



## Meeting visitor interest to advance conservation: A study from Indiana Dunes National Park, USA

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### ABSTRACT

Thousands of visitors to parks take part in ranger-led programs annually. During these programs rangers work to evoke and maintain interest in order to connect visitors with cultural and natural resources. Researchers have found interest is a powerful driver of learning, yet its role in the experience of adults who participate in ranger-led programming has not been well studied. Open-ended telephone interviews conducted months after a ranger-led hike to a prominent dune in Indiana Dunes National Park illustrate the extent to which visitors' recollections show continuity with their reasons for attending the ranger-led hike and their uptake of resource messages. Like other ranger-led programming, this hike was designed to make intellectual and emotional connections, to fuel long-held interests, and activate new stewards. The program was the result of collaboration among rangers and local scientists. Responses to a pre-hike survey were matched with post-hike recollections transcribed following an open-ended phone interview. The vast majority of post-hike interviews revealed a match between hike participants' initial interests and recollected details of the experience as well as new areas of piqued interest. In post-hike reflections, visitors mentioned factors that influenced the dune's formation, and the majority mentioned the problems caused by trampling. Participants recruited for this study grasped and recollected resource messages connected to their interests. They spoke of the need to protect a popular and puzzling geological formation.

### INTRODUCTION

US national parks host millions of recreational visits each year (National Park Service 2020). They are a natural backdrop for visitors to explore and pursue new and existing interests. Parks are rich with science phenomena, and visitors can participate in a variety of ways, following and expanding on their interests by reading signs and brochures, listening to audio tours, and

learning about park destinations from a variety of web sources (Storksdieck and Falk 2020). Here we discuss the potential and the research gaps related to ranger-led programming, visitor interest, and conservation messages.

With a well-deserved reputation for leading engaging talks and walks, National Park Service (NPS) rangers

have long been part of the informal learning ecosystem, extending opportunities for learning about science and history in out-of-school settings (Washburn 2020). Interpreters are among the most visible spokespeople for protected lands. In their thousands of contacts with visitors is the potential for inspiring stewardship and shaping behavior to minimize human impact on stressed ecosystems. Though interpretive rangers plan programs and talking points with care, they have few opportunities to learn which messages stay with their audience as detailed memories.

Rangers reveal the meaning of places set aside for protection and enjoyment. According to the goals of interpretation, they foster emotional and intellectual connections with the aim of long-term engagement with environmental stewardship (Bacher et al. 2007). On an annual basis, interpretive rangers (usually known simply as “interpreters”) have thousands of contacts with visitors (Rowe 2021) in both formal programs and informal encounters. Resource messages such as “Leave no trace” are tailored to the season and site. Encouraging visitors to stay on paths helps preserve lichen, grass, and delicate formations. Park divisions can work together on campaigns to slow traffic, thereby decreasing injury and death to vulnerable species such as turtles, scorpions, and chicks while touting the benefits to the visitor experience (Abrams et al. 2019). The Interpretation Development Program (the professional development arm of NPS) has also encouraged interpreters to facilitate conversations on climate change. In formal and informal interactions, interpreters may convey the destructive changes extreme weather conditions will have on beloved, fragile, iconic landscapes. Interactions may end with a call to action.

Though researchers have shown that physically experiencing or exploring a place can make an enduring impression (Knapp and Benton 2005; Forist 2018), little is known about how the science content and resource messages conveyed during ranger programs persist in visitors’ memories. Isolating and measuring the impact of a single program like a ranger-led hike is difficult because most such visitor experiences are part of a multi-faceted park visit that lasts more than a few hours, possibly extending over days or even weeks (National Park Service 2020). On social media, involvement can extend beyond a physical visit. Millions maintain a connection to national park units through social media. They share posts, offer memories, and contribute images. Yosemite National Park alone has more than 1.2 million Facebook followers. Parks support engagement among past and prospective visitors with Instagram posts of iconic species, resource messages, and alerts.

### Visitors’ interests

The concept of “interest” has received quite a bit of attention among learning researchers. While interest may begin with noticing and attending to something in the environment (National Research Council 2009), Hidi and Renninger (2006) pushed the definition beyond momentary, observable engagement. They characterized interest as dynamic, developing over time. Thus, interest triggered in a situation has the potential to evolve and culminate in expertise. When interest motivates learning, learners voluntarily stretch their understanding, develop a sense of ownership, deepen interest through associations with others, and explore ways to satisfy their curiosity (Azevedo 2013). With so much at stake for park-based biodiversity in what some have characterized as the Sixth Great Extinction, cultivating new allies and stewards with a sense of ownership, driven by curiosity, is critically important (Kolbert 2014). Research conducted in museum settings found that when the experience supported the interests of individual visitors, had high emotional content, was perceived as novel, and was supported by later experiences, people tended to remember it (Falk 2006). If these findings carry over to park settings, one could predict that visitors would retain resource messages if they connected to their interests, were perceived as novel, and were experienced with some emotional intensity.

Connecting tourism and human impact with education and conservation messages, researchers in a 2011 study confirmed that many wildlife tourists were able to recall the information they had been given about human impacts on wildlife as well as practical things they could do to make a positive difference (Ballantyne, Packer, and Sutherland 2011). These researchers essentially endorse melding interpretation with recommendations for actions that promote conservation for the benefit of wildlife. While popular geographic features or vulnerable plant life are not a focus of their study, the authors presume a similar approach to them will be effective. In a study of 180 Washington, DC, residents, the public’s interest and awareness in biodiversity coalesced around the plight of large, endangered mammals. Studies have confirmed the perception that the public was more concerned about large, endangered mammals, such as elephants and pandas, than other species that are less photogenic or perceived as pests, and yet are equally threatened or endangered (Shah and Parsons 2019).

