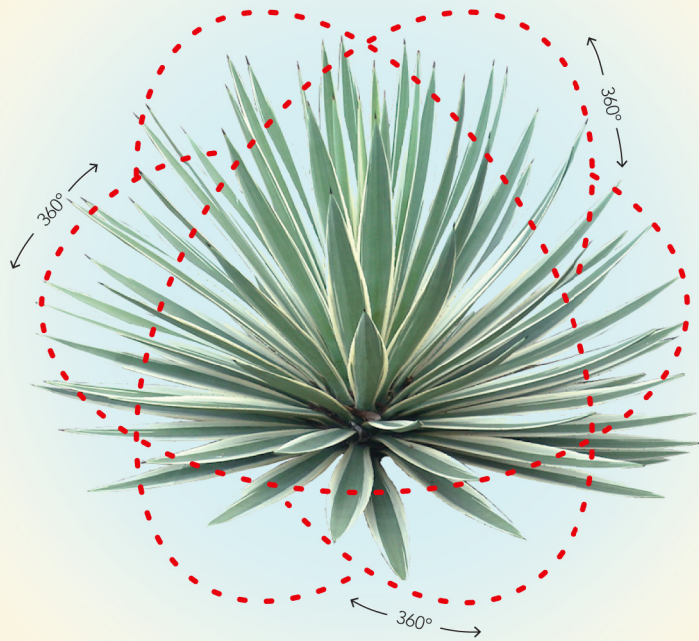


# DISCOVER BEARS EARS



*An interactive educational platform to explore connections between humans and the ecosystem*

