces concepts regarding digital humanities as they apply to technological platforms in public archaeology, the topic has much larger implications than what I briefly discuss here.

Technology is embedded into the daily lives of certain wired populations, the majority of which reside in nations typified by the Global North designation. These populations marked by digital literacy or competence are also frequently characterized by digital dependence, as computerized tech forms crucial tools in the workplace, education, home management, and entertainment (Park et al. 2019). Technological dependence is fairly high amongst the majority of the American population, so it may surprise some that digital literacy and access does not extend to every population in developed contexts of the Global North (Díaz-Domínguez 2020;

Park et al. 2019). Only ten years ago, there were still approximately seven million people in the United Kingdom living without home internet (Richardson 2013 [Office for National Statistics 2012]). As of 2016, one statistical outlet reported that almost half of the world's population used internet and mobile data devices on a semi-regular to regular basis (Park et al. 2019 [International Telecommunication Union 2016]). That still leaves several billion people across the world who did not regularly use the internet only seven years ago. While these statistics are ever-changing with widespread availability of online infrastructure increasing, it is important not to assume that your collaborator has the same digital access or capabilities as yourself, which can be clarified with an initial logistical conversation. Economic, political, social, and geospatial denominations may dictate a wide array of technological benefits or risks to be weighed on a case-by-case basis. The issue of access is important for archaeologists to understand due to the impact of controlled versus improvised information reaching different groups (Richardson 2013; Díaz-Domínguez 2020; Park et al. 2019).

De-colonizing museology and education has spearheaded global efforts in recent decades, but the nature of globalization is inherently dominated by colonial versus multi-vocal patterns. The most digitally wide-spread narrative exerts the most influence, so technological entities can easily overpower non-digital narratives with information control (Appadurai 1990; Park et al. 2019). This scenario coincides with power plays and neoliberalist agendas from technological tycoons, governments, and corporations that control the word market and continue to create necessary demands for their digital products in as many countries and communities as possible (Díaz-Domínguez 2020; Van Dijk 2006). This is one example of technical governmentality that influences and even programs the daily lives of individuals regarding digital literacy and dependence (Inda 2005; Park et al. 2019) This applies to large marketing data accumulation,

algorithms, internet access necessity, online media, and artificial intelligence technologies that are contributing to the global digital divide (Diaz-Dominguez 2020; Van Dijk 2006). Digital archaeology attempts to stay relevant within these technological trends but are any aspects of archaeology unknowingly furthering the digital divide and this neoliberalist technological colonialism without consideration for these issues? Archaeologists must continue to evaluate these broader questions on a case-by-case basis, actively listening to the needs of collaborators and stakeholders. Professionals should promote training in technological developments for collaborators who desire to directly represent themselves in digital platforms (Winter and Boudreau 2018). This may require advocating for more current wireless infrastructure in rural areas alongside those who wish to play a larger role in heritage identity expressed through digital tools. The field of public archaeology should embrace digital platforms to diversify supplemental transmedia for heritage education, but it should not become so digitally dependent that technology replaces tour guides or interpretive staff. The personable aspects of these positions make them a valuable part of public archaeological experience. Interpretive staff such as park rangers, volunteer docents, and tour guides are also a part of the local community representing their own experience with these places to the visiting public.

Community Sharing

The point of public archaeology is to break through exclusively bounded walls of collegiate halls and academic jargon to present the value of archaeology, culture, and heritage identity to anyone interested. Perhaps we can even sway those who are not interested in history to investigate something new from a more anthropological perspective. Stakeholders in heritage management include descendant communities, local communities, and tourists. People experience the past of a place differently but sharing that experience with others fosters broader

acceptance of diverse perspectives while also promoting interpretive accuracy and best practices at heritage venues. This research provides a glimpse of public heritage management in the American Southwest during unique and difficult conditions of a pandemic safety concern.

Professional archaeologists are obligated to share their research with colleagues, but they are also encouraged to share in public outreach to benefit the communities surrounding their archaeological projects. Archaeological publications provide numerous broader discussions about topics briefly mentioned in this thesis project. The effects of digital applications within public archaeology contain exponential research potential. Sharing is best facilitated by researching current discussion about public archaeology, heritage management, and digital platforms, though these topics may not apply directly to one's scope of specialization. Future research on similar topics could include broader studies about how people respond to digital transmedia in heritage venues, factors that prompt visitor number fluctuations, and ways that archaeology and anthropology can ethically interact with the digital humanities.