Indeed, national park rangers do field thousands of questions related to viewing wildlife. Nevertheless, park visitors have other interests as well. In a 2009 study at Indiana Dunes National Lakeshore (now renamed Indiana Dunes National Park), visitors suggested a number of

## METHODS

### Context

Mount Baldy is a popular destination within Indiana Dunes National Park. The site presented unique opportunities for science learning and interest development. As the dune erodes, its footprint spreads south into an abutting parking lot. Mount Baldy routinely buries structures like stairs and fences. Generations of visitors used to enjoy scrambling on the dune until 2013 when a six-year-old boy fell into a hole there. That hole—which, it was later learned, was a “decomposition chimney” (i.e., a void) created by a buried tree trunk that had decayed—quickly filled in with sand, burying the child alive for a time until he was rescued (Sabar 2014). After the child’s rescue, the area was closed to the public. Using ground-penetrating radar and coring, geologists Erin Argyilan and Todd Thompson published research to explain the previously undocumented holes (Argyilan 2015).

In summer 2018, Mount Baldy was opened again, but only for visitors on ranger-led tours. The model used to develop the Mount Baldy hike involved a collaboration among resource managers, interpretive rangers, and local scientists. Collaboration laid a foundation so that rangers were able to present relevant content that matched the visitor interest they anticipated and while also making space for incorporating urgent resource messages. Prior to the re-opening, local geologists gave presentations to rangers, guided hikes, and produced 3D models to illustrate change over time. Park leaders and resource managers established priority conservation messages and briefed interpreters on sensitive restoration projects. Interpreters and Scientists Working on Our Parks (iSWOOP) supported the ranger–scientist collaboration and the development of visualizations to prompt discussion of change over time and scientists’ methods.

With scientists’ assistance, interpreters designed a multi-stop hike targeted to recreational visitors, which was offered twice weekly. Increased understanding of dune formation was a priority for the geologist, while the interpreters involved wanted to highlight the role of science in managing the dune. They wanted visitors to see that closing Mount Baldy was not a capricious decision, but one based on science conducted in the park. Further, they hoped showing how long it takes for species that stabilize the dune to recover would affect visitors’ behavior, specifically their compliance with NPS requests to stay on trails. The hope among collaborators was that visitors would retain resource messages if they were situated in a novel way and were experienced in the context of emotional intensity and intellectual stimulation.

themes for programming (Holmes et al. 2009). One hundred sixty visitors suggested 307 themes or topics. While the wildlife category garnered 67 comments, 73 comments fell into the general park category. Among those, visitors named “conservation efforts” and “future park plans.” Topics related to plants (45), history (44), and the dunes (49) accounted for nearly one-half of the total suggestions. While researchers have recommended that environmental organizations use charismatic species to attract a broad audience, and then teach about endangered habitats to address gaps in biodiversity knowledge (Shah and Parsons 2019), the effectiveness of such an approach among mixed-age audiences in informal settings is less clear. This article aims to probe the impact on visitors’ recollections after attending ranger-led programs that took this approach: focusing on a charismatic geological feature as an entry point to teaching about a complex landscape and its less charismatic characters that play a vital role in the ecosystem.

### Research questions

The literature suggests a ranger-led program that supported interests; made an emotional connection; was novel, informative, and delivered within a framework informed by responsible management practices; and was supported by later experiences would leave a memorable impression. In the present study, we collected data to answer the question of whether resource messages attached to a charismatic geological feature—Mount Baldy, a prominent dune in Indiana Dunes National Park—would be remembered by visitors two months or more after a ranger-led hike. Would the resource messages stick, or would other aspects of the park experience persist without a trace of content related to fragile ecosystems and stewardship decisions?

Because interest has the potential to affect recollections of critical resource messages, we set out to understand the interplay between the interests aroused prior to and the content delivered during a ranger-led hike. Overall, we wanted to know: How do memories of the ranger-led hike mirror or deviate from visitors’ initial interests? We therefore asked:

1. How did visitors express their interests when asked?
2. In what ways do visitors’ recollections show continuity with their reasons for attending the ranger-led hike (particularly with respect to enhancing existing scientific interests)?
3. In what ways does a ranger-led program at Mount Baldy enhance existing scientific interest?
4. In what ways do visitors’ memories reveal the stickiness of resource messages conveyed by rangers?

Following traditional interpretive practice, the rangers leading Mount Baldy hikes revealed aspects of the resource, fostering wonder for the unique formation and its long history (Tilden 2007). They also honed their storytelling of the nearly fatal 2013 accident to reach an emotional pitch and to further cement a connection to the resource. Novelty and emotionality were aspects of the experience we presumed would seed long-term recollections (as was found to be the case by Falk in a 2006 study of museum settings). However, explicit elicitation of visitor interest for purposes of tailoring the hike was not a priority goal in the restarted ranger-led hikes). Thus, after the collaboration generated visuals and talking points, the researchers in the present study offered to gauge visitors' interests with a pre-hike survey and post-hike interview.

We believed that Mount Baldy had the potential to spark or fuel visitors' interests in:

- geology (evolving understanding of the dune formation),
- the interaction of sand and trees (tree death and fungal activity),
- methods such as coring and ground-penetrating radar, as well as
- management decisions to protect a site of interest while conveying the potential danger to visitors.

Several interpreters led hikes during the summer of 2018. Interpreters followed a detailed outline, stopped the group at designated places, and shared the visuals and 3D models each time. Visitors gathered in the parking lot before the hike, at which time rangers ascertained who had visited Mount Baldy in the past and what they remembered. Asking visitors to confirm details had the potential to add to the vivid descriptions rangers offered. This technique also increased visitors' personal connections to the place by recognizing their past experience publicly.