# DISCOVER BEARS EARS

In partnership with:  
**FRIENDS OF  
CEDAR MESA**

**Knox Heslop  
+ Jan Pell**

Multi Disciplinary Design, University of Utah

*DES 3520-001 - Design Product Studio 2  
Tsoutsounakis // Fall 2021*



# Table of Contents

2-6

*Initial  
Research*

11-17

*Platform  
Walk-through*

7-8

*Opportunity for  
Design*

18

*Final  
Thoughts*

9-10

*Additional  
Research*

19

*Bibliography*

11

*Process  
Work*

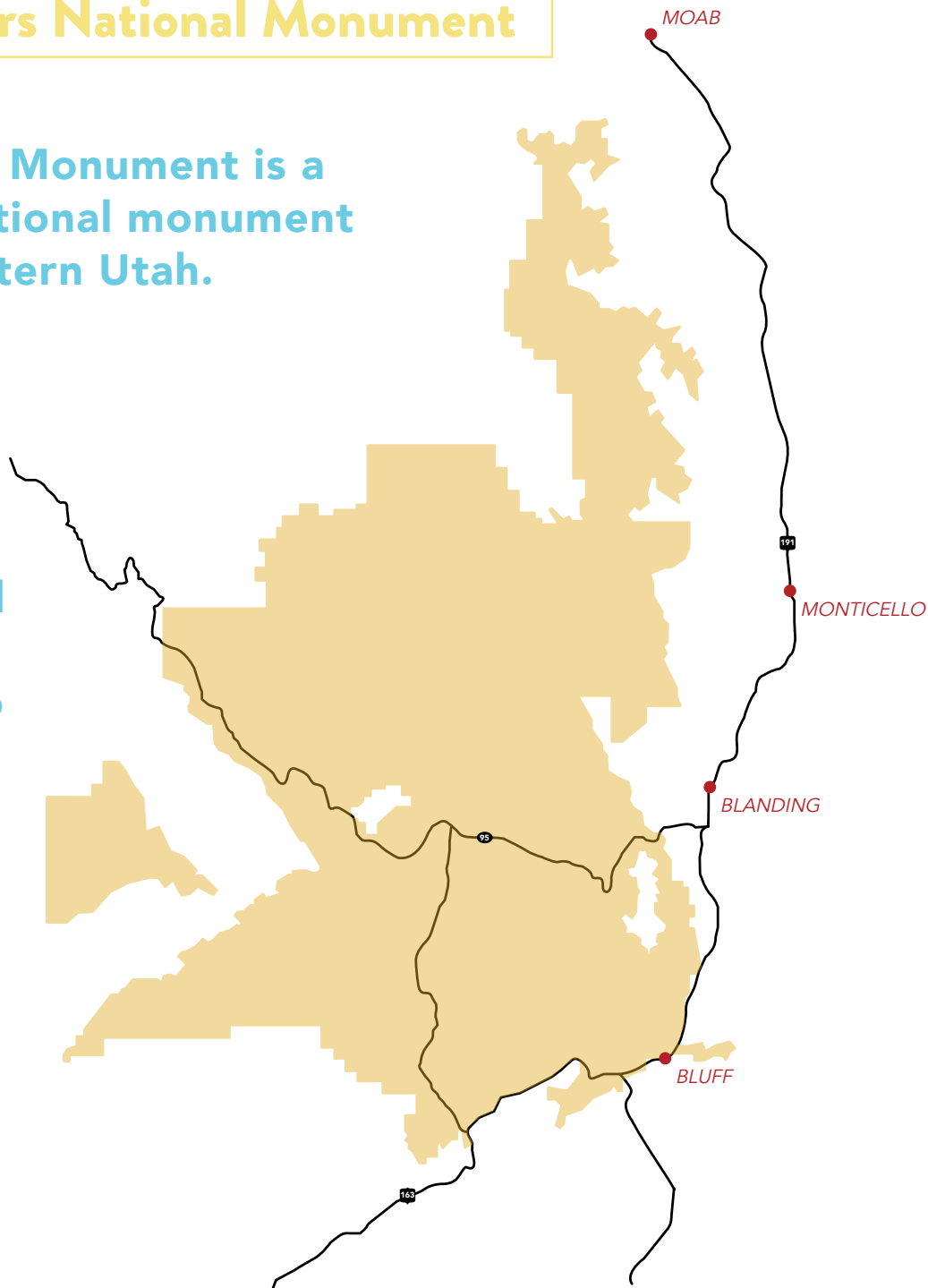
20

*Acknowledgments &  
Colophon*



**Bears Ears National Monument is a 1.36 million acre national monument located in Southeastern Utah.**

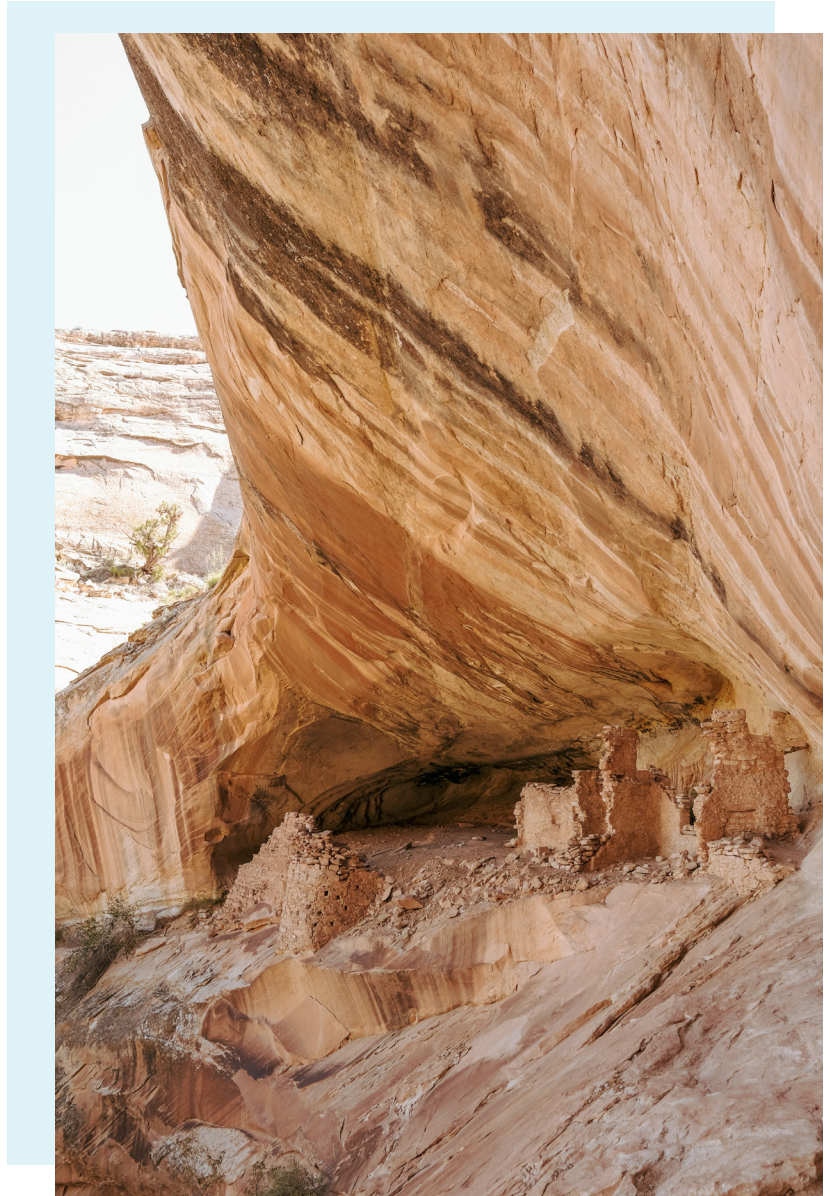
**The monument contains more than 100,000 cultural and archaeological sites, some dating back to 11,000 BCE.<sup>5</sup>**