It is important to remind archaeological colleagues about the value of these topics, as well as share new archaeological discoveries with non-professional audiences. While sharing a research poster for this study at the Society for American Archaeology conference in 2022, an NPS representative approached me about discussing my research on his established NPS podcast. I intend to pursue this and other opportunities to share this study with colleagues and the general public wherever possible. I will have multiple opportunities to present this research to my work colleagues within professional development learning channels encouraged by my employer. As a career archaeologist who enjoys teaching people, I will continue to prioritize opportunities to act as a tour guide, museum volunteer, and public heritage promoter where

possible. Perhaps someday my career will turn toward full-time heritage management and public archaeological engagement.

Conclusions

This study has demonstrated that digital platforms provided useful alternative outreach methods during 2020 and 2021 when COVID-19 restricted indoor venues and cancelled group events. Though the Elden Pueblo public education and children's programs were canceled for much of 2020, Elden personnel continued student curriculum with PowerPoint presentations, conference call platforms, and educational video curriculum. Short videos showing puppets interacting with archaeology at the pueblo kept younger children engaged with the material even through computer screens, while they learned remotely from home. Tour-guided films and documentaries available through streaming platforms, such as Project Archaeology's educational curriculum videos provide easy ways for much of the public to learn about local heritage through the internet. Self-guided tours that use digital QR codes allow visitors to engage with interpretive material at their own pace using a smartphone, but it is difficult to assess how much information they retain from this form of transmedia. This kind of interpretation negates the need for knowledgeable tour guides, which is safer practice during a pandemic, but reading words about archaeology is not always as engaging as listening to a passionate docent explain it.

Digital models such as the Walnut Canyon Nine Room Virtual Model allow fun manipulation of a structure from multiple angles. The Nine Room Model even reveals some viewsheds of the canyon from inside rooms. These photographs turned to 3D web visualization are informative but only engage one of the senses—eyesight, versus inspiring a multi-sensory experience of a monument within its landscape, described by Ruth Van Dyke (see Chapter 2, page 25) (Van Dyke 2009:223). Digital models extend at least part of an archaeological

experience and interpretive material to the extremely wide array of internet audiences around the world. They offer a glimpse of unique archaeological sites to people who may never receive an opportunity to visit such a place in person. Ideally, they also inspire those with means to travel to these places for a broader learning experience and cultural understanding. Careful balance between digital transmedia and in-person experience provides the most complete version of heritage education.

Results from the research statistical analysis answered the question, “did people still visit Arizona monuments during 2020 pandemic lockdowns, temporary visitor center closures, and extra safety restrictions through 2021?” A sample of four archaeological parks in central northern Arizona proved a non-significant impact of tourism decrease during this period. Independent sample *t*-tests and one-way ANOVA analysis, tested against multiple variables over a time span of five years, dissected a comparative trend of park visitor totals before and after the implementation of COVID-19 restrictions in March of 2020. Statistical results show that due to these grave safety concerns, and some initial temporary park closures, the on and off seasons of 2020 saw a decrease of tourists to these monuments (Figures 3-6). However, a substantial increase of visitation in 2021 (particularly the spring and summer season) balanced the analysis to a non-significant effect over five years. Many factors can restrict visitation to these recreational, educational venues. During the on-season of 2022, shortly after widespread vaccination boosted confidence in increased travel, several of these national monuments were closed due to a particularly bad wildfire season. Though circumstances beyond human control may occasionally restrict people’s plans to travel and learn about history and culture, these events will never eradicate human curiosity.

As long as global web connection persists, extreme circumstances, such as viral pandemics cannot staunch most human vocality via digital platforms. In countries that allow free speech over internet and social media platforms, reviews about businesses and recreational places will continue to heavily impact economic markets driven by consumer satisfaction. Even when assessing visitor experiences on public lands, a broad spectrum of opinion can promote useful change. The public itself is a valuable stakeholder within heritage management because monument conservation is not their only goal. The strictest conservation of archaeological materials only exists in curated contexts that are completely closed off to the public. People unfamiliar with archaeological value and practice may vandalize and damage these ancient places, which is a risk taken for the sake of larger community benefits. Most heritage venues do not simply protect archaeology but promote public edification. In turn, the tourism industry funds further archaeological research and monument upkeep and preservation. It is a mutually beneficial arrangement that requires managers to understand what the public truly want from these experiences.