Rangers at Mount Baldy were often pressed for time. They had content they wanted to cover before turning to other duties. If visitors approached prior to the walk, or even during it, rangers engaged with them (e.g., sharing information about other local attractions). However, as a matter of practice many rangers choose to leave the question of visitor interests closed and assume that their participants have read an online description or received a recommendation, and therefore the ranger can assume they have an interest in the content that will be presented.

During the hike, rangers presented 3D models of the lakefront and Mount Baldy's topographical footprint at

three different times. Then the group walked to a better vantage point for the slip face of the dune; entered the adjoining forest; stopped at two places to observe layers in the soil—visible markers or indicators of changing glacial conditions; climbed the dune; and gathered at two vantage points on the summit. At the summit, interpreters pointed out the jetty in the adjacent town of Michigan City, Indiana, which influences sand deposition.

Ranger-led Mount Baldy hikes were a model for science-infused programming: a carefully constructed program/hike that walked visitors through history, both recent and glacial, of a charismatic dune, with dramatic visuals of change over time and a story of named geologists' findings underpinning resource messages. In keeping with Tilden (2007) and Falk (2006), the sequence of the ranger-led hike revealed aspects of the geology, history, and human story that were place-specific and thus novel for participants who had not visited Mount Baldy before.

### Participants

Participants were recruited from six different hikes (of a total of 25) in July and August 2018. Seven hikes were observed for this study. Before the advertised hikes began, one of the researchers recruited participants by explaining that he was conducting a study on visitor experiences of ranger-led Mount Baldy hikes. This study was a complement to one of several efforts in the summer of 2018 designed to increase science content in park interpretive programs. For this reason, the research plan was to observe a minimum of five Mount Baldy hikes and recruit as many visitors into the study as were willing to participate between July 8 and August 10, 2018. Twenty-one adults agreed to participate (of 119 visitors on six of the seven hikes observed; one hike elicited no respondents). The participants completed a brief survey before the hike and agreed to a telephone interview afterward. Fifteen (10 women and 5 men) of the 21 adults were successfully contacted and interviewed. Interviewees were promised anonymity and received a lapel pin as a token of thanks. Four attempts were made by email and telephone to contact the remaining individuals, with no success. All individuals referred to in the article were given pseudonyms. By using a convenience sample, this small study attracted those predisposed to give an opinion as well as to be helpful (as the data collector framed the study as one that would help us to learn about visitor experiences on hikes like the one they were about to go on). While we did not collect data regarding frequent park visitation or past experience at Indiana Dunes National Park, most of those surveyed and interviewed offered comments implying a general interest in national parks, guided hikes, and/or learning about areas like Mount Baldy. More than half commented on

their pre-hike surveys that they knew little about Indiana Dunes or were visiting the area for the first time.

### Instruments / analysis

Two instruments and the datasets they generated are the basis for the study: (1) survey responses that probed for interests of visitors before the ranger-led hike; and (2) follow-up phone interviews with 15 visitors. No demographic data were collected from the self-selected convenience sample. The brief pre-hike survey included five questions: two probed visitors' scientific interests about Mount Baldy, one asked about prior knowledge, one asked reasons for participating, and one elicited contact information for a phone interview. Data on knowledge gain were analyzed and reported in Forist et al. 2021.

Telephone interviews of 10–20 minutes in length were conducted about five months after the hikes. (See Appendix A.) The interviewer used a phenomenological approach to data collection and analysis, which seeks an understanding of the meanings people give to events (Mabry 2000).

This process examines the experience of each participant and recognizes each experience has a relationship with the phenomenon (Smith and Shinebourne 2012). There are generally three research processes that compose the phenomenological method: (1) investigation of the phenomenon (in this case, participant recall of the ranger-led experience), (2) identification of general themes/ essences of the phenomenon, and (3) delineation of essential relationships among the themes (Farmer et al. 2007; Creswell 2013). Our open-ended interview questions allowed respondents a “voice.” The interviewer did not impose or shape responses with close-ended questions.

The interviews began with an open-ended question: “Can you please tell me about your Mount Baldy hike?” Follow-up questions were based on interviewees' first response. For example, if the interviewee mentioned buried trees, the interviewer said: “Can you tell me more about the buried trees?” The interview method avoided bias based on social desirability. There were few if any cues about what the researcher would like to hear or was expecting to hear. The interviewee determined the beginning and ending with few prompts. The interviewer followed the topics and themes that were salient to the interviewees. Further, this approach was consonant with the goals and expectations of informal learning, which seeks to contextualize learning, build on prior knowledge, avoid methods that might trigger memories of school failure, and be shaped by learners to suit their needs and interests (National Research Council 2009).

Analysis included manual coding of reasons for choosing the hike and scientific interests into emergent categories.

Subsequently for each of the 15 cases, coders matched areas of interest articulated on the pre-hike survey with participants' post-hike recollections. Emergent categories in the pre-survey data were noted and related to motivation to attend. These were compared and contrasted with post-hike recollections. Two coders noted the details recalled, including factual/ intellectual engagement with information about the dune and emotional reactions. Finally, the researchers highlighted where the words “interest,” “interesting,” and “interested” occurred in the transcripts and made notes about the use of these words to describe surprising dynamics and facts.

Throughout these processes, we strived for consistency and dependability, an “internal reliability in which the findings of an investigation reflect, to the best of our ability, the data collected” (Merriam 1995). No significant discrepancies among coders arose.