Bears Ears was designated as a national monument by President Barack Obama on December 28th, 2016. The 1,351,849 acre monument<sup>1</sup> was created after lobbying efforts by the Bears Ears Inter Tribal Coalition, which was established by leaders from the Hopi Tribe, Navajo Nation, Ute Mountain Ute Tribe, Pueblo of Zuni, and Ute Indian Tribe.<sup>2</sup> The monument remained at this size until President Trump ordered it to be reduced by 85%, cutting the size down to 201,397 acres and removing protections for thousands of native American cultural sites.<sup>3</sup> This reduction stood for the entirety of Trump's presidency, much to the dismay of archaeologists and indigenous people in the region. President Biden restored the moment to 1.36 million acres on October 8th, 2021.<sup>4</sup>

**History:**

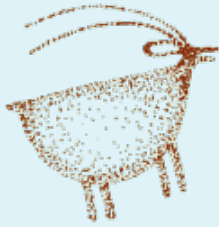
With over 100,000 cultural sites spread through Bears Ears, the monument is one of the most culturally and archaeologically rich places in the US. Bears Ears has been home to many different tribes throughout its history. Archaeologists have found evidence of Clovis settlements dating back to 11,000 BCE. Archaeologists believe Bears Ears saw occasional use from 6,000 BCE to 500 BCE, and heavy use from 500 BCE to AD 750 and AD 750 to AD 1290.<sup>6</sup> The area is well known for its amazing cliff dwellings. Along Comb Ridge, an 80 mile long geologic fold, there are many beautiful cliff dwellings, as well as ancient roads, houses, pit houses, and shrines.<sup>7</sup> Despite the high density and amount of cultural sites through the region, Bears Ears has not seen the same degree of archaeological study as other sites in the US.<sup>8</sup>



Monarch Cave Dwelling. Photo: Knox Heslop

**Looting and Vandalism:**

In recent history, Bears Ears has been plagued by a high rate of looting and vandalism of cultural and archaeological sites. Artifacts are often stolen from the area to be sold on on-line black markets.<sup>9</sup> Between May 2014 and April 2015, more than a dozen serious looting cases were reported.<sup>10</sup> Significant damage is caused by intentional stealing or destruction of cultural sites and artifacts, but there is also frequent damage caused unintentionally by visitors.<sup>11</sup> Many visitors accidentally damage structures by getting too close, or cause harm by using metal tipped hiking poles and bringing dogs to sites. The Bears Ears Inter-Tribal coalition notes that The more visitors are educated, the better off Bears Ears will be. Education and resources for management will help protect archaeological sites and save the past — and the future — of Bears Ears.<sup>12</sup>



## Friends of Cedar Mesa

Friends of Cedar Mesa is a conservation focused non profit (501 (c3)) founded by Mark Meloy in 2010.

Mission statement:

***“Friends of Cedar Mesa works to protect and build respect for the cultural and natural landscapes of the greater Bears Ears region. ”***

“To further this mission, we work to create local, regional and national support for greater protection of Cedar Mesa through education, advocating for national designations, supporting smart local policy-making, and organizing research and volunteer service activities.

We also continue to monitor the work and actions of the Bureau of Land Management, US Forest Service, and the Glen Canyon National Recreation area, which are tasked with managing resources in the Greater Cedar Mesa area. With that regard, we offer managers research, guidance and education to see that management maintains wilderness values and protects cultural/archaeological assets, while providing for continued access for local residents and visitors from around the world.” -FCM<sup>13</sup>

Their website is [www.friendsofcedarmesa.org](http://www.friendsofcedarmesa.org)

The Visit With Respect principles are a collection of tips and rules on how to visit archaeological, historical, and natural sites respectfully and in a fashion that preserves their irreplaceable stories of the past. Friends of Cedar Mesa, in partnership with the Colorado Plateau Coalition, has created these 17 guidelines that promote appropriate etiquette when visiting delicate sites in-person.



