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Vincent Santucci's NPS Oral History Project, 2016-2024

Jim Mead
July 31, 2020 and August 4, 2020

Interview conducted by Vincent Santucci
Transcribed by Teresa Bergen
Edited by Molly Williams

This digital transcript contains updated pagination, formatting, and editing for accessibility and compliance with Section 508 of the Rehabilitation Act. Interview content has not been altered with the exception of omitted birth date PII.

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Narrator: Jim Mead
Interviewers: Vincent Santucci and Justin Tweet
Date: July 31, 2020 and August 4, 2020
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Transcribed by: Teresa Bergen

Transcript

[START OF INTERVIEW]

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Mead: Okay. Go for it.

Santucci: Thank you. So today is Friday, July 31, 2020. My name is Vincent Santucci. I'm the senior paleontologist with the National Park Service Paleontology program. Today we're interviewing Dr. Jim Mead, who is currently the chief scientist and director for the Mammoth site at Hot Springs, South Dakota. He's also worked as a professor at East Tennessee State University and Northern Arizona University. Jim's been involved in some really important paleontological projects in National Park Service areas that we're going to try to capture that information today. We're also joined today by Justin Tweet, a paleontologist for the National Park Service. The interview is being conducted by telephone. So, we're going to go ahead and jump into questioning. Thank you, Jim, for your time.

Mead: Sure. No problem.

Santucci: So, the first question's going to be—

Tweet: The first question will be for a thousand dollars, what is your favorite mammoth?

Mead: (laughs) What is my favorite mammoth?

Santucci: No, no, no. Break.

Mead: The pygmy mammoth. There you go. Done.

Tweet: Okay. (laughter)

Santucci: So, the first question is, when and where were you born?

Mead: I was born in Tucson, Arizona. My parents were both biologists. My dad was a zoologist, chairman of the zoology department at that time at the University of Arizona in Tucson. So, I grew up with that kind of a background to look at things, question things, what is that, why is it there, why do those two occur together but other ones don't? That kind of concept.

Santucci: Great. And as you're growing up, before you attend a university or college, are there any experiences that moved you in a direction of interest toward natural history, towards science, paleontology, or geology?

Mead: Oh, yeah. There were some critical things. First of all, when my dad would do research. A lot of his research was on the giant African land snail. That stemmed from his work with the military in World War II in the Pacific. So my early years were spent traveling around the South Pacific on ships and boats. We lived in Sri Lanka, then called Ceylon. And as I got older, I would of course help my dad with his field work. So I got used to quote "taking notes," helping take notes, doing various things that he needed on his field research. So that became kind of typical. They thought that during summertime between school sessions, I should read. Probably keep me out of trouble. I didn't want to read the typical things my sister read and stuff they suggested. I wanted to read about bison and archeology and that sort of thing. So once I got into that, that took me, pushed me into a direction to natural history museums.

And a colleague of my dad's at the University of Arizona was Emil Haury, an eminent archeologist of the Southwest. And I met him and he said, "Well, why don't you in your spare time volunteer some work here at the Arizona State Museum on the campus of the University of Arizona?" And I just kind of caught my breath, that would just be so cool. So if I wasn't competing with wrestling and weightlifting, I was working at the Arizona State Museum. And then that was during probably my junior, senior year of high school, so that would be the late '60s.

Then come college, I was working with him on weekends during the school year and during the summer. So I was actually at times a paid archeological assistant sort of thing. And that just kind of drove home research, studying, taking notes, asking questions, looking for evidence that would answer questions, that sort of thing.

What really got me going was the Museum of Northern Arizona in Flagstaff was offering a summer assistant program. They needed summer assistants to do excavations in northern Arizona. And in the summer of '71, I thought well, let me apply for that. And the director said, "Well, this is really for people who've graduated from college and who are graduate students. But go ahead and apply." And when I applied, they saw that I'd had so much work in the labs and in the field already that I got the job. So that told me that I had to work hard and keep doing what my passion is. So that's really kind of where it quickly developed.

But then I realized I don't really want to study the artifacts. I don't want the pot sherds. Those are cool, but I didn't want to study them. Lithics, nice. They're rocks, broken, cool. Didn't want to study them. A lot of that I didn't really care for. I liked the basketry was neat because it was a plant. The bones left over from being butchered and eaten, those were cool. So I found myself kind of quickly moving towards that aspect.

But I think one last thing real quickly that really crystallized it all that I wanted the natural history was in 1969 when I was a high school student, there was an Arizona Academy of Science at the time was going to have a river trip down the Colorado River in the Grand Canyon. And I could go on that. And my dad suggested that I go by myself, not with him. Of course that was his way of saying, "Hey, Jim, it's time to grow up and get the hell out of the house, and learn your own things."

So I went on this trip. But the person running the trip was a professor, also at the University of Arizona, named Paul Martin. So I met Paul Martin. And he talked about caves and

packrat middens. And as we went eight days on a raft through the Grand Canyon, it was just like oh my goodness, look at, I mean, there are all these secrets of the past right there. And I asked how many of these caves have been looked at. And he says, "Well, none, really, other than Stan's Cave," which is being dug at that time. And then a little bit in Rampart Cave, which is at the far western end. And I thought, well, this has to be done.

So all those quickly crystallized in my mind as this is my passion. I know what I don't want to do and I now know what I do want to do. How's that?

07:30

Santucci: Wow, that was worth the price of admission to hear that. To be on the river trip with Paul Martin, the first time you meet him. What a great opportunity that would be. How much would you pay for that experience now?

Mead: Well, you couldn't buy a trip like that. But trips like that of course now are visitor oriented. And this was one for the academy members, who I met there. There was only one other kid along. And we kind of bonded together and did a lot of stuff together. I remember Paul saying, well, one night we were down by what's called Shinumo Creek, not too far from where a lot of people can do some hiking. And we were talking packrat middens and shelters and caves. And he said, "There should be middens anyplace. There are secrets of the past where you can find plants and animals."

And I go, "Well, maybe that shelter way up there."

And he goes, "Possible."

Well, I thought. Enough said. So I got up super early in the morning. And I ran up the hill and went in there and found a midden. And told the people down at breakfast. So a sample was taken. And it turned out at the time to be the oldest packrat midden in the Grand Canyon. Well later on, of course, it became one of the younger ones. But that just, it's like oh my God, I found some cool stuff. And it was so easy to do, you know? So all that kind of came in quickly.

Santucci: How fun. That's great. I was unaware of that experience. So then, I guess the next question is, where did you go to college or university? What program were you involved? Did you enroll immediately wanting to study natural history or geology or some other topic? And who did you work with?

Mead: Well, you know, this is Vietnam time. My number was called for selective service, but I got a 2S deferment and made sure that I did well with my grades in college. I went to the University of Arizona there in Tucson because at the time, with my dad working there, each semester cost me only 176 dollars. Why wouldn't I go there? And besides, all the cool things that I wanted to study were being taught by the professors there. Paul Martin and Emil Haury and those departments. So I was in anthro. But my minor was geology. And very quickly it was kind of like, I want to do less anthro, more paleoenvironmental studies. And so I finished off my degree, my undergraduate degree, in '74. But knew well that I wanted to go for a master's, if not a PhD.

So at that time, I met a guy named Peter Mehringer. He was up at Washington State University. The summer of '74 and then the summer of '75, Vance Haynes and a guy named Larry Agenbroad and Pete Mehringer were excavating at the Lehner Mammoth-kill site near Hereford, southeastern Arizona. And they said would I like to work there. Well, you know, I just about wet my pants on that one. So I worked paleontology there, doing archeology and paleo. And it was kind of like yeah, archeology's cool. Look at the projectile points. Fine. Wow, mammoths. You know, camels. Dire wolves. So I cranked on that as hard as I could, as fast as I could. And that cinched it. My master's is going to be environments. Now my dad teaching me about snails and his work on snails, I said, well, how about I do a master's on all the mollusks that are found in the sediments at the Lehner Mammoth Site and other similar types of sites in that area of Arizona. Pete Mehringer said sure, come on up to WSU there in Pullman, Washington, and work on that.

So I went up there for a year and learned a lot about pollen from Pete Mehringer. And a lot about just everything, secrets of the past sort of thing. And then a year later moved back to Arizona to start my master's really with Paul Martin and Vance Haynes and all in the department of geosciences. So that was a different college, different environment of education. So I didn't feel goofy about staying at the same place. And I did my master's on the environments using mollusks for, let's see, I finished in 1979. So that took me essentially three, four years, whatever, to go to WSU, learn stuff, bring it to Arizona, finish it, and that sort of thing.

Working with Paul Martin, of course, put me up at Tumamoc Hill, Desert Lab Research. And that's where I met people doing more on packrat middens and everything. It's kind of like oh my God, yes, this is what I'm doing. And they were going to Rampart Cave to do some work. A couple of people were doing their dissertation work out there on packrat middens. So I went out and really got to explore that part of the Grand Canyon. And of course I found that most of them were only going like one water bottle's distance from the camp to look for middens.

And I said, "Well, what about way up those canyons? Up those cliffs? There's got to be caves."

They go, "Well, yeah".

"Well, have you looked at them?"

"No".

Well, once again, that's just kind of like, well, then I'm going up there. So I found [unclear] Cave. And that had a tremendous record of packrat middens from essentially 13,000 to 33,000. Had camel in it and all this sort of thing. So again, each thing just blew up in my mind as this is so fantastic and it's so easy to do this if you work hard and consistently.

And being at Tumamoc Hill, everybody's publishing. It's kind of like hey, if you're going to be part of the gang, you're going to do this. And it was kind of like, okay. I'm not a good writer. I've never got that. There's something both internally in me and my education in Tucson public schools or whatever. I'm not a good writer, but I don't give up. And so, it's always been hard. It's still hard today. But I continually write, write, write, and just keep going at it. And it's getting better. And then I guess when it gets really good, I die, or something like that.

(Santucci laughs) But I just do a lot of writing. And everybody was publishing. Everybody was working together. Everybody was, you know, you help me, I help you. Let's do this. Let's all publish. Hey, you do this, I do that. It was such an environment that it was just so seductive that well, of course, you're going to get in there and do this. So I lucked out. Completely.

15:14

Santucci: So as a master's student, I assume you took courses from Paul Martin and Vance Haynes.

Mead: Mm hmm.

Santucci: Did you take a vertebrate paleontology class from anyone?

Mead: Sure, yeah. Ev Lindsay was there. And so I took classic paleo from him. And of course, he had his whole bunch of students. And of course most of them are working on Pliocene, Miocene on back. And here I am coming in with Pleistocene. Which is just overburdened trash sort of thing. So that was all good and dandy and fun to work with and humorous, and a learning environment that was just tremendous. And many of those guys and gals, you know, we're great friends still today. Yuki Tomita in Japan. I've stayed with him on a trip to Siberia. And Lou Jacobs at SMU. And Lou Taylor. All these people. It was critical environment to be with. And Ed Lindsay course taught teeth, and rodent teeth. And so his students did that. And so that's what got me into that. And I realized, I don't really want to do rodent teeth. I want other things. But it taught me a base that is critical. And how to work together as a team is critical. So yeah, those were the major players.

Now we also did a lot with climate. Because Paul Martin, I'd take a class from him, but he'd say, "Well, you need to know plants," so you learn plants. "You need to know climate." So we learned climate. And so it was a package deal of stuff. Very little hardcore geology, though there was geomorph and things like that. It was more environmental geology and archeology and that sort of thing, because of my bend towards the Pleistocene.