An evaluation of online reviews across four Arizona national monuments during the COVID-19 pandemic revealed that many visitors were saddened by visitor center closures but seemed generally positive about walking around the sites and learning from what interpretive material was available. While limited only to individuals who have regular access to internet connection, online reviews offer a sample of visitor satisfaction rates and notable complaints for a venue. Most visitors leave a four to five-star review for the average National Park, even when making unrealistic comparisons between Walnut Canyon and the Grand Canyon. Reviews containing negative tones about COVID restrictions did not necessarily result in a low rating. A few reviews were negatively opinionated about masking policies, but most reviewers were

relieved that NPS adhered strongly to COVID safety practices. Themes of fundamental appreciation for conserved natural landscapes and archaeological monuments seem established among most online comments. While the COVID-19 pandemic took an overall toll on the tourism industry, Americans continued travelling around their own local areas or neighboring states to enjoy outdoor recreational venues and several of these southwest monuments in 2020 and 2021. Reviews were largely matter-of-fact in tone as COVID became a pervasive part of everyday life; the majority of people accepted the changes required during these difficult years. For those who were able to experience visitor centers in small groups at a time, many wrote very positive reviews about their learning experience from artifact exhibits, displays, and other interpretive material. According to this narrowed evaluation of reviews, visitor centers and interpretive signs play a valuable role in visitor experience, and many glean a surprising amount of archaeological knowledge. The public's views about history, however, are heavily influenced by other forms of information, so professional archaeologists and heritage managers maintain a vital responsibility to continue promoting collaborative interpretation and interdisciplinary training to convey past lifeways appropriately. Developing more supplemental educational transmedia at these venues could also improve accuracy retention among visitors in the future.

As digital platforms and tools continually change the landscape of archaeology as a field, professionals must balance uses of older technology with newly introduced digital platforms to stay relevant within the technoscapes of the Global North. As COVID-19 pandemic conditions prompted more use of digital platforms in response to safety concerns, people are learning to navigate a balance between the value of physical experiences versus supplemental digital information. Archaeologists and heritage managers are obligated to reach the public in whatever innovative ways seem useful for the community. Digital platforms via world internet globalism

can facilitate an extremely wide outreach of educational material for any wired population to interact with. This requires understanding of a caveat though, that not all groups throughout the world maintain the same levels of technological access and use as others. Demographics throughout North America vary on digital literacy, competence, and dependence. Professionals who endeavor to collaboratively connect with stakeholders such as descendant communities should prioritize discussing levels of digital comfort, access, and use on a case-by-case basis for each new project. Even in a growing technological age relying more upon computers for almost every aspect of business and everyday life, it is polite not to assume that one's digital comfort and dependence is the same as your own. The archaeological community should also be careful not to overemphasize digital technologies above traditional forms of knowledge. Interpretive specialists can present multivocal perspectives to the public through several different forms of media to broaden and cultivate public edification. As a global technology race drives much of the world today, public archaeology can use new innovations and simultaneously value multicultural and multisensory ways of experiencing a place and its past.

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Appendix A. Thesis Project Location Map