*“The truth is many people don’t know how simple it is to visit cultural and scientific sites like cliff dwellings, rock art panels, dinosaur fossils, and historic structures respectfully. By following some simple tips, walking softly, and leaving things where we find them, we show respect for those who came before us and those who will visit after us.”<sup>14</sup>*

*-Josh Ewing, Former Executive Director for Friends of Cedar Mesa*

Although the Visit With Respect education campaign is primarily targeted at outdoor enthusiasts coming to visit Bears Ears in-person, we still feel that these are important principles to know and be familiar with when exploring the desert anywhere. We think that our digital platform could be a good tool for spreading the VWR principles further. Understanding and practicing these principles will protect these ecosystems for years to come.

From our initial research, we came up with research questions about topics that piqued our interest.



*How to protect cultural sites without gate-keeping.*

*How to educate people about Visit with Respect without advertising cultural sites.*

*What motivates people to loot/steal?*

*How can archaeologists continue to study cultural artifacts without taking them permanently?*

*What would engage people to learn to be more responsible in nature and at cultural sites?*

These questions gave way to our idea for a design opportunity, and guided our research moving forward.



The design opportunity we have identified is to create a digital platform that will allow users to explore Bears Ears remotely, learning about the culture and ecology of the area without impacting it. The platform will also educate users about Visit with Respect principles, so they understand how to behave in culturally or environmentally sensitive areas before they visit in person.

**WHY:** Through our research we have found that teaching people about how to visit cultural or ecological sites is difficult. Not only do people misinterpret, forget, and disregard rules for visiting sites respectfully, but a lot of the time visitors do not realize the larger impact they have to the entirety of the ecosystem along with the delicate spaces within it. This is where the foundation of the Discover Bears Ears project began.

**WHO:** The Discover Bears Ears app is made for anyone and everyone. We want this platform to be all-inclusive for anyone who is interested in learning more about the Utah desert and the culture within it. By making it a mobile app that is accessible anywhere, we hope that people all over the world will explore it and learn something new. That being said, we think this platform could be especially useful for people who plan on visiting Bears Ears. Learning about the VWR principles through interacting with the landscape digitally will engage users with the ideas of responsible recreation before they go out into the monument.

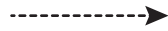
We strive to create an experience that educates people about the Visit With Respect Principles while also highlighting all the incredible aspects of Bears Ears that they are put in place to protect. By integrating these two learning experiences together, we hope to not only help people learn about Bears Ears itself, but foster a love of place and inspire stewardship for the desert ecosystem.



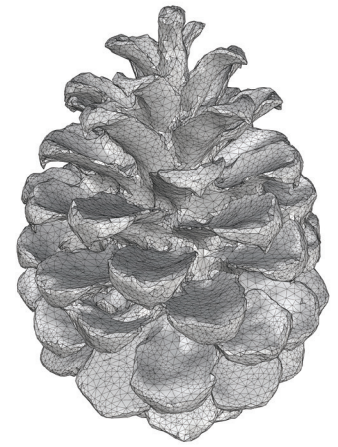
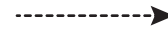
We decided that photogrammetry would be the best technology to collect scans of these objects. Photogrammetry is a low cost method, high quality of 3d scanning that creates a 3d model, then maps photographs onto that model for greater detail. It works by taking hundreds of images of an object from different angles, then using a software to derive a 3D model from the images. When done right, photogrammetry produces very high quality scans that are perfect for use on a digital platform. The textures of these scans would not be high quality enough to 3D print. We have been using an iPhone to test the 3D scanning capabilities of an software called PolyCam. To create higher quality versions, we could use a high end digital camera instead.



Photograph of a pine cone



Photogrammetry scan of a pine cone



Mesh constructed from scan

Pictured above is a test we did 3D scanning a Pine cone. Using photogrammetry for an organism with robust textures like a pine cone works very well. We found that 3D scanning something like a bush or grass can be trickier, as some of the finer details get lost.

After identifying our design opportunity, we began more specific research into methods other organizations have used to facilitate remote experiences.

The Perishables Project is a digital archiving project created by Dr. Laurie Webster in partnership with Friends of Cedar Mesa. Their archive is made up of thousands of photos of artifacts like textiles, baskets, hides, wooden implements, feathers, and other objects that may not survive at an archaeological site. We thought the idea of building a digital archive of artifacts like this one is a very powerful resource. Not only can historians, archaeologists, and indigenous people use this archive for research, but it is also an amazing platform for educating people on the importance and culture behind these artifacts.



## Examples of artifacts documented by the Perishables Project<sup>15</sup>



Striped Yucca Yarn Bag



Coiled Basket



Wooden Awl with a Knot Handle

Many organizations have used 3D scanning technologies and digital fabrication to support education, or as a form of preservation.