## RESULTS

For each of the research questions, we describe the results from 15 pre-hike surveys and post-program interviews. Essentially, we wanted to know: What was memorable and how do memories of the ranger-led hike match or deviate from participants' initial interests? Quotes from visitor interviews illustrate the ways park visitors made sense of their experience. While this is a small study, the open-ended questions gave space to participants to express their own motivation, interests, and scientific questions, and the lasting impressions of the experience and the need to protect Mount Baldy.

### How did visitors express their interests?

We begin with the results from the survey data. To the question: “What are the reasons you chose to participate in today's Mount Baldy Hike?” the majority of individuals gave a reason tied to one or more of their interests, though a few, 3 of the 15, based their decision on logistics: it fit their schedule. Additional criteria included cost: “it was free.” Nevertheless, interest was still a factor: “Out of the schedule of events, that one seemed interesting, not too long.”

The reasons (apart from logistics) fell into three categories: interest in (1) visiting a place that was deemed special (11 of 15 respondents' comments mentioned restricted access, the national park designation, or scenery/a special view); (2) taking a hike, partaking in an outdoor, physical (but low-risk) activity (9 of 15); and (3) learning about dune formation and changes (8 of 15).

When analyzing scientific interests, we found clusters of responses. Adding to their original reasons for

participating, respondents mentioned an interest in how Mount Baldy was formed, with 13 different questions/comments. A few responses fell outside these categories. They included an interest in “what we can do to help,” “any information,” and the weather, as well as a statement of “no interests.”

Interest in human history, human impacts, and how NPS would manage access for visitors were on the minds of 7 of 15 survey respondents, with 11 related comments, such as:

- Why can't [visitors] go up alone;
- How will they be able to safely reopen it without ranger-led hikes;
- Preservation efforts;
- Future plans; and
- Past uses/legends stories, quirky facts, and history of people in the area.

Eight of 15 respondents listed specific questions and interests related to plant life and wildlife. Visitors mentioned “deep interest in wildflowers and butterflies”; interest in the “biodiversity of the park,” the “biological system associated with it”; and a love for “botany in general”; and curiosity related to “what wildlife is around”; “what type of plant life” is found in the area; and “significance in habitats.”

More than two months after their pre-hike surveys, when asked about their experience, visitors explained the circumstances of their visit, noting companions, the weather, or time of day, and organized their comments according to the chronology of the experience. Most readily spoke of their participation in a larger context—explaining a lifelong interest in parks, an interest in learning about the local area, or an interest in revisiting a place that held fond memories. Specifically related to the ecology of the site, several spoke of the revised conceptions of how dunes, fungi, and trees interact to form dangerous pockets or decomposition chimneys. The ranger-led hike “filled in gaps,” “solved a mystery,” and “equipped us to come up with answers.”

“Interesting” was a term 11 of the 15 interviewees used. In at least six instances, “interesting” referred to a dynamic interaction, such as how NPS will manage the site. Other times “interest” signaled an intention and state of mind, as in “I’m interested to learn more.” Four of the 15 planned to return, demonstrating the potential for maintained interest in Mount Baldy. “Interesting” was also used by one participant to describe a fact which struck a chord. Given the chance to ask the interviewer questions, a majority expressed interest in the study they

were part of. They asked how the study was going and followed up with questions about its purpose.

The interviews enabled us to learn in what ways a ranger-led program at Mount Baldy enhanced existing scientific interests. We found evidence that the ranger-led program enhanced existing interest. Of the 15 responding to the interviews, the recollections of 14 matched at least one of their initial interests expressed in the survey. The outlier expressed no scientific interest in the pre-hike survey. The participants offered specific details in their recollections. For example, all (100%) of those who initially expressed interest in how Mount Baldy was formed later relayed information about the dynamics of dune formation to the interviewer. Participants recalled the role of the wind off the lake, which affects the movement of the sand. Three referenced glacial action and one mentioned the bank (the jetty) installed off the coast of Michigan City, which alters patterns of sand deposition.

Eight of those who expressed interest in plants and wildlife in their pre-hike surveys spoke of plants (oak or cottonwood trees and “vegetation” or grasses) in their interviews. Essentially 100% of the people interested in plants retained this interest post hike. Trees and grasses in visitors’ recollections were related to the dune and its stability as well as the integrity of the ecosystem. Participants mentioned cottonwood trees, oaks, and grasses, though the qualities of the trees were sometimes reversed (oaks decay more rapidly when covered by sand; cottonwoods remain solid forms even when buried in sand). Grasses were mentioned by all eight (100%), though just one tried to summon the common name, marram grass.

Similarly, six participants in the sample (86%) expressed an interest in human intervention, influence, and history. All (100%) recalled and relayed details about humans’ effect and impact (trampling, restoration efforts, presence of industry). One explained the jetty in Michigan City had changed deposition patterns, while others mentioned the work the park is doing to replace fragile grasses that help control erosion. Visitors recollected that recent research added to scientific understanding of interactions between dunes and trees, and that dune change and formation was ongoing.

One participant described the hike as interesting, but she recalled few details. And when prompted, she explained that the houses from the 1933–34 Chicago World’s Fair (a collection of structures that decades ago had been dismantled, transported to a location down the shoreline, rebuilt, and placed under the care of NPS) were more interesting than the “pockets.” Initially her main reason

to participate was to climb a tall dune to get a good view. The hike itself was disappointing as the walk was short.