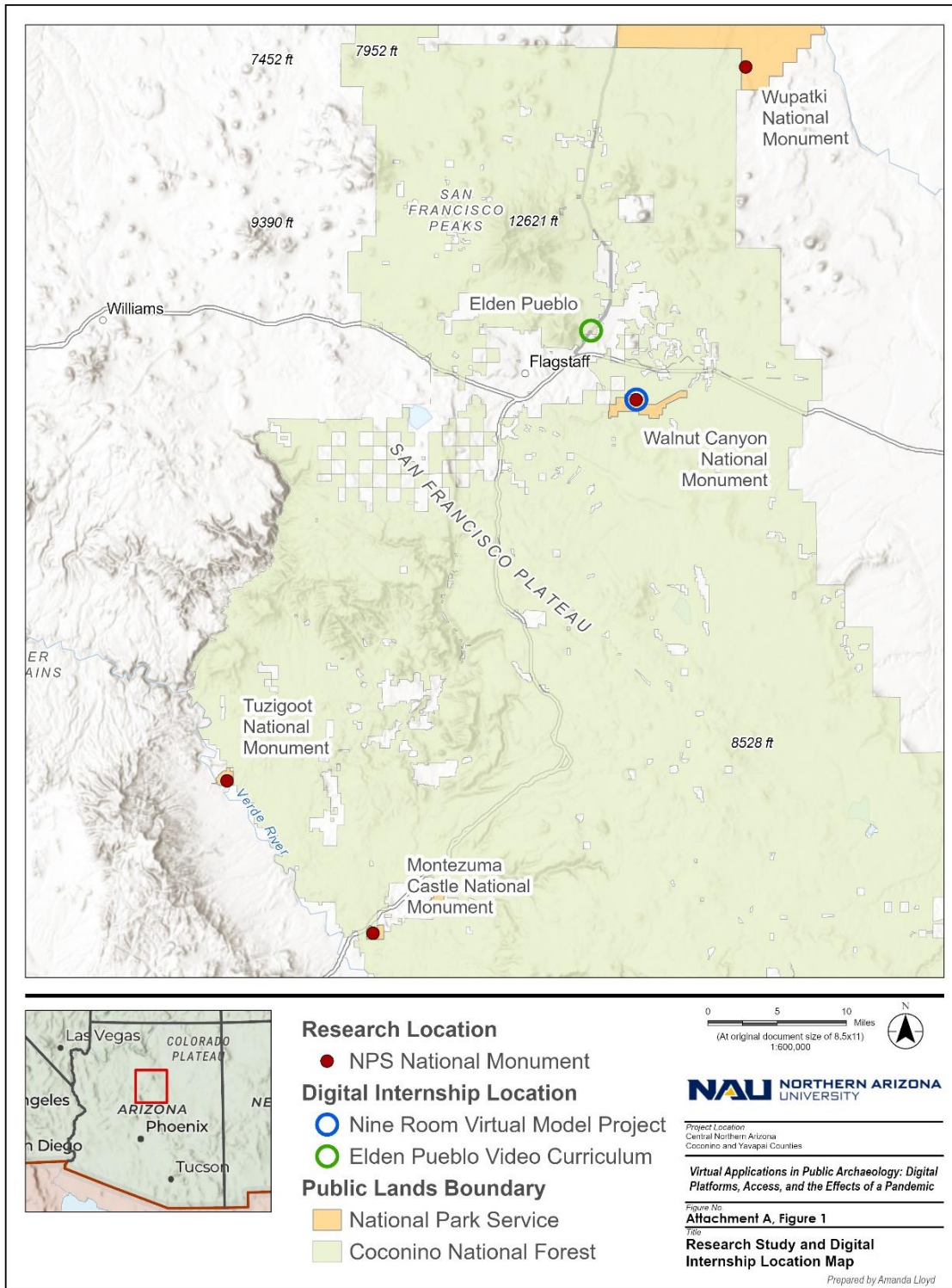


Figure 1. National monument locations included in statistical analysis and public review research study are indicated by red points; larger outline circles represent digital internship locations

Appendix B. Visitor Info Pamphlet for the Nine Room Virtual Model Project

Flagstaff Area National Monuments



What are researchers doing on the Island Trail? Researchers you may see along the trail today are photographing a section of rooms to create a photogrammetric virtual model. Photogrammetry is a technical process that involves taking hundreds of photographs of every surface within and outside of a room, then using specialized software programs to combine the photographs into a 3D model.

Photographs are taken with high-quality cameras for capturing fine details on the wall, roof, or floor surface, even at wide angles. Because lighting on each surface must be relatively consistent, lighting equipment and the position of the sun or clouds are all very important factors for this project.

Researchers and project personnel include students, archaeologists, and computer engineering specialists affiliated with Northern Arizona University, working with National Park Service staff and archival specialists at the Museum of Northern Arizona where previously excavated artifacts from these rooms are curated.



Why create virtual models? The Island Trail at Walnut Canyon is not accessible to all park visitors. Installing additional modes of accessibility such as elevators into the canyon would have a very adverse impact on cultural and natural resources that the Park Service aims to protect. Walking beside these rooms on the Island Trail, you will also notice that entrance to fully enclosed rooms is restricted for the sake of visitor safety and archaeological preservation.