Temple of the Sun,  
Palenque



Palenque –  
Temple of the  
Inscriptions,  
  
Hieroglyphic  
Panels, West

## Google Maya Project

The Google Maya project uses 3D renders of archaeological artifacts and sites to bolster an educational experience. They are working with the British Museum to show important artifacts from the Maya world without removing them or stealing them. This project also uses digital fabrication technologies such as 3D printing and CNC machining to create precise replicas of certain artifacts. These facsimiles can be observed and interacted with in person, while leaving the original undisturbed. This project is an example of how new technologies can provide new opportunities for preservation and education.<sup>16</sup>

## The Factum Foundation

The Factum Foundation is another organization that uses 3D scanning technology to observe and rebuild important cultural artifacts. This organization operates primarily in Europe, and focuses on creating high precision facsimiles and renderings of a variety of cultural artifacts. The Factum Foundation’s main goal is preservation; they are building an archive of important cultural resources that the public can experience without needing to see the original in person.<sup>17</sup>



Obtaining a 3D scan of an artifact



A full size facsimile created with digital fabrication methods

We began exploring and researching different organisms and artifacts that could be contained in this app's

## Navajo Woven Yucca Basket

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat.



### Learn

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel

## The Yucca Plant

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel



### Learn

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel

## Natural Minerals & Pigments

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat.



### Learn

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel

## Clay Deposit

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel



### Learn

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit lobortis nisl ut aliquip ex ea commodo consequat. Duis autem vel eum iriure dolor in hendrerit in vulputate velit esse molestie consequat, vel



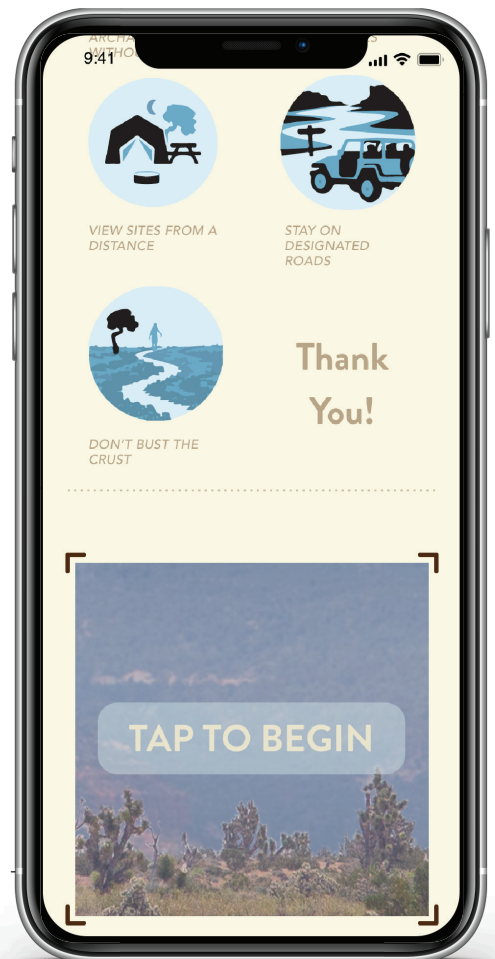
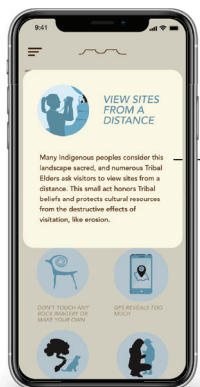
Upon opening the app, the user lands on this homepage. The homepage acts as a welcoming. Here the user is greeted with their first impression of the app so we wanted to keep it simple and inviting.

There are three buttons on the homepage. "Our Mission", "Learn More", and "Enter the Ecosystem". Once ready to begin, the user can start their exploration by tapping the "Enter the Ecosystem" button.



The user begins their journey on “The Desert Ecosystem” page. Before they explore the ecosystem, they scroll through the VWR principles. The user can easily learn more by tapping on any of the VWR icons. The VWR principles are integrated into the experience to help reinforce the preservation of these delicate spaces, especially if visiting in person.

After scrolling and familiarizing one’s self through all the VWR principles, the user reaches the ecosystem entry button at the bottom of the page and is prompted to tap it to begin.



Tapping on the "TAP TO BEGIN" button brings the user into a first person, alternate reality of a desert ecosystem area within Bears Ear National Monument. The user is prompted by some directions and an icon to encourage them to pan around and explore the organisms in the environment.

While exploring, the user may come across an organism that is glowing. This indicates that it can be tapped on. If a specific organism is of interest, the user may tap on it to learn more.