17:23

Santucci: And you defended your thesis in what year?

Mead: I did my master's thesis in 1979. And then decided with very little prompting or anything, I'm going to just flow right on into the PhD program right there at the University of Arizona with Paul. So working on master's, it was mainly snails. So I had Vance Haynes and I had a biologist at the time named Walt Miller. Walt Miller was a snail man, if you will, in the department of biology there at the U of A. he was actually previously a student of my dad's there. So I learned a lot about anatomy of snails, and conchology and this and that, which was wonderful. And I don't, I still work with snails today, but not as intensely as I did back then. It's another whole language, if you will, to learn. But it's stuff you can do and it's another way of looking at environments. We have snails here at the mammoth site. We're working on snails from caves that we're working on. So it hasn't been lost at all.

But I wanted for a degree, for a PhD, to do vertebrates. And because I'd done so much in the Grand Canyon, and of course once you do a river trip, that's in your blood. You have to go back. It's probably worse than alcohol. (Santucci laughs) You have to do this stuff. So it was kind of like, there's all these caves. And every cave I'd go into would have middens. And this thing that looked like a mountain goat. And what was strange was to go into a cave that didn't have a fossil record. That's what was unusual. So I just kept working at that to understand well, what is Harrington's mountain goat, the extinct little mountain goat. And is it really little? And what environment? It's not just describing the critter, but what did it live in and why and where and how different is it? Is it just a smaller today's mountain goat, or how different is it? So I did that in various caves throughout the Grand Canyon. And of course that continually solidified the stuff that I like to work with.

Santucci: And so, your dissertation topic was?

Mead: Harrington's mountain goat. Essentially, what is Harrington's mountain goat and what environment did it live in? So we did a lot of very detailed radiocarbon dating of both the dung – So that's really, working with Paul, of course, is how I got into dung studies. And then that's kind of carried me. I mean, nobody else is really going to do that, right? Everybody else is saying, "Why would you study a turd?" It's kind of like well, do you want to know what that animal ate? That's a cool way of doing it.

So I looked at the dung of mountain goats. And I wasn't the first, but I carried it further in different directions than a lot of people had at the time and still today. So I look at the dung. And then I describe packrat middens, and what environment was outside. Maybe the mountain goat didn't eat that plant, but the packrat collected that plant. So here is the environment in which the mountain goat lived. And then oh, by the way, here's all these other animals.

Now the whole time I'm working on this, I'm working also with Tom Van Devender, who's one of the graduate students of Paul Martin up at Tumamoc Hill. And he was, although an incredible plant person, and still is, he also spoke reptiles and amphibians. And he taught me that language of fossils. So that's what really has gotten me into looking at fossil reptiles and amphibians today. And in many ways, I work more on that than I do other things. Although I still get—this is kind of humorous, but you know when somebody finds a turd, whether it's a fossil one or a modern one, they think of me, which I don't know quite if that's a compliment. I think it is. But they see shit, they think of me. And I get called in all over Texas and other places. "We find this layer. What is it?" Nobody else can help. So we're doing Sloth Cave in Texas, southern Texas right now. We just did bighorn sheep dung from a shelter that's archeological in Trans-Pecos, Texas, not far away from the sloth one. So these things all materialized then and I've just carried it through to now.

22:25

Santucci: Very good. And what year did you defend your dissertation?

Mead: Eighty-three. So 1983, I defended and passed. And I got a, what I thought would be a job, but turned out to be a postdoc, up at the Center for the Study of Man. It was called that at the time. Study for the Study of Man at University of Maine, at Orono, with Rob Bonnichsen. And it

was interesting. I was, there was three of us. Rob was the archeologist. And then we had a physical anthropologist, Marci Sorg, and then myself as environmental and [unclear] vert material. And I did that for two years, but the call for the west was there. And so Larry Agenbroad, who I'd mentioned early on I met at Lehner site in '74, well he and I kept working together on his bison site. And then also in '74, we had, working with Larry on bison and all, there was a potential of mammoth occurring at a place in the Black Hills called Hot Springs, South Dakota. And that's when the mammoth site was discovered. I was there on day one.

And it's kind of like yeah, there might be possibly four, maybe five mammoths. Which at the time was like oh, wow, that's a lot of mammoths in one spot. Now we have sixty-one, and we know we've only done about a quarter of the site. So while that's developing at the same time as a, at the time as a background, is now at the forefront. So working in Maine in '83, '84, you know, it's kind of like well, but there's all this cool stuff being found that I work on at other times out west. I've got to be out west. And Larry kept, of course, saying, "Well, geez, I was out this weekend and found more fossils. And boy, it would sure be nice if you were out here." So it's kind of like okay, Jim, go.

So in '85, I had a one-year appointment at Northern Arizona University, which is where Larry was at the time. And we just kept working on more and more things. We had contracts through the Park Service to work on basically all major park units of the Colorado Plateau. The emphasis from the Park Service viewpoint was to understand quote "early man." My feeling was yeah, whatever, that's just another fossil record, if you will, amongst all the other stuff. So we were finding more caves, more shelters, more dung deposits. So if we found dung—of course, I did that. If we found middens, I did that. If we found vertebrate remains, I worked on that aspect. And snails, I would do that. And then Larry would do the geology and the overviews and that sort of thing. So again, it was teamwork. But it was clearly that I had to be out west continually, not just during summertimes.

So moving from Maine to NAU at Flagstaff in '85 was just the cat's meow. So he had just developed the Quaternary studies program. That's what it was called at the time. It was a graduate-oriented degree program. And that was a blast. So I was a prof there at NAU. Developed into a fulltime position. And then basically became chair of the department and figured I'd just go ahead and do research and then die of old age at NAU.

But things had changed. East Tennessee State University had found basically a late Miocene/early Pliocene site. The governor built a museum on it. And indicated to the university, you don't teach this stuff. Create a department that accents paleontology/geology. So I was brought in to make that department. So from 2008 was when we began that program, the Gray Fossil Site at East Tennessee State University. Worked that, developed that. One person there actually was a student of mine at NAU. So it's very incestuous in many ways. It's everybody knows everybody and works together.

But I decided in 2016, I needed to retire. Larry Agenbroad had kept the mammoth site going and developed it to what it is today. And it was time for him to go, as he told me. And he died that fall of 2014. And I was asked by him and the board would I come and take over at the right time.

So for 2015, I basically ran the department of geology at, department of geosciences at ETSU. And then I would come out to the mammoth site in South Dakota. So I had long drives. But in 2016 I retired from academia and just moved fulltime here to the mammoth site.

28:03

Santucci: Perfect. And just one more time, so we have it all together in the transcript, your start and end date at NAU, your start and end date at East Tennessee State, and your start date for the mammoth site.

Mead: So the start date at Maine would have been ’83.

Santucci: Okay.

Mead: And then start date at NAU would have been ’85. And then start date at ETSU would have been 2008. And then start date at the mammoth site would have been 2016.

Santucci: Perfect. Thank you. So you arrived at NAU and of course you had lots of responsibilities there. Did you have time to do research while you were at NAU? And were there any National Park Service projects that you became involved in while you were at NAU?

Mead: The contract that I referenced that Larry was getting from the Park Service from Adrienne Anderson out of the Denver office was to look at all park areas on the plateau for, as I was saying, for quote “early man, early humans.” Paleo-Indian aspect. And so that was a critical thing. But what we were also doing, we were developing and expanding the Quaternary studies program at NAU. So, master’s. So we just hooked the two together. You want a thesis? Sure. Come with me. We’re going to go do this stuff. So every weekend, literally every weekend, we’re out doing something in some national park. Now, very little in the Grand Canyon at that time. But it was more like Arches and Glen Canyon was a major area. Arches. On and on and on. Now, a lot of those parks, if we found something—which we did, every weekend we’re out, we’re finding a new locality. So it was just mind-boggling. But they would say, “Well, tell us what it is. Tell us everything. We don’t have any money for you. Use Adrienne’s money from the main office in Denver.” Which we expected. And then, “Could you curate it for us?” And I’m going oh my God, curation. Yeah, I mean, if you guys because Grand Canyon would curate their own stuff, typically. So it’s kind of like, oh, yeah, we could do this for you. So that meant I had to have training through the NPS for museums and curation. And how do you do this, and what do you do? And that sort of thing. So that was a whole new game to play for me.

So we curated at NAU, we developed our collection there to not only have modern material to say, “Yes, that fossil is a such and such snake or whatever,” but then here’s the fossil snake. And we had to curate that aspect of it. And so we curated for up to twenty-two park units at Quaternary sciences program at NAU for the various places. Again, Grand Canyon would say, “Hey, we’ll take care of our own.” Which is fine. But Glen Canyon couldn’t at the time. Arches couldn’t. Capitol Reef couldn’t. Bryce, Zion, blah, blah, blah, on and on. Some places develop, because of those collections, developed their own little place. And that’s been handed off to them.

But this was very exciting. And aggravating. Because I had to learn the federal system, the park system. And how sometimes it wasn't maybe the most expeditious or the easy way of doing things, which we don't need to get into. But I was learning how do you work with a government agent? We don't have a class on that. How do you work with that kind of aspect and rules and regulations and permits? So that was very instructive for me to learn that. And I'm still doing that kind of stuff today.

32:29

Santucci: So you mentioned that there were up to twenty-two different National Park Service areas that you managed collections for?

Mead: Yeah. And it would just be the Quaternary material. So if Dinosaur National Park unit was doing their stuff, of course they would curate their own material there. But if it was Quaternary, they'd kind of go well, we really don't care about the Quaternary. You're doing Quaternary. So why don't you hold onto that for us, and you have space for it. So we would do basically Pliocene, Quaternary material for those park units. So again, Dinosaur would have all their stuff that they really cared about. And we would take care of the stuff that they maybe weren't able to take, for whatever reason. So we kept all that.

And most of those parks either have that now or it's done for them by the Museum of Northern Arizona now. Because once I left in 2008, you know, parks were saying, "NAU, you're not replacing Jim when he leaves. You're not replacing that concept at NAU. All that stuff needs to go to each park when Jim leaves." So a lot of material left NAU and most of it went to MNA, Museum of Northern Arizona, to be curated there for those same parks. So Grand Canyon, of course, has theirs. But Glen Canyon, which doesn't have a big facility but has lots of stuff, that's all at MNA.

34:13

Santucci: Would Grand Canyon be the only park that took their collections back? Would most of the rest of them have gone to MNA? Or were there any others that recalled the specimens?

Mead: Hmm. I'm trying to think. Let's see. Well, we were doing some for Wind Cave. And Wind Cave took it back. And of course about that time they were getting, South Dakota School of Mines was beginning to develop their curation. So Wind Cave took it back, so to speak. Grand Canyon was the main one, because they've had such a good system for such a long time, and have had so many remains that they just had to take care of. And they had a lot of archeology which they were taking care of. So that kind of already set the pace for them to do Quaternary material, too. Ice Age material.

I'm trying to think of some of the other ones. Oregon Caves, they didn't really have it. So we were doing that for them. I think much of the Oregon Caves stuff might still be at ETSU. I didn't want to leave it, and they wouldn't go to MNA. So I took it with me to ETSU. But it could be that that's now been transferred back to Oregon Caves. Which would really be at, I guess the curation spot's out of, what is it? I'm not sure where they would have that. So once I left, it was kind of like everybody can do their own thing, obviously, and I wouldn't know what's been changed. But for the plateau, I think it's pretty much Grand Canyon had their own stuff.