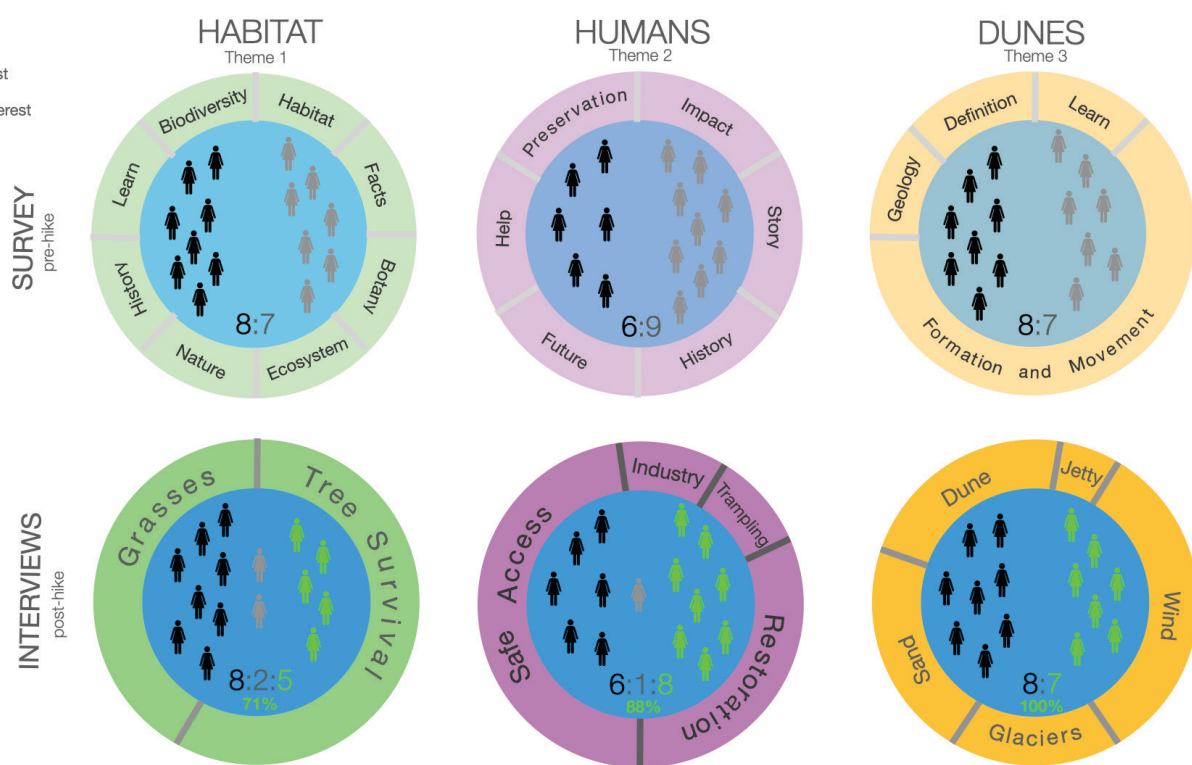
Figure 1 shows the number of respondents for whom the hike matched their pre-hike interests as well as the number whose interest was aroused, as demonstrated by the details they recollected and conveyed during the post-hike interviews. In each category, the interests were matched and sustained for all of those with initial interest, and as many or nearly as many more participants showed interest in the post-hike survey. The number of participants showing interest doubled in the category of human impact (6 participants with initial interest in this topic sustained interest and 6 more showed interest in the post-hike interview). In the category of plants, 8 participants with initial interest sustained interest and 5 more showed interest in the post-hike survey, a 160% increase in plant-related interests. And in dune formation, 6 of 9 participants' initial interest was matched and sustained and an additional 6 showed new interest. We also calculated the percentage of visitors with newly expressed interests in three themes or categories, matching individual pre-hike and post-hike responses. As shown in the second row of Figure 1, interest grew. As expressed in the post-hike interview, of those with no previously expressed interest for habitat, this percentage post-hike was 71%; for humans, 88%; and on the theme of dunes, 100%.

This particular ranger-led program did not enhance visitor interest in wildlife. Generally, flora and fauna were an interest (8 of 15 respondents listed specific questions and interests in plant life and wildlife). Specific responses to the open-ended survey item included “deep interest in butterflies,” “the biodiversity of the park,” “general ecology,” “animals that live there,” and “what wildlife is around.”

As an example of how the ranger-led program connected to existing interests, we examined DJ’s responses. DJ identified himself as an outdoor enthusiast who sought out the hike for a view, exercise, and local park knowledge. Early in the interview, DJ established himself as a supporter of national parks: “I’m definitely behind any of those federal efforts to revive those kinds of areas.” DJ frequently visited protected lands. He mentioned several dunes he had previously visited. DJ remembered “the natural air conditioning coming off Lake Michigan” and he connected the pleasure of a cool breeze to epic glacial action, which formed the Great Lakes.

In his pre-hike survey, DJ expressed interest in dune formation. In recollecting the hike, he mentioned the dunes are dangerous: “the trees that had been covered up and rotted and now, could collapse and you can end up 20 feet down. That was pretty darn interesting.”

**FIGURE 1.** Matching and expanding visitor interest. Analysis of post-hike interview responses revealed that memories of the ranger-led hike matched interests visitors expressed in pre-hike surveys (black silhouettes), whereas nearly all of the participants who didn’t express an interest pre-hike (shown in gray), acquired an interest (shown in green).



Underscoring this point, DJ said the interesting thing that he took away was that the cottonwoods are not affected the way the oaks are by sand movement. DJ's recollection had a strong emphasis on safety—“that's not a safe place for people to be wandering around aimlessly ... they could be covered up in ... their own grave right there on site.” Recollecting this point triggered an insight: “I think that was the highlight of it for me ... what this dune actually was about and how it varied from the Oregon dunes.” He continued: “Sand dunes are unique places.... It's kind of a theme, you know.” Note that in DJ's case, the ranger-led hike tapped into a long-term interest in dunes. New information about trees, sand, decomposition, and safety added to his pre-existing knowledge.