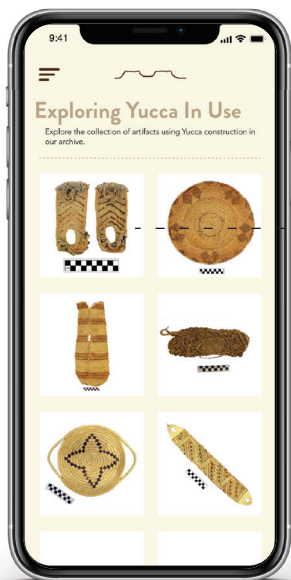
Selecting an organism brings the user to its specific page. Here they find a three dimensional rendering of the organism. The user can pan around the model a full 360° on the X, Y, and Z axes as well as zoom in and out. The rendering is also accompanied by relevant information including scientific classifications, scale, characteristics, and more.

Scrolling to the bottom of the page the user can find three additional buttons. The “Back to Ecosystem” button returns the user to the AR ecosystem area. “Additional Resources” brings them to external links to find out more about the organism. But the coolest button, “Yucca in Use”, brings the user to a page to learn about how it is, and has been, used by people native to Bears Ears.

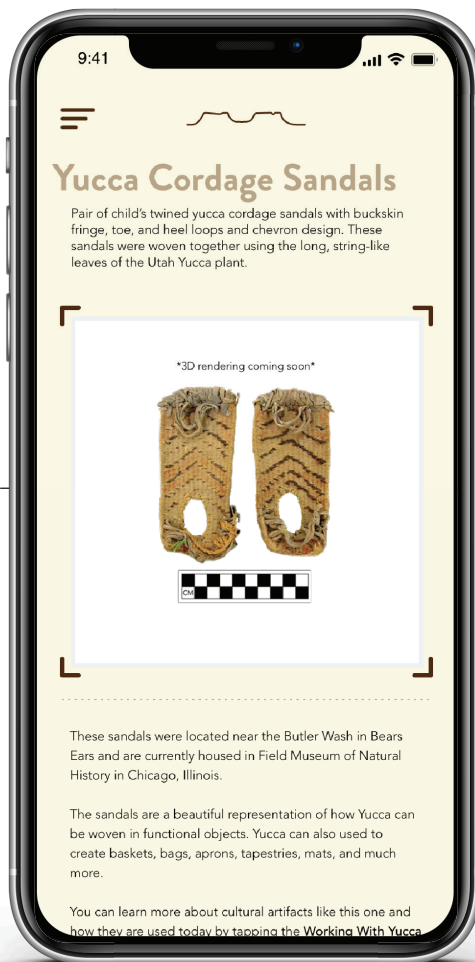


From the “Exploring Yucca in Use” page, the user can choose an artifact to learn more about. Tapping on the sandals, the user is brought to that artifact’s page. Here they find another three dimensional rendering of the organism. The user can pan around the model to view it from any angle as well as zoom in and out. The rendering is also accompanied by relevant information including history, scale, characteristics, and more.

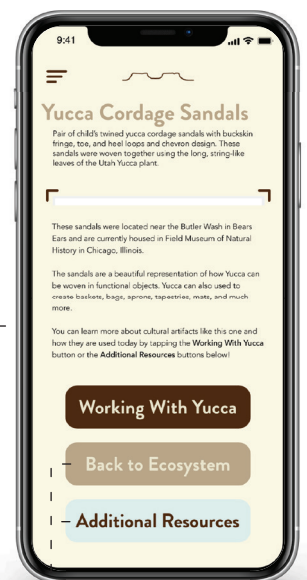
Scrolling to the bottom of the page the user can find three additional buttons. The “Back to Ecosystem” button, the “Additional Resources” button, and a new button, brings them to external links to find out more about the organism. The “Working With Yucca” button shows the user some contemporary indigenous artisans creating beautiful artworks with Yucca today.



The user can choose from a series of cultural artifacts constructed with Yucca to learn more about.