Santucci: Very good.

Mead: And I had seen, I had some records about that as well. And there were a few of the smaller ones, I guess, requested theirs back. Bryce and Cedar—

Tweet: Cedar Breaks?

Mead: Yeah. The material that we collected, the NAU group collected from some of those parks were very small. Just a little bit here. So a bunch of snails from Cedar Breaks would be nothing. Same thing with Zion. But I just don't know what each park was capable of curating. Sometimes they didn't want to. Sometimes, you know, they only had room for one cabinet's worth of materials. Yeah. Understood that. And that's why we wanted to make sure that we were available to help each park unit break into new areas besides just rocks, dinosaurs, and people management sort of thing.

Santucci: And just going back before we drift away too far, did you help to establish the Quaternary Studies program at NAU?

Mead: Yeah. Larry got it started. Larry Agenbroad had said, "Hey, we need to have this as its own separate master's program." It couldn't be a sub-unit of the department of geology. Which irritated some of the geology people. Because the program was set up to be, you had to take classes in geology, in climate, in biology and archeology. So you had to speak a lot of languages. And no single department at that time in the right way would they say, "Oh, we're geology. You have to take an archeology class." Nobody would do that. Archeologists wouldn't say, "Oh, you must take geology." So we were kind of avantgarde sort of thing. Bastard child approach sort of thing because it was so multidisciplinary.

And when I got there in '85, Larry said, "Well, I got it started. Now, Jim, make it. Turn it into something."

So we worked together. We rounded it out. I pushed to get people. I helped evaluate who we're going to bring in. People who came through our program, I think, are really good folks. Chris Bell at University of Texas, Austin. Lynn Murray, paleontologist for the Southern California State Parks system. Chris Jass, paleontologist up at Alberta. There's a number. Blaine Schubert at Tennessee. There's a number of people that went through the program of the master's that have gone on to do well. And I think it's because we were multidisciplinary in our approach and pushed publishing, pushed research sort of thing. I tried to carry Tumamoc Hill to NAU. And I think that worked well. So I helped develop, I didn't help initiate QSP. I helped develop it to what it turned into. And then we changed it from Quaternary studies to Quaternary sciences program. I said we needed to be more, it was kind of wordsmithing, but we needed to do science, not just studies. Which seemed to be a little too blah. And I think it went well.

Now when I left, there was a number of professors who were part time Quaternary sciences and part time some other department. But it faded away. I guess the energy that I provided wasn't replaced or whatever. So it morphed into other things. And that's fine. That's how things move along. I don't feel bad about that. I liked what I did. I'd do it again. I think it has its place. So it went well.

40:08

Santucci: Excellent. It certainly had a tremendous reputation with you and Larry, for sure.

Mead: It was fun. I mean, Mary Carpenter, who's a part time preparator for Badlands, where did she learn all that stuff? Well, it started at NAU. So there's a number of people that got their initiation into the world of paleontology. And typically, more often than not, it had some aspect with a national park flavor to it. And just kept – Chris Bell is working on a cave in the Great Basin. And is now not actually part of Great Basin Park. It abuts it. But it's in the Snake Range and is all part of that whole area of eastern Nevada.

Santucci: The collections that you maintain in the Quaternary sciences program, were many of those student projects? Collections made as part of a student project?

Mead: Yes and no. It really depended, it was student by student. What did they want to know, what did they want to study? Was it plants? Was it climate? Was it pollen? Was it macro botanical? Was it a critter? So that varied quite a bit. Sometimes it was by the type of animal or plant. I want to study just the shrub ox, that sort of thing. I would say, it would be hard to be accurate on what percentage. But I would say almost all the students were doing some sort of Park Service or Forest Service type thesis there at NAU. If they didn't do that, they were certainly having an RA, a research assistantship, helping out with the collections. So Mark Lawler, his thesis was on the bighorn sheep [unclear]. Is it a good extinct species or is it a large today species? But he was my collections manager. And so he worked with the Park Service stuff all the time for his quote "job" as a graduate student.

Santucci: Very good. Justin, did you want to jump in with any questions at this point?

Tweet: Not in this section so much.

Santucci: Okay. Jim, what I thought I would do is to try to go through park by park and find out how you became involved in a project in a park, a little bit about the significance of that project, anything regarding collections or outcomes.

Mead: Sure.

43:04

Santucci: So, for example, if we started with Oregon Caves, how did you get involved in that project, and can you tell us about it?

Mead: Oregon Caves contacted me. I guess my name was out there about caves and critters and Ice Age. And John up there said, "Hey, we're getting some bones out of this cave. There seems to be a jaguar and a bear." Greg McDonald was of course looking at parts of that. But they needed somebody to dig in the cave and look at all the itty bitty critters. Not just a specialty critter of your sort of thing.

So I said, "Well, sure." So I took, let's see, I took two, three, yeah, I took three, two major graduate students with me. And we worked in that cave, excavating. And of course they

still are doing that stuff today. But yeah, we went up there and we stayed in their place up there. And we've worked with that.

They wanted us to look at mainly at one of their old entrances. They wanted to reestablish some routes through the cave. And they were kind of worried, well, if we go through here, we have to dig out sediments. What's in the sediments? How old are they? What are we going to ruin when we take it out? So in many ways, it was pure mitigation. But I looked it as well, this is cool. First of all, it's helping with the Park Service again. It's a cave and it's itty bitty critters in an area that nobody's really working right now at that time. And so it's kind of like, sure. So we go on up there and do that.

And, neat cave. The area that we actually worked on turned out to be, most of it was totally mixed. And so there would be, here's a cool fossil that's maybe only three thousand years old, but it's also next to some aluminum foil. So it became kind of a mixed issue. But we did dig back where the jaguar was found, and we found more of the jaguar, which Kevin Seymour has or is working up. And we went into other rooms that had a lot of bear, which I think pleased Craig McDonald and his work. So there was a lot of stuff. But that was mainly to help them at their request. If I lived closer, I'd have done more of the cave. But you know, Oregon to Flagstaff's a little bit of a distance. But I learned a lot with that. And that was fantastic.

Santucci: So, two clarifying questions. When you mention John, you're speaking about John Roth.

Mead: Yeah, yeah, yeah. John Roth at Oregon Caves. ORCA.

Santucci: And do you remember what year or years that you were involved in work there?

Mead: I certainly do not. (laughs) Too many years have gone by. I'd have to look back at it. It had to be the '90s. Late '90s is my guess. Of course, they would have records. I could go get my field notes, but they're way over there, and I'm over here at my desk. So I won't be able to tell you.

Santucci: That's okay.

Mead: But Blaine Schubert went with me. And he did his thesis on cave stuff from Missouri. And Larry Coats, who's now a botany and geographer person at University of Utah. And so he did his plant work, his thesis on packrat middens from Canyonlands National Park. So it had to be the late '90s if I remember right.

Santucci: Okay. And Justin probably already knows, he scouted it out.

Mead: And he's being quiet, because he didn't want to say, "Jim, you don't remember anything." (laughter)

47:17

Santucci: Okay. Let's try a whole different one. Did you do much work in Arches National Park? And can you tell us about the mammoth discovery there?

Mead: We didn't do that much. We did do some critical things. And to me, what we did just kind of kicked the back door open. But Arches, being beautiful sandstone country, it's not really going to have caves per se, but it's going to have nice rock shelters. And they wanted us to look at this one deposit that had a mammoth jaw. And it was, I'm amazed what that mammoth jaw had preserved. And there was really nothing else with it. We were kind of in a hurry at that stage of our work. They were in a hurry. And so it didn't go too far. But they did say, "Well, we have this shelter that has archeology in it. And there might be some middens in it. So could you look at that?" So we go, well, sure.

So we went out there to what we now call Bison Alcove. It's more our term than probably their term. And in there, it was just, I mean, it's a treasure trove, you know. And we barely touched it. We didn't do any digging. And I don't know if they have or not since then. But there's a lot of archeology on the surface. And there's a lot of Ice Age paleontology on the surface as packrat middens. And of course packrats, as they're collecting, will collect at that time today's stuff, and then anything they find on the surface that might be older. So they're going to mix today's stuff with ancient stuff. And then of course as they pack that away, that midden becomes ancient. So there was a lot of mixture in there that you could figure out with radiocarbon dating.

But we found, it was really funny. There was the tip of a horn of a bison. And it's, like most bovids, the tip area is solid but then as you go down the horn sheath, it becomes hollow, of course. And this had been packed with pinon pitch and a stick stuck in it. So it looked like a corndog, you know? So I said, "Well, that's bison. It's old. Who knows how old?"

And then many of the archeologists, a number of the archeologists, "Oh, that's a socio-religious thing."

And I go, "Well, it could be. I don't know." But it could also be, I can imagine my daughter, giving her some stuff and she'd make some goofy little toy. So to me it was either keeping my kid busy toy or some religious artifact with great importance. Either way, a packrat said, "It's mine. And I'm taking it." And then we found it. So we wrote that up with one of our students who did her thesis in Dinosaur. But we all collected that stuff. We worked it up. There's mountain goat in there, there's bison in there, there's bighorn sheep. That is a treasure trove, I think, for Arches. And it just, to me, I don't think it's the only one. I just think it's the one we happened to look and find.

Interestingly, maybe, dealing with Canyonlands and Arches, they asked us in one case, I won't say which park, to go find new, undiscovered alcoves of this Ice Age stuff. And we said sure.

And so we picked an area to go search. And they said, "Well, we need to send a ranger with you." And of course to us it was oh, they just want to make sure we're, kind of like a spy rot of thing. And they said, "Oh, no, no. It's purely to keep you safe." It's kind of like uh huh. Right. Okay.

So we started off hiking. And the ranger guy said, "Well, aren't you going to stay to the trail? Because of the cryptogram soil, you don't want to destroy it."

And I said, "Well, how many undiscovered caves does this trail go to?" (Santucci laughs) And he was kind of perplexed like well, what do you mean? I said, "Well, if you want us to find, if the whole idea is to find something undiscovered by us, sort of thing, then we've got to go off the trail. Otherwise, everybody's seen it."

So that was a change in thinking at that park, if you will. So they realized yeah, we can go outside of the highway sort of thing and find things that are not typical. Which we did. We found lots of neat, cool things that are out and about in the back land.

Santucci: And the student that was involved there, was that Saxon Sharpe?

Mead: Yeah. Saxon Sharpe worked with us both at Dinosaur, what little we did in Dinosaur, and she did the middens from that area, in part for her thesis. And then worked at the Bison Alcove there at Arches.

Santucci: Great. Thank you. Shifting across the other side of Moab, Canyonlands? Anything from Canyonlands?

Mead: Fantastic material from, to me, Canyonlands is yet another tremendous place that every alcove will have something. And packrat middens, of course, are going to be the main thing, because they can easily preserve an itty bitty alcove that sandstone would produce. One of their better places called Paul Bunyan's Potty, which is a really weird geologic formation area. And lining the inside of the pot, if you will, are middens. And I've never seen such huge middens in my life. They can be three meters tall. And the amount of time would be recorded in there. And we barely touched on it. But we did get essentially a fifty thousand-year record of plant change in Salt Creek, that whole area of Canyonlands. And to me, although Salt Creek Canyon area is a well-known, pretty dominant canyon, it's not the only one. There's many canyons out there that would have an equivalent record. So I think we were barely scratching the surface. And we're not even really talking the alluvial record. We're just talking plants through time, and critters through time. So Canyonlands is another one that just, you know, hey, folks. If you want to know the Ice Age, go to that park. While you go to Arches, while you go to Canyonlands, when you go back to Grand Canyon to get a different flavor, and then if you want more things, well go higher up the slopes. Go to Bryce and Zion and Cedar Breaks. Every place out there has it.