#### **In what ways do participants' memories show continuity with their initial reasons for attending the ranger-led hike?**

Initial reasons for attending included learning about the dune and the area, seeing a special place, and hiking. We begin with learning. Like DJ, 3 other participants began with interest in dunes, and their interviews subsequently revealed interest in both plants and human impact. Besides the 4 participants with a single expressed interest in dunes in their surveys, which grew to include plants and human impact, 2 more participants started with a single area of interest (human impact). Eight participants started with two areas of interest (dunes and plants or dunes and human impact). As described above, initial interests were matched in the post-hike interview for 14 of 15 participants. As shown in Figure 1, the number of participants interested in each topic increased by more than 50% and in some cases doubled (an increase of 100%). In the case of interest in dunes, 9 participants originally expressed interest. Seven additional participants showed interest in dune formation in the interviews along with 6 of the original group. Interest in human impact was slightly less than interest in the dunes in the pre-hike survey (7 out of 15). During the interviews, interest in human impact was matched for 6 of the 7 participants and mentioned anew with interest by 8 participants. Plants were popular on the pre-hike survey (8 expressed interest). This topic garnered interest among 5 additional participants.

Overall, 14 of the 15 (93%) were forthcoming with details on a topic not previously mentioned in their surveys, indicating areas of expanded interest. The post-hike interview comments of 14 participants demonstrated continuity of interest from pre-hike to post-hike and 13 of those participants demonstrated one or two additional areas of interest. Just 1 participant's interview demonstrated no new interest areas. Most commonly added interests were human impact (9 participants newly mentioned this in their post-hike surveys); dune formation (mentioned by

7 participants); and plants (mentioned by 5 participants). Interviews revealed new connections and expanded areas of interest as a result of the hike. Eight people added one area of interest, while 5 people added two areas of interest and 1 person who had not claimed any interest on the pre-hike survey exhibited interest in dunes, plants, and human impact.

Examining transcripts, we found evidence for recollections tied to novel and emotional content. The human impact was expressed in a variety of ways: the role for industrial machinery in a rescue, the vivid images of people climbing and trampling, the potential danger. Most details mentioned related to the story of the accident that nearly claimed the life of the six-year-old boy. Comments about the shape of the dune were more common than references to the glacial forces that acted on the land. Several participants mentioned seeing 3D models of the dune shape changing over time. A few remembered acting out the impact of waves on the shoreline dune. It seems that interest was aroused and maintained by embodied activity and tactile, colorful 3D models. The rangers were focused on specific roles plants played in the story of Mount Baldy. Visitors mirrored this emphasis, recalling the process that led to holes in the dunes. They contrasted the way different types of trees responded when buried, and mentioned the importance of the grasses, or vegetation generally, to preventing erosion.

As mentioned above, 66% wanted to see a special site. All 15 interviewees offered observations of the natural surroundings. Participants remembered the terrain (commenting on the steepness of the dune and the forested area, the parking lot bumping up against a fence and the dune). The experience lived up to expectations.

I recall, I enjoyed it quite a bit. I mean it was a great view.... There was some tough parts getting up there.... That was a climb.... Yeah, got some great photos and, and my son really loved being up there and learned a lot about the dune and the holes that are being created and that sort of thing.

Another expanded on her survey response. She told the interviewer about her quest to learn more about the Midwest region:

I'm interested in learning any information I can. I was just curious, you know, 'cause I grew up here in the Midwest and my travels usually take me outside of the Midwest. So, I wanted to explore the Midwest area more.... [I] didn't really know much about Mt. Baldy.... Most of my other dunes

experiences have been like White Sands and Colorado Great Sand Dunes National Park. So a lot different textures, dunes, so I was interested by the vegetation cover of the dunes....

For the 9 visitors who identified hiking, physical activity, wanting to get exercise, or climb, a few registered disappointment that the hike wasn't longer. However, for 1 participant, the ranger-led Mount Baldy hike triggered an interest she was explicit about pursuing. She told the interviewer: "It was a really good experience and as soon as I came back, I said, "Let me see if there is any more of those guided things I can do to learn more about the area." The hike changed the way she regarded the landscape. After the ranger-led hike at Mount Baldy, on her own she looked for signs of past glacial activity. "Even yesterday I was out in Miller Woods [another part of Indiana Dunes National Park], and I see this deviation and I see these low-lying pools of water. It makes me think, 'Ha, is this from the recent receding glaciers?'"

Like those who returned to topics touched on in the pre-hike survey, Amanda's interview revealed continuity in her pre-hike and post-hike interests. Amanda had strong memories of Mount Baldy and had been wanting to return for some time. In her pre-hike survey, she wrote, "I just want to see it; it's been almost twenty years since my last visit." Though she expressed interest in her pre-hike survey in wildflowers (regional) and butterflies and stated with intensity, "I love botany in general," Amanda answered "none" to the question: "What are you interested in learning about Mount Baldy during today's hike?" By joining the hike, Amanda gained access to a place that was personally significant. During the interview, Amanda reminisced about a visit with her family decades ago. However, Amanda admitted having a hard time recalling the things that she did on the hike. Though Amanda had a hard time summoning details and facts—she remembered being in the woods, taking it all in. Her recollections can be seen as well-aligned with her motivation.

### Visitors' memories revealed the stickiness of resource messages conveyed by interpreters cultivating and inspiring concern for the dune.