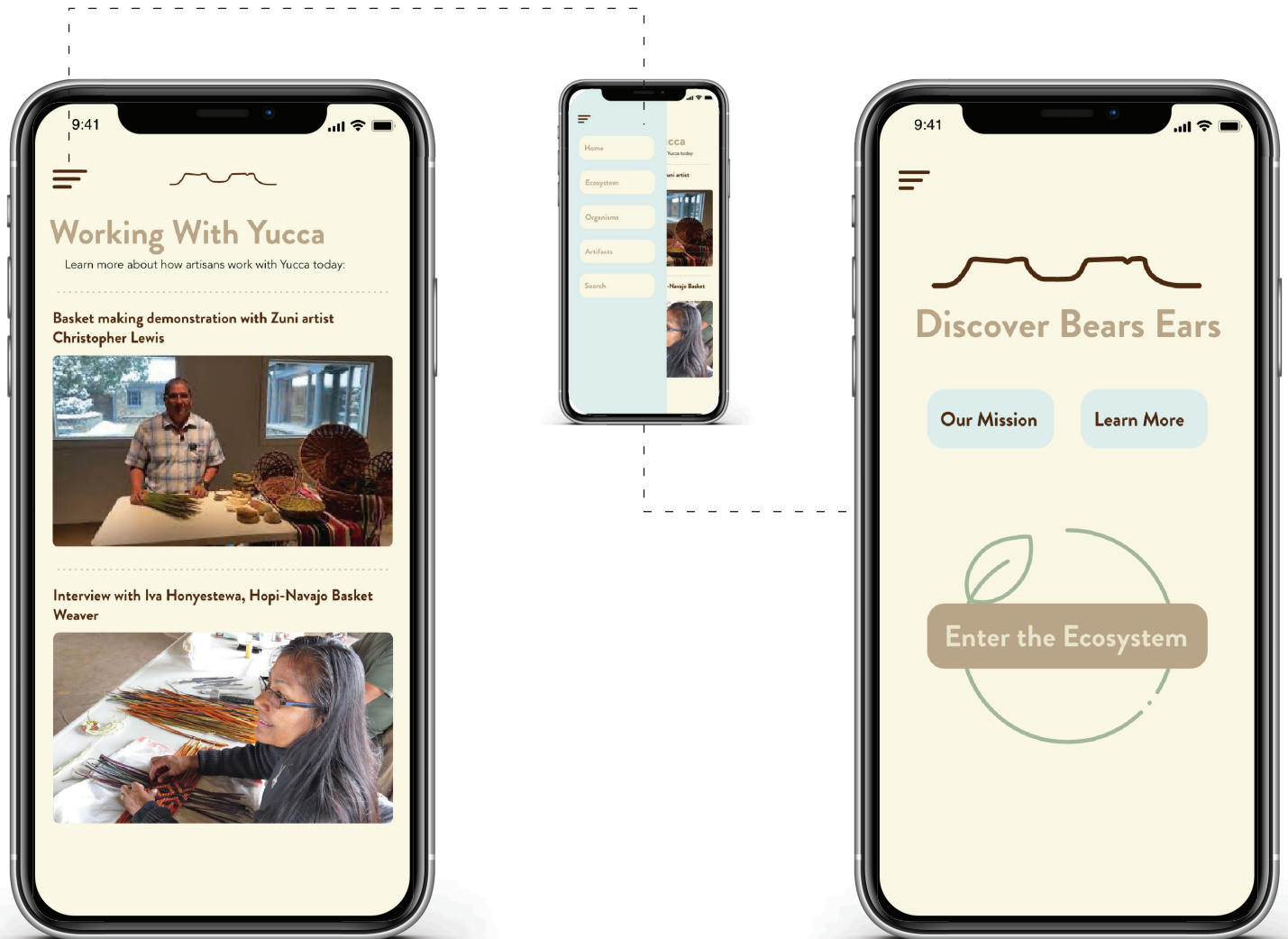


A short write-up contains more information about the artifact such as history, use, location, year made, scale, characteristics, and more.



The “Working With Yucca” page contains amazing information on the cultural significance, tradition, construction and more. This page is here to give the user more resources to push their exploration further and keep learning about the incredible culture and environments that make Bears Ears so special.

After exploring, learning, and discovering a personal love of place for Bears Ears, the user can use the hamburger menu in the upper left hand corner to navigate to a specific section of the journey or return to the homepage.



*Discover Bears Ears is a digital platform that gives users the ability to explore the natural and cultural history of Bears Ears National Monument through 3D models and renderings. The platform has been designed to facilitate discovery and learning without causing further harm to the ecological and cultural resources of Bears Ears. We have created this experience in the hopes to inspire exploration, promote education, and foster a love of place from afar.*

**FUTURE:** The Discover Bears Ears experience is just getting started. Throughout this report we have done our best to build an outline of what this platform is capable of and how it can be implemented. In order to build a fully functioning archive of cultural artifacts, there are many more steps to be taken. Speaking with tribes and tribal leaders and getting permissions from the museums that hold the artifacts are necessary to display any cultural artifacts. In order for the 3D scans to function, the files will need to be stored in a more robust database that can handle the file sizes, then referenced by the app itself. More research is required to develop the platform further. We have been very grateful to be partnered with Friends of Cedar Mesa throughout this project's initial phase and are excited to be apart of this project in the future. We would love to continue working on the Discover Bears Ears platform and developing it into an amazing educational experience for all.