54:41

Santucci: Very good. Thank you. How much more time do you have? We're coming up on about an hour right now. Do you have a few more minutes?

Mead: Oh, I got, no, I have easily a half hour. I just got a note that's saying the appointment's been moved from 11:30 to one. So it's up to you guys how much you want me to just keep babbling along.

Santucci: Oh, this is great stuff. We'll keep you on as long as we can.

Tweet: Keep going.

Santucci: So let's move on to Capitol Reef National Park.

Mead: Capitol Reef was an interesting one. While I was at NAU as a graduate student, there was another packrat dissertation guy named Ken Cole. And Ken was purely plants, which is good. And later on, he got a contract to work in Capitol Reef. So he did more work in Capitol Reef than we did. All we did was essentially run out there and go, "Well, here's a canyon or two. And yep, they got middens, and boy, there's a potential here. And somebody needs to do it. And thank you very much, goodbye."

So, like so many parks, there was a lot of information. And again, all this, from our viewpoint, all this is being paid for by archeology money. And they were saying at times, and Adrienne Anderson was kind of cringing when she was saying, "Don't find anything older than humans."

It's kind of like, right, I can go into a cave, scratch the surface, sniff it, and go, "Yep, that's less than," at that time they wanted eleven thousand years old. It's kind of like no, that's just the beginning. We're going to go back to fifty thousand here, folks.

She said, "Just don't accent that initially. But find it afterwards sort of thing." Because she knew the value of knowing the Ice Age. And of course the mantra was, oh, early man? Paleo Indians? Oh, no, they weren't here prior to eleven thousand. That's the Paul Martin thing and that's the Vance Haynes thing. Clearly that's the mantra. And of course at that time, a lot of people are saying, "Oh, no, we've got humans in North America and South America much older." No, no, no, that's wrong. We have good data that says it's only eleven thousand.

And of course Larry and I are going, "Who cares?! Let's look at the Ice Age." And Ice Age at whatever time. And then if you find something that doesn't look natural, then bring in the archeologists to play that game. But the archeology is, once it's in the ground, it's purely just another clast in the surface, in the debris. It makes no difference whether it's a Clovis point or a basket, it's no different than a bone and a turd and anything else, from our viewpoint. That was our concept, to not be biased.

So it was rough working on things older than eleven thousand. But Adrienne was very—I mean, thank fortune for her that she had that approach and was able to twist the arms essentially telling her bosses, whoever those were, that yes, it's okay if Larry and Jim find something older than eleven and it's not archeological.

Clearly if we found something that was really archeological, we'd try to leave it alone. Because then all the archeologists will say, "Oh, you guys don't know archeology." Even though we had degrees in it and published in it.

Bechan Cave in Glen Canyon Recreational Area, that's an archeological cave. Because the surface has a Southern Paiute wickiup. And there is some basketry in there. But more importantly, from our viewpoint, was if you dig down a meter or so through the sand, you hit a layer of organic material that turns out to be predominantly mammoth dung. And we estimate basing on cores, there's over 300 cubic meters of mammoth dung in that cave. And of course that prompted a lot of things. I forget the guy's name, but at the time, the head of the Park Service said, "So, what were the mammoths doing in this shelter?"

It's kind of like, well, we know what they're doing. They're taking a dump. (laughter) But now why did they go there, you don't know. And of course that invokes, at that time, that's the mid-'80s, right? So that invokes a Gary Larson Far Side cartoon where you know, the mammoths are down in the valley. And one's saying, "Hey," you know, looking at his wrist. "Hey, I've got to go to the cave real quick. I'll be right back and then we can continue on for lunch." So that became a place to go to as a barnyard. The entrance is, say, a hundred feet wide, thirty feet tall. And it goes back you know, a hundred or 200 feet, easily. It was a nice barnyard.

And that's where we also start finding these other turds. I said, "This is not mountain goat, although that one is over there. This one's not mountain goat. This is something special." And of course the shape of it was, as Larry called it, a Hershey kiss. It looked just like a Hershey kiss. So we called it that officially, Hershey kiss. And I thought, you know, this is shrub ox. This is going to be some sort of musk ox animal.

And so I worked that up. I had a student later on do a project, a thesis, on the shrub ox. And then a gal for her dissertation out of Denmark doing DNA. She wanted to work on the whole bovine musk ox group. And I said, "Hey, I got some poop for you." And so the DNA also says that yeah, those Hershey kisses and some other ones like it definitely are shrub ox. They're not mountain goat, they're not a bighorn sheep that had a rough time. No, they're unique. So we've gotten into the ancient DNA because of the deposits in national parks.

1:01:12

Santucci: That's a great story. Thank you.

Mead: The funniest parts have always been dung-related, as one can imagine. (Santucci laughs) One geologist in the department at NAU didn't like the fact that I was being brought in in a different way than most profs. I was just being brought in by a vice president at the time and Larry for Quaternary sciences. And at one point he was kind of, I was guilty by association. He and I didn't really know each other at the very beginning. And he was kind of very angry. And he said, "Well, Jim, you don't know shit."

And I go, "Well, actually, I do. (Santucci laughs) Or at least I do know that aspect." And so I think from then on I became more the, in probably more ways than one, I became more the turd man to work with. And it's kind of like, whatever.

Santucci: I'm going to get—go ahead. I'm going to get some feedback from the transcriptionist on this. (laughter)

Mead: What's the journal on academia? Oh, darn it, I can't remember that right now. But it's a well-known journal for education. And they wanted to do an article on dung and what I was doing. And I became the number one two man, I think, or something like that was the title. I'll send it to you. I'll send it to you both. But it was a play on the work on dung. So it's kind of like you know, if people will laugh at science and what you can get, I'm all for it. You know, if it will take down a barrier and they can actually start to listen and enjoy science, poof, I don't mind that at all.

Santucci: Absolutely. Yeah. Good approach.

Tweet: I've heard a lot of those jokes. My graduate professor was Karen Chin.

Mead: Oh, yes. I know her well. Yes. Excellent. Yeah, she, working on dinosaur poop, and really old poop. And it's kind of like yeah, a lot of jokes get thrown your way. And you kind of go, fine. I'm not going to dodge them. I'm going to accept them and return them. So, this is fun. That's good.

Santucci: Thanks. So I'm going to try to focus on some small parks, and you may not have worked there. Natural Bridges? Anything?

1:03:42

Mead: Yes. Really cool spot. Now when you go to Natural Bridges White Canyon area, as you would expect, all the major formations are basically horizontal. But the erosion has been differential. So one layer will be eroded very deeply, so that makes a nice, deep crack and eroded level. And yet the one above it is say a sandstone that is very resistant. So you get all these horizontal shelves, if you will. Shelf upon shelf upon shelf. And they had an archeological site that they're excavating. It was a very large, well, in many ways, a very large quote "cliff dwelling." Not as much as in Mesa Verde. But a cliff dwelling. And they were digging back in in this one area that was kind of eroding of a kiva. And they were finding some stuff that the archeologist didn't understand. And one person said, "Well, I think that's a turd. Let's get Jim out."

And so getting out there, it was not that difficult. But it's a forty-foot ladder to get into the shelter. So it was a very good cliff dwelling area. And sure enough, the Anasazi, if you will, had carved back into the dirt that was in there and made their kiva. And in so doing, they were cutting into an old mountain, extinct mountain goat, camping area, if you will. So there was bones and dung of Oreamnos harringtoni. And of course I was pleased as the dickens. So we wrote that up in what, '97, I guess it was, or something like that, '87, someplace in there. Wrote up that article. So to me it said, oh my God, yeah. Natural Bridges. Yeah. Like every other park, it's going to be packed full. Now how do you go about assessing all that in the field? [unclear] 1:05:47 But it's there. And I can't imagine we found the only one. So clearly it's out there. It's just go out there and don't go with a bias of what I should be looking to find. Just go look at everything.

Santucci: Thank you. Hovenweep National Monument?

Mead: That's going to be basically packrat middens from our quick weekend shot at that place. As you know, it kind of sits up on top, if you will, of an area, although there are some canyons. I would expect there to be a packrat midden record there. We just did one little thing there and it matched everything else. Oh, yeah. Another huge area that's going to have packrat middens. So maybe an alluvial deposit. And who knows what you're going to find, and it should be fantastic.

1:06:48

Santucci: Great. Timpanogos Cave?

Mead: Which one?

Santucci: Timpanogos Cave in Utah, in the Wasatch?

Mead: Yeah. Yeah. That one, we never looked at officially. I've been in it once. If I remember right, it has really nice speleothem work. If it's really nice speleothem cave, then it means it's growing well, which means it's going to seal off rooms and areas geologically quickly. But what would surprise me about Timpanogos is if there is not a record there. And of course we know other caves in that area do have paleo in it. What I think every park—now this is magical thinking, right?—every national park out there like that should have a person on staff or somebody more regional readily available that speaks paleontology of some aspect that can say, "Oh, this is what you have." I think, and I don't mean this in a mean way, but I think the NPS has made a tactical, strategic error in assuming that archeologists on staff or on call will know all this, because they do not. And I really think that is an area that you two can really push more and more. I know you have already. But we need to get people who speak bones. And that sort of thing.

And then caves is another area. Typically you'll get a, "Wow, I really know how to do LIDAR, and I really know how to cave. I can roll in mud and get jammed into a corner better than anybody." And that's good, and they can map caves. But how do you assess what you're walking over? That's critical.

And I've been working a lot with Wind Cave folks next door to us here in the Black Hills. And clearly their folks did not know any of that and now they are learning that. And so they said well, they found a carcass way back in the cave. To them, way back. It takes a day to get back into this part of the Wind Cave. And what is it, Jim?

And I go, "Well, you've got to give me a picture. I can't just touch your head like Spock and understand, so give me a picture." And they say, okay. "Now I need a picture with a scale in it." So they now know that. Well, it turns out to be a pine marten. And it's eleven thousand years old. It's really cool. We got that as a manuscript now submitted to a journal. It's way cool. And it's in a far back area for them because they're going the regular entrance. But that tells them now that oh, there's another entrance.

Well, we have another new cave called Persistence Cave, which is not far away. It's only nine hundred feet away. And it's saying that you know, those two caves are going to connect, or something close to that, anyway. They're finding more and more carcasses, so now they're learning how to evaluate what they're seeing, other than, "Hey, we found some bones. What is it? It's really big bone." What the hell does that mean, caver? Park Service employee, ranger, volunteer, whatever. And so I'm trying to teach the local groups here, here's how to assess that. And I want to start having more workshops for those parks and other federal agencies that want to assess that. I think we have to push paleo more because the archeologists just won't have it. No complaint about that, other than the fact that they're relying on them. They need the training. They're not going to get it because it's not cultural. Somebody has to have that training within that. I'll get off my soapbox.

1:10:59

Santucci: No, we agree with you wholeheartedly. Now we can play this every time we go and meet with an archeologist, we can play this little sound bite.