The main resource message related to human behavior—namely, minimizing trampling. Reflecting interest in human presence in their pre-surveys, 6 participants expressed related questions including: preservation efforts, efforts to sustain/maintain the site, and why visitors are prevented from going up alone. Along with questions about past uses, stories about legends, and the history of people in the area, participants were keen to hear about future plans. "How will they be able to

safely reopen it without ranger-led hikes?" one visitor wondered. In their interviews, 7 participants mentioned how the park was working on restoration. Nearly all (13 of 15) made comments about NPS restricting access and rangers encouraging visitors to stay on trails to avoid trampling the grass. One visitor recollected that the rangers were knowledgeable and friendly and were also "educating people about the necessity to honor the boundaries ... so that, you know, we weren't damaging the dunes that are fragile...." Another participant said:

I guess where Mount Baldy is concerned, I didn't realize that there was so much human impact on the dune that had caused all of the dune to move back so far and kind of lose its shape. So, I found that to be an interesting aspect of it that I had no idea about before.... Apparently it should be a lot more vegetated.

The ranger's comments left a strong impression in terms of Mount Baldy as a sensitive area.

Priya exemplifies participants who were swayed by the need to preserve Mount Baldy. Priya said her reasons for participating in a Mount Baldy hike were "an opportunity to see nature and this curious dune formation. She wrote: "I'm interested in learning any information I can." In her interview, the connection to resource protection was interwoven throughout. For example, "I found people working there that were very helpful and very nice, which ... makes me want to learn more about the area, one, and then, two, it helps me respect the area...." After reading about the marram grass, seeing images of it, Priya could explain the impact of visitors going off trail: "You will destroy the grass, and just have the common sense to know that this, the trails are marked out where they are, and the grasses are only a first line of protection preserving the dunes for the future people to come see them...." Above all, she wanted to be able to "come back in 15 years and see it."

A different interviewee made her point about the need for collective action: "If you would do what you're supposed to do and kind of help maintain things, and we can all enjoy it that much longer." Notable in these comments is not only implied approval for the park's preservation goals, but a sense of collective action needed for an individual benefit ("do what you're supposed to" and "we can all enjoy it").

## DISCUSSION

To review: visitors chose the Mount Baldy hike in order to: (1) visit a place that was deemed special; (2) hike; and (3) learn about dune formation and movement. Just

6 participants (40%) initially expressed an interest in human history and impact, past, present, and future. They wanted to know about how the area would be managed and what preservation initiatives were underway. No one mentioned grass specifically prior to the hike (though there was interest in plants and botany among 8 of the 15 survey respondents). It was striking then to find the vast majority spoke about grass or vegetation planted to prevent erosion after the fact and emphasized the importance of not trampling it. The majority recalled the critical role of vegetation in preventing erosion. Nearly all interviewees (87%, 13 of 15) at some point mentioned the theme of protection, often coupled with safety both for humans and for the dunes.

By matching pre-hike interests and motivation with post-hike recollections, we saw continuity across time in interests, particularly related to plants. In addition, the great majority of visitors retained a memorable conservation message, which was an extension of their interests in botany and their questions about human impact. Enduring interest in parks, the region, dunes across the US, and humans' interaction were evident in surveys and interviews. Visitors took this one ranger-led hike and situated it in different ways—as one park among many, as one stop within a multi-faceted park experience, as one of several visits in a lifetime, or as one stop to build familiarity with the area. Visitors, like DJ, who were familiar with other dune landscapes compared and contrasted them with Mount Baldy.

For many, the hike was couched within a broader experience of visiting the area or visiting many parks. The ranger-led hike contributed to visitors' goals such as learning about the area, reconnecting to a childhood experience, and finding physical pleasure walking through a forest and enjoying a stunning view. In their recollections, visitors incorporated memories of weather, companions, terrain, as well as content that matched their initial, pre-hike interests. Our results show that a ranger-led experience can capitalize on visitors' place-based interests and contribute to long-standing interests while imparting a resource message. It was striking that 11 of the 15 interviewed were new to the area. They did not have a history of scouting, walking the shoreline, or birding in the area. For them, the content of the hike was pretty new, and yet months afterward they summoned details about plants, dune formation, and humans' impact on the site. Their detailed memories of the content show the potential for this kind of science-based, ranger-led talk that capitalizes on visitors' interests.

Wildlife did not come up in the interviews. In other Indiana Dunes programs, beavers, bats, spiders, and the

unusual diet of carnivorous plants of the Pinhook Bog are points of discussion, but in this program, wildlife was absent. Given that initial interests appear to foreshadow the content participants find interesting and memorable, rangers could find creative ways to incorporate wildlife into their talking points, thereby piquing and extending visitors' areas of interest.

We also noted that the visitors interviewed did not report developing their interests in formal ways. For example, no one mentioned taking an online course about geology after having their interest aroused. Interviewees did not talk about joining a community of interest, such as a dune preservation group. Just two mentioned encountering similar content or ideas in the media or traditional exhibits.

### Implications for practice

Rangers can quickly identify some visitors' interests. Binoculars and fishing poles are good clues. However, visitors' interests are not always so obvious. To learn about visitors' interests, rangers have to make an effort to elicit them. Due to limited time for their program or large numbers of participants, rangers often forego this step in order to proceed with their planned program. This small study indicates that taking visitors' prior experience and interests into account may serve the long-term goal of inspiring concern, of making a resource message stick. A talk that emerges from a ranger's passion may or may not be a close match with visitors' interests, whether those be observed over time or elicited at the beginning of a program. In this case, developing the Mount Baldy hike program outline was a group project. The rangers and scientists working on it were long-time residents in the area and frequently interacted with the public (as opposed to seasonal staff with few ties to the area). They were able to anticipate visitors' questions. At visitor centers, rangers develop a repertoire of recommendations (tailoring suggestions to visitor interest and capacity—such as “a good hike for birding”; “a loop you can do with a stroller and a toddler”). During ranger-led walks and talks like the Mount Baldy hike, a similar repertoire of strategies to elicit visitors' interests could be useful. This approach aligns with the commitment to supporting audience-centered informal learning (Washburn 2020). There are instruments available (in English and Spanish) that can be used or adapted for eliciting visitor interest (Merson and Pattison 2020).