Virtual tours can be easily accessed online to facilitate a close-up, detailed view of these rooms from anywhere with an internet signal and device. A virtual tour can educate the public about Walnut Canyon online and assist visitors with planning a trip to the monument. Virtual tours can also include interpretive reconstructions of ancient sites that reflect how these rooms may have looked when the Sinagua lived here. Virtual reconstructions of prehistoric contexts are based on dwelling masonry and architecture, artifacts, archaeological interpretation, and cultural expertise from descendants of the original builders of these dwellings.



Where will this 3D virtual model be available for viewing when it is complete? This project is anticipated to be completed and ready for online publication by early 2023 and will be available for viewing through links at the NPS.gov website for Walnut Canyon www.nps.gov/waca/learn/photomultimedia. The American Southwest Virtual Museum website will also provide virtual tour links and information at <https://swvirtualmuseum.nau.edu>. You can access these websites today to view current virtual tours, photographs, videos, and educational material about Walnut Canyon and other Arizona national monuments.



Figure 2. Educational pamphlet available to visitors who walked the Island Trail of Walnut Canyon during field photography hours for the Nine Room Virtual Model Project

Appendix C. Screenshot Portions of the Nine Room Virtual Model Project



Figure 7. Complete exterior view of the photogrammetry model of the Walnut Canyon Nine Room cliff dwelling site

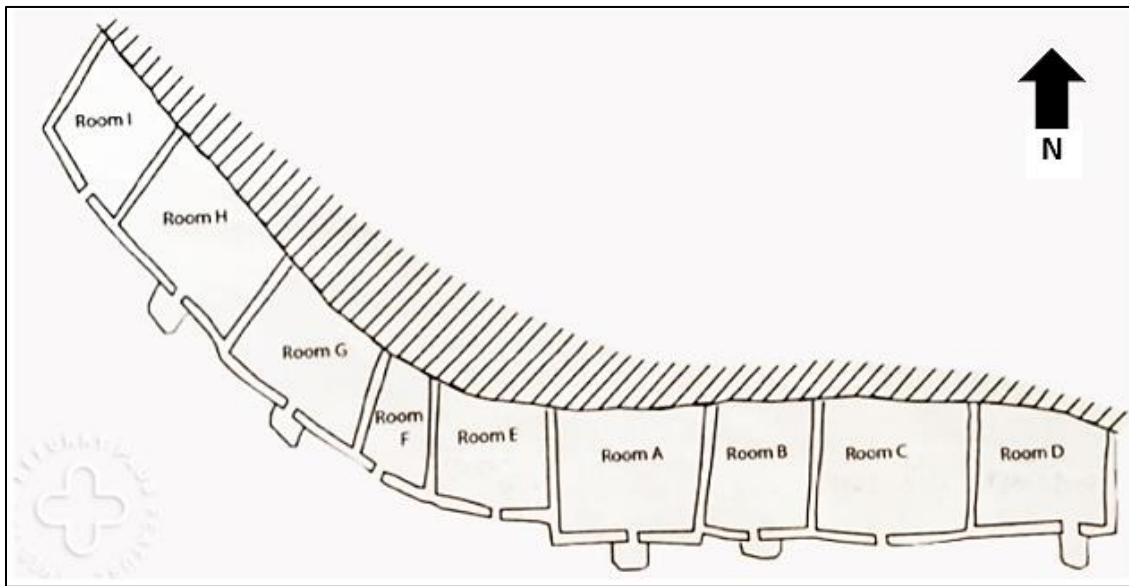


Figure 8. Drawn diagram of Nine Room site room letter designation (courtesy of NPS)



Figure 9. Model exterior view of Rooms A and B, facing northeast



Figure 10. Model view of Room D interior from east wing, facing northwest



Figure 11. Model interior of Room E, facing southeast



Figure 12. Anvil (ceramic forming tool) from Walnut Canyon *



Figure 15. Mano (groundstone) from Walnut Canyon *



Figure 13. Ceramic bowl from Wupatki*



Figure 16. Small ceramic pitcher from Wupatki*



Figure 14. Ceramic cup from Wupatki*



Figure 17. Ceramic bowl from Wupatki*

**Note. Artifact models are not pictured to scale.*