Mead: (laughs) Yeah. Definitely. And again, it's nothing against them. They've learned a whole grunt load of their stuff. Pottery, and this and that. And that's fine. No problem. It's just that, it's okay to say, "I don't know what the hell that is. Let's get somebody else in here that does." And of course that's what the archeologists are doing in Texas. They're saying, "I don't know this stuff. Let's get a turd expert in," you know, or whatever. And I think the Park Service in, certainly in Carlsbad area. And Great Basin. Of course they're doing that now, too. They're saying, "Oh, maybe that's not the raccoon we think it is. Maybe it's something else. Here's how to take pictures and here's a list of people that could help us because we don't have, due to finances, we don't have that person on staff readily available." Not a problem. Just get those connections going.

Santucci: I'm going to keep going until you tell me there's a two-minute warning.

Mead: Okay. (laughs) That's fine.

Santucci: Bryce Canyon?

Mead: Nice place. Now, the neat thing about Bryce, of course, is the age of the deposit that's so high up elevationally today, and it wasn't before. And it certainly keeps Howard Hutchinson happy because of all the turtles. But the sediments typically are so soft and beautifully eroding, we're not going to get, as far as I can tell, that much Pleistocene material. Although there could be a little bench here and there that does have it. Everything we looked at said oh, yeah, we should find a beer can in this midden. And oh, these sediments aren't going to be very old. They could have it. And again, we spent, again, a real short, biased snapshot of that area. But at least the classical Bryce is not going to probably have that much Quaternary. But I could be way wrong on that because I certainly didn't look over the whole park.

Santucci: Cedar Breaks?

Mead: Cedar Breaks is nice because it's higher up. They will have more. Now we found one little deposit that had snails in it. And that's kind of cool. I think there's potential there. Now of course one of the problems is it being so high up that there can be some damages. But I think that park definitely should be looked at. Because it's so high today, it should be looked at. Because there could easily be some middens. You know, that's one of the few places that has the pika, the lagomorph pika there, which doesn't occur before that elevation, really, on the Colorado River Plateau. And I think there's a whole story with pikas that would start up there. And, interestingly, you can tell pika poop from other rabbit-type things, other leporids. And so there's a record with packrat middens that could easily have a record of the pika. So, Cedar Breaks needs to be looked at more. And it's definitely going to speak sedimentary and mollusks, is my take. So that could be way cool.

Santucci: Thank you. Dinosaur National Monument?

Mead: Really neat. You know, forgetting the dinosaurs and everything that Dan Chure's done and all that sort of stuff as that's their game, there are shelters out there along the rivers and side

rivers. And they'll have packrat middens. No question about it. There's a good Quaternary record out there. Which again, all these Quaternary records can play into the biological resource management aspect. "Well, we've got to save the elk. Because the elk is native here." It's kind of like well, no, actually it's not. It's probably fairly young introduction, but pre-Spanish, but not by much. "Well, we've got to save the condor." Well, you know, probably the condor was long gone by nine, ten, eleven thousand years ago and it's been reintroduced. So you guys have to play your argumentative game of what is native and what is not. I played that with Grand Canyon on the bison thing. Because they're saying, "Oh, bison's not native." Well, yeah, it is. It's just that you have to remember don't think of all bison have to be a herd of one hundred thousand bison roaming over your land. It could be ten or twelve bison hiding out in a forested environment.

1:16:20

So I played that argument a little bit with Grand Canyon, just because I felt I should and could. And that went over with some people like, well, like a turd in a punchbowl. But I think they need to be open about what the data says. And then make your decision based on the data. As we all know, that doesn't always go over well with people who are more, thinking more policy, politically, instead of what does the data tell us right here?

Santucci: Great. Zion National Park?

Mead: Zion? That's going to, to me, that's going to be a tremendous record for the periglacial aspect coming off of Cedar Breaks, of course, area. Some of the shelters will have middens. But I see, because of the tremendous alluvial record packages that they have, that mollusks would be a really way cool thing to go with. In which case, how do you date a lot of that? You know, you're going to be able to do some radiocarbon, but you may have to do OSL and maybe some of these others, like beryllium and such. So it really needs to be a geology, the team has to have a geologist and a malacologist along with somebody who knows bones when they do find them. The record's going to be there, but it's going to be a different game than say Arches or Canyonlands.

Tweet: I have a question. It seemed like in the southwest corner of Utah, we don't have a lot of really good ancient packrat midden records. I think Scott Madsen or somebody surveyed in Zion in 2002 and they suggested that there's too much moisture in that area nowadays, and that destroys the older records.

Mead: Yeah, you know, what you're saying is probably correct generally. It could be that you pick the—you, whoever, is picking the wrong formations. I mean, of course the metamorphics and granites typically are not going to form cavities that are good for preservation, and it is a wet area. The higher you go, the more, as you're saying, the humidity is higher and therefore more likely to decay things the way the organic aspect. I think one needs to, you can find in some cases where the faulting has created some nice crevices, but they have to be more horizontal so that when snow melts or it rains, it's not running into the crack, it's running off the edge and down, avoiding the crack. We have a shrub ox dung locality in a basically metamorphic rock unit. But it's down in Tucson. So the outside area is already dry. So that's in favor of it, even though the rock unit says oh, absolutely not, you're not going to find anything. So I think Zion

and as you said, the southwestern corner is going to have some problems. Yes and no. I think one has to take that as a challenge, as a hypothesis, and then go select areas.

Certainly the Grand Canyon Parashant is wide open to be studied. And that end of the Grand Canyon—of course, now we're talking Arizona, I know—but that end of the Grand Canyon is so totally different than the east end, which is what we know. As you know, the river goes essentially 277 miles of river miles. And our best data on paleo-environment stops at about, say, 100, and then jumps to the Rampart Cave at 274 ½ left. So there's a whole area that's not looked at. And that's river quarter.

Now let's get above it. And those plateaus, the Shivwits, I think, in that mainly, they have limestone units that can form a sinkhole. Well, sinkholes are wonderful. We don't really get those in the Grand Canyon and have searched them. But that's where unfortunate and stupid animals fall. So could we get more of the camels and the peccaries and the mammoth and whatever else that occasionally get into those sinkholes. And they're going to be on the Shivwits and that sort of area.

And if you could get a profile from, say, the Shivwits right up to Cedar Break, through the area you're talking about, and get middens, you could get potentially as climate was colder and climate was different, that the pika could have moved down out of Cedar Breaks. And as it heads south down that slope, they're going to end up on the Shivwits at the Grand Canyon.

And when I brought that up, people said, "Well, we've never found that."

I said, "Well, you've never looked." We've never sampled for that question. We sample for other things. Typically, mitigation to other issues. But we've never had that ecological question and approached it from that viewpoint. And the pika's just one of them. Just because I think it's cute and I can recognize its poop. But I mean, there's a whole number of other animals we could play the same game. Shivwits is going to have a lot.

Tweet: Just to correct myself, it was David Madsen, not Scott Madsen. I just looked up the publication.

Mead: What article is that? I'm trying to think of that. It's not coming to mind.

Tweet: That was an internal report, it looks like. But he has some other publications with the Utah Geological Survey at that time period.

Mead: Yeah. Yeah. He, you know, he's very, he's good. He's a good paleontologist. It could be that vertebrate paleontology folks that work with older material are not quite sure how to get the Quaternary. So that might be re-approached. Rock's, as we all know, rock's not all the same. And therefore it's not going to always preserve the delicate organic remains that are required to answer the questions about climate for the Quaternary. So it deserves—I mean, there's points well taken, but it deserves another look with a different set of eyes, maybe.

And one of the things that I haven't really totally appreciated for most of the archeological stuff is that it's not readily available. That's why I'm so happy with you guys in the Grand Canyon thing, in that yeah, we're going to turn out this fantastic, very expensive time-

wise report on paleontology of the Grand Canyon for the park units. But we're going to change it a little bit and make it available to the general public. And I think that's fantastic. I wish more archeologists would do that. Because their data's lost. And they might say, "Well, we have an unidentified large mammal in this midden. In this archeological midden." And it's like fine, you know, if you would change your bias, that very large mammal is probably the bison that is part of the record why you guys say there's no bison out there. You know, that kind of concept. That's where I get into these discussions if you will.

Tweet: Coincidentally enough, we have a couple of interns that are going to be starting at Parashant this fall.

Mead: Excellent.

Santucci: Yep.

Mead: Excellent. There's so much that could be done out there. Now, a lot of the little sinkholes that are readily found are gypsum holes. That's fine. But those are all, being a gypsum cave, if you will, they're all going to be less than couples of thousands of years. Parashant were, as you know, as you go out to the edge of, southern edge of Parashant, and you can drop down onto a bench. Actually, there's a place that even a mammoth can walk from higher altitude elevation down, actually, into the Grand Canyon to a lower bench, where there will be limestone sinkholes that haven't been searched. And that's going to take, that's such rough country out in the middle of nowhere and then out from there sort of thing. It's going to take a lot of work.

When I brought that up to the Grand Canyon, they go, "Yeah, whatever. It's kind of cool. Save it for somebody else in the future." But it could be that the Parashant folks could definitely take that.

I backed away from Parashant, Grand Canyon Parashant, a little bit. Because when I moved out, it became further away. And then a contract went to Dave Gillette at MNA, which is fine. But it diluted the energy. So there's definitely a record out there that needs to be dealt with a lot more. And as I understand, Gillette is retiring tomorrow from MNA. I hope the work continues from MNA. But Parashant has a lot to do. And you two can probably influence Parashant and the work crews, interns, whatever that are out there, to take a little bit of different approach.

Santucci: So I'll probably want to come back to Parashant when we get to the Grand Canyon and Lake Mead as a collective body since there's so many overlapping resources.

Mead: Fifteen minutes.

1:26:58

Santucci: We have about fifteen minutes. Okay. So we've pretty much gone through most of Utah, except I wanted to get back to Glen Canyon National Recreation Area again to see if there's anything other than Bechan Cave, and if there's a little bit more information regarding Bechan Cave that you could share.

Mead: Well, all those, along the Escalante River drainage, that side drainage that comes on into the Colorado, all those side canyons, and then side canyons of those side canyons, as you know, the river's kind of carved a meandering route through the sandstones. Every outside bend is going to have some sort of shelter. And there's a record in pretty much, I would say at least 50% of them, if not higher than that. And it takes a set of eyes to look at and go, oh, that's a cool turd. That's not mountain sheep. Oh, that's next to oak, and there's no oak here. You know, that kind of concept.

So, Bechan. I had a guy, a geophysics-oriented student at NAU that wanted to work with GPR, ground penetrating radar. And he wanted to apply it toward a site where I could get some paleontology but go below ground kind of concept. I said, "Well, here you go. Bechan Cave. Big, open unit. It has dung in it. But basically, we had only one tooth, and that was a shrub ox. There's got to be mammoth in there, I would think, someplace. But it would probably be beyond the side or whatever. Could you develop a thing where you do GPR in sand, say, in your backyard or the school or whatever. And then bury some bones and then find the bones. What does it look like when you go through sand and all of a sudden, boom, you've got a mammoth leg bone?"

So, he did that. And he said, "Now, let's take it to Bechan Cave and play that game there for them." Because it could be like hey, if you go over to that corner, you're going to find a mammoth. And if that's important to you, that would be way cool.

So he did some work in Bechan Cave with GPR. And said okay, now we need a permit to truth that. There is something going on at that spot. There's a really weird perturbation going on. And it can't be a sandstone rock in the sand because that would be the same reflectivity of it. So something else is going on there. And he could see the dung layer. So what is going on there?

And they said, "Oh, no. You can't dig in that cave. It's archeological."