The data support the practice of tying resource messages to high-interest topics. The study conducted of ranger-led hikes at Mount Baldy shows that tying resource messages to a popular and unique landscape feature can also help cement those conservation messages. An

awareness of visitors' interests as dynamic and multi-stage may help rangers tailor content, effectively deliver resource messages, and feel more confident in supporting visitors' connections across time and place. The model used to develop the Mount Baldy hike, which, as noted, involved a collaboration among resource managers, interpretive rangers, and local scientists, is promising. Collaboration insured that rangers had relevant content, could anticipate and elicit visitor interest, and could then capitalize on visitors' pre-program interests to influence visitors' memories of urgent resource messages.

### Study limitations and future research

A longer-term and larger study could attempt to detect links between visitors' recollections of resource messages *and* delivery by the different rangers, particularly if rangers' delivery varied (for example by using humor, telling a story, or otherwise adding drama to certain parts of their programs). Researchers could also compare the effectiveness of resource messages when paired with an invitation to visitors to take action: for example, by participating in a citizen science study, helping with trail maintenance, or joining a park friends group to raise money or to volunteer in other capacities. Both approaches could deliver more specific recommendations for practice.

In this small sample, nearly all participants (14 of 15) articulated one or more scientific interests. Participants expressed excitement, interest, and motivation to learn about phenomena in the natural and physical world. In a larger sample, visitors' level of interest and motivation might vary and thus the duration and impact of the ranger's message might be less evident. In this study, the person with the strongest emotional connection to Mount Baldy also remembered relatively few details pertaining to the formation of the dune and geological studies. Is it the case that nostalgic visitors are too preoccupied to attend to resource messages? Future research could look at this type of visitor, those motivated by a personal and emotional interest in a place, to identify the facilitation strategies most effective in sustaining an intellectual, scientific interest that can thrive alongside a strong emotional connection.

Initial prompts asking interviewees to comment on their memory would increase confidence in the sample. Even a rating based on self-report (e.g., "Most people who know me think I have a good memory for details") would give researchers a way to interpret gaps in recollections. In this study, it is unclear if participants who had trouble recalling details generally don't remember details or if this particular experience wasn't memorable. We can imagine starting with an open-ended, phenomenological

approach, which would then be complemented by probing questions related to the pursuit of ongoing interests for researchers interested in sustaining interest among visitors. We also do not know why interest wasn't matched for 3 of the interviewees who initially expressed interest in dunes. Perhaps they were satisfied or not challenged or found the history duller than they expected. Perhaps details about humans and plants were more interesting and eclipsed their initial interests.

The sample of visitors skewed toward those who want to help, who are inclined to revisit their memories of park experiences, and who seek out ranger-led programs. Although one might claim that ranger-led programs are preaching to the converted, these visitors often facilitate visits by less environmentally minded friends and family. Their determination to preserve protected land can be contagious, and so research on how they make sense of their park experiences and what they remember and pass on are critical to broader conservation efforts.

### CONCLUSION

Parks are collectively held and managed lands that host recreation, research, and informal educational programming. Working together, park managers, interpreters, and scientists can enhance park visitors' understanding of efforts to steward parks and protected areas for lasting enjoyment. Crafting and tailoring resource messages so that they match visitor interests hold promise for increasing the lasting impact of those messages. Our findings indicate that charismatic megafauna are not the only viable vehicle for resource messages. Human impact and popular geological features can also perform this function when they are tied to a feature of interest.

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## APPENDIX A. POST-VISIT TELEPHONE INTERVIEW SCRIPT

Note: This interview will follow a primarily open-ended format. At some point in the interview, specific questions will be asked based on visitor responses to the pre-hike survey regarding their stated interest and knowledge of Mount Baldy and Indiana Dunes National Lakeshore.

Hello, this is \_\_\_\_\_ [Researcher's name and affiliation]. I am studying the experiences of visitors like you who participated in Mount Baldy Hikes at Indiana Dunes National Lakeshore.

Is it okay with you if I record this call/interview?

- If the respondent answers **yes**, engage the TapeACall function on the phone and continue the interview, taking reference notes for follow-up questions.
- If the respondent answers **no**, continue the interview, and take detailed notes.

I met you on the (date of respondent's hike) Mount Baldy Hike at Indiana Dunes National Lakeshore. This interview is primarily open-ended. To start with, I do not have specific questions. I would simply like you to tell me about your experience on the Mount Baldy Hike that day.

- Using the phenomenological method, a response is often followed by the interviewer asking, “Can you tell me more about that?”
- 
- Toward the end of the interview, or if it is more appropriate after a particular statement by the respondent, the interviewer will inquire about the respondent's pre-hike knowledge and interests as stated on the pre-hike survey.
- 
- Additional follow-up questions may be asked based on what the respondent reports about their park experience. These questions will emerge from the conversation and the notes taken by the interviewer during the interview itself. For example:

You stated that.... Can you tell me more about that?

- At the conclusion of the interview, the interviewer will say:

Thank you very much for your time. You have provided valuable information for our study.

[Ed. note: at the time of the interviews, the park was designated as Indiana Dunes National Lakeshore, and is thus referred to in the script.]



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