1. United States Forest Service. (n.d.). Bears Ears National Monument Questions & Answers . US Forest Service.
2. Who we are. Bears Ears Inter-Tribal Coalition. (2021, October 26). Retrieved December 25, 2021, from <https://www.bearscoalition.org/about-the-coalition/3> <https://www.nature.com/articles/d41586-017-07794-5>
4. Shivaram, D. (2021, October 7). Biden will restore protections for the Bears Ears monument. Trump had downsized it. NPR. <https://www.npr.org/2021/10/07/1044039889/bears-ears-monument-protection-restored-biden>
5. Enote, J. (2018, November 27). Cultural & Archaeological Significance. Bears Ears Inter-Tribal Coalition. Retrieved December 24, 2021, from <https://www.bearscoalition.org/archaeological-significance/>
6. Enote, J. (2018, November 27). Cultural & Archaeological Significance. Bears Ears Inter-Tribal Coalition. Retrieved December 24, 2021, from <https://www.bearscoalition.org/archaeological-significance/>
7. Comb Ridge. Bears Ears Inter-Tribal Coalition. (2021, January 22). Retrieved December 25, 2021, from <https://www.bearscoalition.org/portfolio-items/comb-ridge/>
8. The ecological legacy of bears ears. Natural History Museum of Utah. (2021, May 19). Retrieved December 23, 2021, from <https://nhmu.utah.edu/blog/2021/ecological-legacy-bears-ears>
9. Engelhard, M. (2016, November 29). A field day for looters at Utah’s unprotected bears ears. Sierra Club. Retrieved December 24, 2021, from <https://www.sierraclub.org/sierra/green-life/field-day-for-looters-utah-s-unprotected-bears-ears>
10. Jessepe, C. (n.d.). Threats. Bears Ears Inter-Tribal Coalition. Retrieved December 25, 2021, from <https://www.bearscoalition.org/threats/>
11. Hananel, S. A., et al., (2017, February 23). Bears ears cultural area: The most vulnerable U.S. site for looting, vandalism, and grave robbing. Center for American Progress. Retrieved December 23, 2021, from <https://www.americanprogress.org/article/bears-ears-cultural-area-the-most-vulnerable-u-s-site-for-looting-vandalism-and-grave-robbing/>
12. Jessepe, C. (n.d.). Threats. Bears Ears Inter-Tribal Coalition. Retrieved December 25, 2021, from <https://www.bearscoalition.org/threats/>
13. About. (n.d.). Friends of Cedar Mesa. Retrieved December 25, 2021, from <https://www.friendsofcedarmesa.org/about-fcm/>
14. Tips for Enjoying & preserving archaeological sites. Friends of Cedar Mesa. (2021, May 10). Retrieved October 7, 2021, from <https://www.friendsofcedarmesa.org/tips-for-visiting-with-respect/>.
15. Gulliford, A. (2020, July 12). Cedar Mesa Perishables Project examines 1,000-year-old fiber, wood artifacts. Durango Herald. Retrieved October 8, 2021, from <https://www.durangoherald.com/articles/cedar-mesa-perishables-project-examines-1000-year-old-fiber-wood-artifacts/>.
16. Google. (n.d.). Exploring the Maya World - Google Arts & Culture. Google. Retrieved October 8, 2021, from <https://artsandculture.google.com/project/exploring-the-maya-world>.
17. Foundation, F. (n.d.). In ICTU Oculi - in the blink of an Eye. Factum Foundation. Retrieved October 8, 2021, from <https://www.factumfoundation.org/ind/spanish-gallery-bishop-auckland>.

# Acknowledgments & Colophon

## Thank you to:

Our partner: Friends of Cedar Mesa

The Perishables Project

Elpitha Tsoutsounakis: Assistant Professor, University of Utah

Alyson Wilkins: Collections Digitization Coordinator at Natural History Museum of Utah (UMNH)

## Special thanks to:

Dr. Laurie Webster with the Perishables Project &

Sarah Burak with Friends of Cedar Mesa

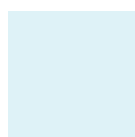
vW their feedback and guidance.

## Colophon:

The title text in this document were set in **Brandon Grotesque (Black)**, 24pt.

The subtitles, body, and label text was set in Avenir **Black**, **Medium**, and **Light**, respectively.

The colors used in this document are as follows:



#def2f7



#6bcbe3



#154a99



#f9f6e2



#f2dd66



#e6ab22



#000000