And I go, "The turd is not archeological. And we've already described a lot of the archeology from that cave when we dug our trenches. So that archaic archeology Larry and I described. So could we truth it?"

"No, can't do that." Done.

So I think Bechan Cave could be done new and better with new techniques. If the park wants to know. It's not going to destroy, it's not going to remove the entire deposit, right? You're talking about another test. But it takes a park unit manager that has the ability to question and think about what they're preserving.

Now there's other shelters in Glen Canyon. I mean, we have Mammoth Alcove. Named pretty nicely and easily because of a mammoth bone. Shrub Ox Alcove. Because of a shrub ox. And there's a number other alcoves. And they've all got just a tremendous record.

My first master's student, Kim Withers. She and I published her thesis along with some other stuff related to it a billion years ago in *Great Basin Naturalist,* Withers and Mead. And that kind of points out, of course what she and I found. And all those alcoves should be the same thing. So there's just a tremendous record out there.

Grobot Grotto has a beautiful record. We did work that. BF Alcove. The Park Service (laughs) the Park Service thinks it's Big Fauna Alcove. But we were at one point, Larry and I wanted to get kind of a general handle, how many problems are we going to have with alcoves? Let's take a helicopter and fly these canyons. So we did that. WE went around, screaming around one corner, one of the bends. And here was this, if you don't mind, a Big Fucking Alcove in front of us. So that's BF Alcove. But it's Big Fauna. Because when we were talking to Park Service, they said, "Well, how'd you name that one?"

And we go, and Larry and I look at each other (Santucci laughs), "Yeah, Big Fauna. Big Fauna Alcove." But it has what I think is camel. I think it was a camel, two camel turds in there. MNA has them. And they could be DNA. But it's a very thin in the sense of front to back deposit. But it's very long. It's like I don't know, a hundred meters long and probably, oh, I'm going to guess twenty meters high. But from the drip line to the back of the alcove, it's like only a meter or two. So, this is stuff that could get lost through time, obviously.

So, there's a lot to do in Glen Canyon. Again, it's going to take paleo-botanist, somebody who speaks bones, knows how to look at sediments, and then there's the ability to do some cosmogenic dating and maybe OSL dating here and there when you get beyond fifty, sixty thousand for radiocarbon dating and so forth.

1:33:25

Santucci: So it seems like the next thing we need to talk about is are we able to schedule you for another day? Because I think there's a lot more that we need to cover. (Mead laughs) We got through Oregon and Utah. We haven't touched Arizona, Nevada, New Mexico, Colorado, South Dakota, or anything.

Mead: You know—

Santucci: Anything in the eastern part of the United States.

Mead: What?! Eastern? Oh, no. I don't recognize that, that's a different country. Sorry, Vince, you're gone. (laughs) I go to where Justin is and then draw the line there. No, we can. You guys, mull it over between yourselves. See if it's worth the time. And then we can do this again if you want to with other topics or whatever. It's fun for me. I'm kind of reliving, having a blast. I'm getting ready to retire again anyway, so this is fun to kind of go over all this stuff.

Santucci: And I have several page of notes. So this has been very, very informative to me and enjoyable to just listen to you. So, yeah, if we can schedule another time. We can communicate through email and find a convenient time for you.

Mead: Yeah.

Santucci: There certainly is many more things that we want to discuss. Justin, did you have any closing questions at the moment before we get off?

Tweet: We haven't even gotten to the Channel Islands and to Lake Mead or anything like that (Mead laughs)

Santucci: I have a long list of parks.

Tweet: Right.

Mead: (laughs) We can do that. It's not a problem. I'm having a blast. It's all fun. And reminiscing, and it brings up these funny little things that come up that I'm sure most archeologists don't want to hear. But anyway, yeah. You guys talk it over. Next week is good for me, but if you guys have another time, just let me know.

Santucci: Okay. Yeah, we'll look at some times and dates next week. Boy, thank you. This has been really enjoyable and informative. When we finish this, we will give you a transcript. One, for you to review, and two, for you to have. So, thank you.

Mead: Oh, wow. Cool. I appreciate you guys very much. So it's been a lot of fun. And you guys just stay safe out there where you're at, and we'll talk again whenever you want to meet up again.

Santucci: Really appreciate it. Thanks so much, Jim.

Mead: You guys take care. We'll catch you later.

Santucci: Yeah. Have a great weekend. Bye-bye.

Mead: Bye.

[END OF RECORDING 1]

[START OF RECORDING 2]

00:00

Santucci: I'm going to give this opening statement and then we can jump into the interview if that's okay.

Mead: Okay.

Santucci: All right. Thank you. Today is Tuesday, August 4, 2020. My name is Vincent Santucci. I'm the senior paleontologist for the National Park Service Paleontology Program. Today we have a second with paleontologist Jim Mead. Jim is currently the chief scientist and director for the mammoth site at Hot Springs, South Dakota. He also worked as a professor at East Tennessee State University and at Northern Arizona University. Jim has been involved in paleontology and paleo-environmental studies in many National Park Service areas, requiring us to schedule this second interview to cover this work. We are joined today by National Park Service paleontologist Justin Tweet. And the interview is being conducted by telephone. So thank you again, Jim.

Mead: Sure. Sure. No, this is great. Go ahead and ask questions.

01:03

Santucci: Okay. So I think Justin's really excited to talk to you about Channel Islands. So I think we won't make him wait any longer. Can you provide us your background as it relates to Channel Islands?

Mead: In the Channel Islands, really that got started because of Larry Agenbroad. And he basically had been called out to kind of look for more pygmy mammoths. And so I went along on one. There was an indication that there might be one eroding out and it might have more than just the typical skull or tusk. And so in doing that we found basically the complete mammoth that they have. And so it was designed to excavate that. So we kind of planned that out. Now, I was not part of the excavation. But I did say, "Look, when you guys are doing this, be sure to save some of the sediments, because there could be micro stuff." And the general trend at that time seemed to be well, there's probably no micro, I don't see any micro, therefore what's it really going to tell us? And I said, "Well, just go ahead and save the stuff, and then we'll take a look. And if there's nothing, so be it."

So they did their excavation and of course a replica was made. So that one's on display both at, I think it's at, I don't think it's at Santa Barbara Museum. I think it's at the actual visitors' center for Channel Islands. I can't remember that. And then we have another copy that we have on display here at the Mammoth site that Larry wanted. So we do a little bit of advertising, if you will, because of the theme mammoth.

But in going through the micro stuff is when I found the salamanders. And so that turned out, we published that right away and that turned out to be the first fossil salamander from the islands. It's not totally unexpected, it's just that nobody had found it before. And there is the [trachosets?] 03:28 out there, but in a very reduced number and distribution. And so we got that. So that told me there really is micro out there. Of course, they already knew that in the work that various people, Guthrie, especially, was doing on the various shelters that are out there. So we knew that stuff was out there. It's just it hadn't been found Pleistocene, necessarily, and in the context of some mammoths.

So that kind of moved along. And Larry then kept doing the pygmy mammoth studies out there. Mainly mitigation. Although he did do a lot of surveying with Don Morris and they did a lot out there. And of course a lot of geology has since been done out there that's been fantastic. So that was going on.

And then when Larry, unfortunately, died in '14, I think less pygmy mammoth was really ongoing. I think there was just not the energy for that.

When I came onboard here at the mammoth site in '15, basically in '15, and then permanently in '16, I wanted to evaluate, what is the mammoth site really doing out at Channel Islands? Are we accomplishing what we want? And we didn't really know what we wanted. And then are we helping out the park, per se?

And of course, along with that, of course, would be Santa Barbara. But that really wasn't my focus. I figure Santa Barbara can take care of themselves. But they're basically speaking Channel Islands, the park. So I wanted to be able to help out.

Another survey was done out there by two of our people and they did find another tusk exposed that was just barely eroding out at the bottom of a canyon. Actually they went to check out what one of the rangers had found, a guy named Larramendy. And so they took pictures of that. And I said, "That's got a color to it that we might be able to get DNA. So why don't you see if there's the whole tusk there?"

Well, then it became obvious that it's in a skull, and that there's probably another tusk there. I said, "Well, then, you need to check to see if the rest of the body is there." Well, it wasn't. But some work with Channel Islands and various things, we were able to preserve it, excavate it out and conserve it basically in place. And then we had to find money to get it out of there. And that's not something that you know, hey, let's just pick it up and put it in Vince's backpack and he can take it out. You know, it's obviously very heavy.

So after a lot of conversations and all, it's my understanding that the Park Service, Channel Islands, did come up with the money to air lift that big, heavy thing over to the boat dock. And then the Park Service with their typical boating took it to shore. And took it to the mainland. And then a company was able to get it to Santa Barbara.

Now, Santa Barbara really didn't, they didn't want to spend money on this, on our endeavor. They'll have their reasons. That's fine. We said, "Well, you don't have a preparator." So we, the mammoth site basically put in the money for our preparator to be there for over a month. And then at some magical point then, of course there was a lot of advertising and everything. So you know, Santa Barbara really raked it in on this one. Because they got all the advertising and it looked like they were doing it. And they weren't doing squat with it. Fine. Not an issue. My goal was the mammoth, not promoting Santa Barbara at all.

At some point then we decided you know, we can't afford this anymore. We'd already spent about probably twenty-five thousand on this thing. So we got a U-Haul and permission and I drove it back here to the mammoth site, where our preparator kept working on it. And then things got busy here. And ultimately we hired Mary Carpenter out of Badlands to work on it seasonally for us. And basically have the whole Larramendy skull prepped out and ready to go. And then of course thanks, Vince, to the Park Service and all, we now have money to do some DNA analysis. Hopefully there will be something in this. So, out at [McMaster?] we're getting the sample of the tusks analyzed to see if there is any DNA.

In the process of working on Larramendy, Justin Wilkins from here, who was here at the time, did part of his thesis out on the Channel Islands. Looking for fossils and kind of saying where are they found, and finding some new ones. And I convinced him to look at the micro. Mammoths are wonderful, but they're not the entire story. There are a lot of other things going on. And my approach is always environmental, habitat, not just one particular critter, necessarily. And so, and that process, we screen washed a lot of the sediments from Larramendy and adjacent to Larramendy skull. And we're getting a fair amount of micro out of that.

In the process, I identified a chorus frog that is definitely Pleistocene in age. So that, we published right away. So that's out there. So now, because of mammoth, we basically know about salamanders and frogs out on the island. To me, that tells me there's a lot more to the story out there. It's just that we have to have a different set of eyes looking and sampling.

So that's pretty much where all that is right now. We have Larramendy on display. My intent is to, has been to have it on display here. We talk about the pygmy mammoths. We do a variety of things about the pygmy mammoth and such. And then, for the Channel Islands Symposium in November, we would just take it on back and give it to the Park Service/Santa Barbara. Of course now with that being cancelled, then we won't be taking it back. So I'm kind of leaving it up in the air right now on what to do with that. But at some point, if they want to come pick it up, of course they can. But at some point, it will get back there.

Now since all this is, since all this has been going on, of course, we know that Santa Barbara has now hired Jonathan to be their paleontologist. And I think that's fantastic. So he's out there and we work together well. We'll probably collaborate on a few things. But I don't know how much he wants to do with Pleistocene. He's certainly doing other things. So we're there to help. But us being so far away here at the mammoth site, I'm not really sure how much we should push to do stuff out there. We certainly shouldn't be the senior project coordinator sort of thing. There's a lot of people in California that can do this. And I don't know how many would be showing the interest in it. But certainly Jonathan for Santa Barbara, which is the logical place to push this can do this. So I'm telling them, although we'll help where we can, maybe our biggest help would be with the micro fauna that really, especially the herpetology side, that nobody's really studied out in the California area. But the mammoth side of the story, they've got that covered. I don't see why we need to spend our money to go out there. And again, because our approach here is not just mammoths, I just want us to be available to help out when they ask for it sort of thing.

So that's pretty much the Channel Islands that I'm thinking of unless you guys have a couple questions on that.

Santucci: Justin, do you want to ask any questions first?

12:25

Tweet: Did you get out there much?

Mead: I was out there, oh, what, two or three times. I went out there with Scott Anderson at one point. He had a permit to collect, to do a pollen profile. So we were doing a pretty large profile in this one canyon. Oh, shoot, now I can't even remember which island it's on. I think it was Santa Rosa.

Tweet: [unclear]

Mead: Pardon?

Tweet: Probably Arlington, then?

Mead: Yeah, I just don't really remember on that. But I do know on the profile, we got samples of snails. And all that was written up as a thesis. And I've been trying to get her to publish that. But Snyder did modern and fossil terrestrial gastropods of – oh, Santa Cruz Island. Yeah. Northern Channel Islands. So that's her thesis. And I do want her to get that published somehow.

So I may have to push that along myself on that. So that was really what the botanical side that I didn't really instigate but I helped out. Because again, it's the total environmental side of things.

And I never helped Ken Cole do what work he did out there. He was doing that on his own from the Park Service. So that's pretty much it, I think.

14:01

Santucci: Any other questions?

Tweet: We've spoken with Scott Anderson and also Don Morris.

Mead: Yeah. Yeah. They were doing quite a bit out there. Of course Don's out there as much as he can be. So he certainly has a history out there.

Santucci: Any other questions from you, Justin?

Tweet: No.

Santucci: Jim, I had a general question. It would just be nice to hear your perspectives on pygmy mammoths and island biogeography. (Mead laughs) You know, sort of the Reader's Digest version of it in terms of its significance.

Mead: To me, the site is, the islands are unique. I think we already know that. So there's a unique thing that that everybody will say, "Oh, yeah, yeah. They're unique. And yeah, we know about them." And I think I know just enough about it to say we really don't understand it in its full entirety. We haven't given it due justice attention. And I think, well, for instance, if you talk about the pygmy mammoth. Oh, yeah, the island have the pygmy mammoth. Well, the Larramendy mammoth is not as small as the quote "known" pygmy mammoth. But it's not as large as the large Columbian mammoth that comes out from the—or if you want to call it the imperial mammoth, whatever—comes from the shore, comes from the continent out to the islands. So it's in between. So the general feeling is well, some people would say well, you make it a new species. Well, that hasn't helped any. And so what is it? And my gut feeling is well, it's a transitional form. And so what does that mean in taxonomy?

So, in working with Larramendy, and I'm trying to describe the morphology of the skull right now. I'm trying to pull that together and get it out there and say well, here it is. And they said, well, it's probably just a juvenile form. Well, you look at the tests of Larramendy, they're very, for the individual, they're long and heavily curved in towards each other. That's an adult form. It's just that it's a short adult form. But not as short as the pygmies.

So in doing this description I thought well, this is simple, Jim. Let's just go to the description of the pygmy mammoth and then make a comparison. Well there really isn't one. It just says it's small. Well, that's helpful, you know. An Asian elephant is small compared to something else. So to me, the pygmy mammoth is not well-described. And Larry Agenbroad would go over and collect and look at all the small teeth and then made a, basically a range scale. Well, the tooth is this, it's this. And, yeah, it's smaller. And it's kind of like well, sometimes you need to have the teeth in place in the skull to figure out which tooth you have. Because you can't

just say well, if it's this millimeters long, it has to be this tooth. Well, not if you're a pygmy, it's not going to be that long. So there's a lot of questions around the pygmy.

And I guess if I had to put my money down right now, I would say it's not a good distinct species. It's an ecomorph. And you're going to have a lot of those on the island. If a big guy or gal swims out to the island and dies there, you're going to have a big one out there. If you have one there for who knows how many generations, those generations will become smaller. And I don't know how long that takes. But I think Larramendy is a classic example of a transition form. And presumably it had offspring and so forth and so forth. It, too, would have then become quote "the small one of the pygmy," possibly. But it's thirteen thousand years old. So I mean, there's not too many more years before that whole form dies out. So I think we're not giving it justice on the island.

I think somebody who wants to speak elephants and has a lot of time to go through the collections out there and look at things should say, "Okay, here's what the island had. It had all these different sizes. And here's the individual ages of those." And we need to quit saying, "Oh, well, if it's on the island, it's a pygmy mammoth." Because I just don't think that's correct. And so that's my bias.

Just the mammoth story needs a buttload of work. It could take one person a thesis or dissertation or whatever. It could easily be done.

And then I think we need to start looking at Pleistocene habitats. And this is just my personal gut opinion, I think a lot of the micro fauna stuff that's been done out there has been labeled so much archeological when really that's not proven at all. There's archeology out there, but it's a veneer. But now it's controlled by archeological concepts and archeological processes. You know, so I think there needs to be some other approaches out there that are more ecological and pantological. I read some of the theses that were done out there. Archeological theses on the, if you will, the Zooarch material from a couple of the localities because they were labeled archeological. The data that they were generating, they were weighing the bones of these little lizards. It's kind of like, what did you think you were going to get out of that? But okay, go ahead and do it. Now let's see, what did you come up with a conclusion? "Oh, they were small." (Santucci laughs) Well, no shit.

So I think our approach to the Channel Islands has been a little bit misguided. And I appreciate they've gone out and gathered it. They've got tons of stuff out there. But I don't think anybody with the needed background is actually looking at that stuff. But at least they've taken it, so we know that there's a target out there. Now we have to have the right person quote "to shoot at it," if you will. And they've done great things with the birds. I mean, Guthrie has done fantastic. And we need that same sort of thing towards the mammoth, and the same sort of thing towards the herps. And keep going from there to play those games. If people care, and then if the park from the park's side's saying, hey, we don't really have a good handle on what's going on out here. We have all these things, and there's a lot of wonderful statements. But there's really not a lot of good, hard ecological data on the fossil stuff. Now the geology? Superb. So I mean, the ground is set for this. The chronology's out there. I just think the park or somebody that's close by, meaning California, needs to say, okay, this is my project. And it's not just archeology.

It's Pleistocene paleoecology. Again, no slight to the archeologist. It's just that I think we need a little bit different eye set.

Santucci: Thank you. Any last – go ahead.

Tweet: I was just agreeing with the idea with the mammoth not being a species as you would ideally conceive it. Because there's nothing that was stopping additional full-size mainland mammoths from showing up whenever they felt like it, more or less.

Mead: Right. There's no wall. They can swim. So it's not a problem.

Tweet: And then we've also got, we go from four to one, then one to four islands several times throughout the Pleistocene.

Mead: Yeah. Yeah. Yeah. Let alone going back to, you know, Pliocene and the Miocene. So I mean, although we know that those deposits become harder and harder to find, I guess, and smaller and smaller in area, typically up slope. But I think, now maybe Jonathan's going to be all over this. But I think somebody with that approach can really start looking at these deposits and not making wild guesses. And then just kind of go hey, no, this is what we've got. And start doing a lot more.

So it's a very exciting time. I don't think it's doomsday at all. It's a very exciting time for the right person or persons that have the right background to dive into that place. Because the Channel Islands are unique. They're incredible. We haven't given them due justice, I think.

Santucci: Thanks very much. That was interesting.

Mead: Sure. It's [unclear] but that's my view.

24:16

Santucci: Okay. (laughs) Thank you for that. Shifting to South Dakota, you were involved in a project at Wind Cave. Do you want to share that story with us?

Mead: The Wind Cave stuff, the first time we started looking at Wind Cave, they had found a cave that had some bones in it. Could we assess it? And we were of course digging at the mammoth site. So they asked us to come look at it. It's a cave called Salamander Cave. And it's not really deep in the cave, but it's just more difficult to get into. You have to do a lot of contortions that make you think of I should have been doing yoga for the last ten years. And once you get in there, it's a really nice deposit. We wrote that up. It's in a Rufus Churcher volume on Salamander Cave. And it's a preliminary study. So I think more could be done there, especially in the dating. Our dating was just a one-shot deal with uranium thorium. So more could be done there. That really kind of opened up more stuff to be done in that park. I think the park really wasn't geared towards really looking at what they might have. Their local resource people were the South Dakota School of Mines. And of course their view at the time was, well, anything younger than Pliocene is overburdened, so why would you want to look at that? And it's understandable. Everybody has their select time unit to work with.

So later on, when I'm here, I'm talking more and more with them, I think they're getting used to the word "Ice Age Pleistocene." But I guess I was still in Tennessee when Cora called me and said, "Hey, we found this cave called Persistence Cave." And it's a small entrance and it's blowing an amount of air that says it has to be at least forty miles of passage. And so we want to go through that. But there's a lot of dirt in the way. It's a tube. And it's chock full of dirt. And I guess we kind of need to know, is there anything that we're going to disturb in that dirt. But we need to find this brand new cave.

I said, "Well, isn't it just Wind Cave?"

"Oh, no, no. It can't be Wind Cave because we've never been able to go from Wind Cave into this area. Apparently it's just a wall of something, there's no way to get in there. So it's got to be another new forty-mile cave plus."

I said, "Well, spelunking, the speleogenesis thing is all up to you guys. But intuitively, because it's only over the hill to the entrance to Wind Cave, I bet you guys just haven't found the way through the quote 'wall' to get to this cave. But that being said, just give me couple of bags, just give me like two or three bags, Ziploc bags, and let me take a look to see if there's anything in them." And what we did is we screen washed it through a 500-milimeter, or 500-micron screens. Thousands of bones. And immediately find stuff that, we found a pika. Now the closest living pika is in the Bighorns, two hundred miles away. So I said, "Yeah, you've got a really cool cave and a big problem. Because you guys can't just blast through this thing to find your lost city of cave. But you know, parks, you guys go by your own rules, I assume."

So we kind of worked with them quite a bit on this. And now that I'm here at the mammoth site, we've been helping out as they dig a little bit further, we look at samples of that stuff. Tremendous record! And we did a little excavation one summer for a week in another tube. It kind of drops down seven feet and then it's kind of like a Y. It peels off one way that we dug a little bit, and then it peels off the other way where the wind is coming from. And they've taken that hundreds of feet now. And it is beginning to drop. And I'm certain that it, and it's of course heading toward Wind Cave. But that's their game to play. I ultimately don't care if it's one cave or twelve caves. I just want to know what cool dead things are in it.

And when you walk the ridge outside, you find these little depressions that just can't be an old root bowl. You know, where a ponderosa will be growing and then it tips over and it yanks up the ground and you notice a depression after the tree rots away. Those have a certain look to them. And these depressions that we're seeing for the most part look like filled in old entrances. And when you get into the cave, you kind of go yeah, these are just little tiny entrances that are lasting for who knows how many hundreds or thousands of years, and then they fill in and something else happens. But a phenomenal record is coming out of that cave. And we're getting radiocarbon dates back to forty thousand. So it's a tremendous record for the Black Hills, let alone Wind Cave.

Now, interestingly, I've gotten them to kind of well, when we're actually in Wind Cave, maybe we ought to look around a little bit more. So when they do that, of course, surprise, they find things. "Oh, we think we found a big bone. Could it be a camel? Or is it a horse?"

And I go, “Well, that’s a bison.” So we get it dated. And it’s not surprising to find a four thousand year-old bison from Wind Cave National Park. But this is all making sense. It’s a beautiful part of the story.

And then they’re pushing this one area that lo and behold, is kind of towards Persistence Cave. And they’re getting all these new passages—not a surprise—and they find a carcass. And they go, “Could this be the black footed ferret?”

And I’m kind of going, “Well, let’s get some good pictures and take a look.” To make a long story short, they bring the carcass out and it’s a pine marten, which is not in the hills today. Eighth century, twelve, thirteen thousand years old. It’s a beautiful carcass. And we’ve measured it up and we’ve compared it with the material that we’re getting out of Persistence Cave of the marten. We have two different forms, if you want to call them species, we can. But there’s the noble marten and then there’s the current two species sized essentially the same. So that’s in a manuscript that’s being reviewed right now. So they’re very excited, as they should be. And then they start exploring more back in there and they say, “Well, there’s more carcasses.”

And I go, “Well, who would have guessed? Yeah, there’s going to be more carcasses.” As they get closer and closer to Persistence Cave, they are finding more carcasses. So there’s some other entrance that we don’t know of or was there and is now sealed up, or it is Persistence Cave. Either way, that whole area’s kind of filling in with cave passages and very cool paleontology. So I think the park now is kind of going oh, we really do have a wonderful record on the Ice Age for at least the southern Black Hills. Isn’t that a surprise? So I’m working with them as much as I can on that. And keep that going. One is to keep the interest going. Now, they don’t have money. Who has money in the Park Service unless you’re one of the top five or whatever? And even then, I don't think there’s that much money. So we’re basically funding it as much as we can, either out of my pocket or volunteer stuff, which is still a cost. And then I can use, I have a certain amount of funds here at the mammoth site that I can use it however I want to. And I’m spending it on Wind Cave because it’s a fantastic record, and I can’t rely on the Park Service to provide that. And that’s, not a worry about that. I fully understand that after dealing with the park for what, forty-six years.

So there’s cool stuff going on in the Black Hills. And we barely understand it. And Wind Cave’s going to be critical to this.

Now, Jewel Cave’s probably another story. Agenbroad got a little bit in the entrance area that Jewel Cave people wanted looked at. And that never went anywhere. Part of it is, I think it may have been a little bit disturbed. And part of it, Larry just wasn’t into the little critters. He was, you know, big bears and mammoths. So that aspect hasn’t really taken off. But I’ve talked to a couple of their administrative people and said, “As you guys find stuff, let me know.” So, but nothing’s happened from there, though. Did that help you there?

34:06

Santucci: Yes. Thank you. So, Rod Horrocks departed and went to Carlsbad Caverns. Are you working with Mark Ohms at this point?

Mead: Yeah. Yeah. I work with Mark and their people. And of course they're getting a new superintendent some year. I've worked with the temporary one they had for a while until May. But I haven't met, or I'm not sure who the new temporary super is out at Wind Cave. But everything says everything's going to be fine. I love working with Mark. Mark is probably a very good caver. He doesn't know squat about paleo, understandably. I don't know what his geology is but I don't think there's a lot there. That's okay, too. What we want to start doing for the Forest Service and the Park Service and the reservations in this area is to say, to start having workshops that say, "Here's how you can tell these bones apart. Here's when it's human, so your police guys, you cannot worry about potential homicides if you have this." And you know, start getting the Black Hills in general kind of up to snuff about what you're going to find in those caves. Because there are so many caves in the hills because of the limestone. The Madison Limestone or the Pahasapa [Limestone] as they call it out here. It's just a tremendous record.

The Forest Service has many caves with cool stuff in it They, too, were working with them on a couple of caves with just phenomenal record. So, it's coming together. I'll work with the Forest Service just fine. They have, they seem to, are able to find different types of money that are more usable at times versus the Park Service. But that's fine. I can piece things together to get the story.

36:09

Santucci: Well, congratulations about that.

Mead: It's fun.

Santucci: And it's close to your backyard.

Mead: Yeah. Yeah. (laughs) It's pretty nice to go way out into the field, fifteen minutes from here, and get this stuff. Working with Wind Cave is fantastic. Everybody there is neat. This is all so new to them, and they're all just, everybody I run into has been very, very helpful and very good. So, it's there. They just cannot fund it. And therefore they feel kind of hopeless. I'm like, well, don't be hopeless. We'll work together on this. But you guys need to start doing more visitor education outreach, visitor enhancement stuff. And I don't think they know how to do that. Or if they do, they may be crimped by the various regulations within the park unit. And that pandemic hasn't helped at all, right? It's hurt everybody, in so many different ways.

So we advertise the work we're doing at Persistence Cave of Wind Cave Park here at the mammoth site. So we're kind of their outreach a little bit in some ways.

Santucci: Great. Thank you. We're going to shift south again. You had a student that had a project just outside of Great Basin National Park?

Mead: We've done a number of things in the Great Basin area. It's always pretty much been the Snake Range. Now we've just published, actually we just did the galleys yesterday on Labor of Love Cave and the cool fauna of that. But that's Forest Service land. But what it's essentially saying is every single mountain range out there is going to have a really cool record. So it's kind of like, oh my God, there's a lot of mountain ranges. But really, the Snake Range I've been looking at since, I guess it was '76 the first time I went out there. And we started doing things

first with bristlecone pine, and finding bristlecone pine and doing cores. And then Bob Thompson, he was a graduate student, as I was, with Paul Martin at Tumamoc Hill. And Bob wanted to do packrat middens from the Great Basin. So we picked Smith Creek Canyon, which is where Smith Creek Cave is. And a lot of archeology had been done in that area by Alan Bryan and Ruth Gruhn. So we thought wow, let's go off here and look at the middens. Well, I mean, you couldn't turn around twice without running into more middens. And then Bob was really pretty much wanting to do the plants and only plants.

So I thought well, let me do the other stuff. So in there, of course, we're finding dung. Right back to the dung thing. Pika dung is very distinctive. And so we're getting pika dung. And we can dig that and we can do analysis of pika diet. And then we're finding other little critters. So we kind of worked that up quite a bit.

But we also went into Smith Creek Cave, which is Forest Service. And just tremendous stuff. We're going back to that, doing a lot in that Smith Creek Canyon right now. And none of that is really Park Service. And I'm not even sure where the Park Service lands are now in the southern Snakes. But we've talked a lot with the park folks about you're going to find more in your area. And you're going to find more in your cave. Now the problem that you have with your cave is that it's so full of speleothems that it will quickly encase a room and cover up a bone and that sort of thing. So a lot of it that's going to be in there is going to be hidden. But they do have a record and there are more things out there to look at. So we're working to them to push that along. Being a typical park, they want to help out anybody outside the park, too. So they're very willing to help out when we did some work in Snake Creek Burial Cave, which is just south and downhill from the park land. And tremendous natural track record there. And we're still working on that material.

And then up the canyon when Gorden Bell was at the park, he was able to get permission to look at Snake Creek Cave. There's too many Snake, Smith and all that kind of stuff caves out there. But Snake Creek Cave is, I think, in national forest land, but was able to work on that, better understand that, even though he was national park. But he doesn't know really the bones, so he's asked Chris Jass and I to work up that fauna of the samples he took. So we're doing that right now, too.

But I think, just thinking of the park lands, there's got to be just gobs of stuff in the actual park. And again, I'm not quite sure where the boundaries are. Because I think it expanded at some point to cover more area. But I could be wrong on that. But there will be a phenomenal record out there. And they need to, again, I'm going to guess they don't have the funds. So as things are found, you know, we're ready to help. And so, what I've done here at the mammoth site is we're running a number of projects through here. And then I have different colleagues that will spearhead it. So of course I do the mammoth site, and I'm doing the stuff in the Grand Canyon and Persistence Cave, of course, which is right here. I'll spearhead that and other people help me. Chris Jass is spearheading a National Forest cave and we have some funding for that. I'll help him, but we'd run it through the mammoth site. Steve Emslie a bird man, paleontologist, out in North Carolina, is spearheading the overall Great Basin project, running it through the mammoth site. So we're kind of a center post to that sort of thing for a number of different projects. So he'll do the birds, I'll do the herps and some of the mammals, and Chris Jass will do the voles. So again, it's this collaborative work in these different areas that we just funnel

through the mammoth site. So there's lots going on in the basin and a lot more could happen. I don't even want to go to some of the other mountain ranges there because I know there's caves there and I know they have bones in them. But it's kind of like oh my God, how long am I going to live? Let me just finish the ones I'm working on now.

43:25

Santucci: Excellent. Thank you. And any questions from you, Justin?

Tweet: No, I just remember working on the inventory report for Great Basin a few years ago. We have one for [Cadet?] 43:41 Park as well, one that Gorden had started before he left.

Mead: Yeah. Yeah. It sounded like he's pretty much backed away from doing that kind of stuff at all. When he retired, it was let me get back to farming, is what it sounds like.

And one of the more important archeological, paleontological reports in that area is Rozaire's what, 1964 report on, what is it?

Santucci: Lehman Cave?

Mead: I don't think it's – yeah, yeah. It's actually on the quote "cave" itself. And I tried to hunt that down. And I finally got hold of a buddy of mine at Nevada State Museum, Gene Hattori. And that report was all done up beautifully and then put away. And so I convinced them they needed to make a pdf of that. And that needs to get out there. We're going to revisit, you know, as much as we can on that. But I mean, boy, that's kicking a door open that nobody is looking at. Especially from the park viewpoint, but let alone anybody else. So we're making use of that and going to expand on that.

Santucci: Justin, we never got a copy of that, did we?

Tweet: Well, let me look.

Santucci: I had an opportunity to meet Charles Rozaire before he passed away.

Mead: Mm hmm. If you don't have that, I can easily send you the pdf. I've contacted all kinds of people that either didn't know of it or knew of it but they really didn't have it. They just references to other people referencing it to other people referencing it. But few people seemed to have the actual report. And it even took the Nevada state museum to find it in their files dug away. And so now Gene is going to, now that he has a pdf of it to send to me, he's making that readily available to anybody at this point. But I don't know how soon that might happen, just because of the limited work they're doing at the Nevada State Museum because of the pandemic. So if you guys don't have that, I'll certainly send you the pdf.

Santucci: That would be great. Thank you very much.

Tweet: We might have. It's forty-one pages?

Mead: I'd have to look. That sounds about right.

Tweet: Okay.

Mead: But I'm not next to mine, so I'd have to take a look.

Tweet: But that even doesn't look like it's the whole thing. The table of contents, and it goes up to sixty-eight pages. So we may only have a chunk of it.

Mead: There's a lot of figures. There's a profile. Let me see if I have it readily available right here. I'll have to dig it out. But what I'll do is I'll send you the pdf. Wait, what is this?

Tweet: That would probably be the easiest.

Mead: Yeah. December '64. I've got it right here. So I've made a print off of it. And then I'll send you the whole thing. And some of the, as you can imagine, the black and whites aren't the best. Gene sent me some separate and high-density better photos. But, yeah. I can send you the whole things and you guys will have it.

Santucci: Thank you very much.

Mead: Sure.

47:14

Santucci: Okay. So while you were at NAU, we assume that you were involved in some projects either at Walnut Canyon National Monument or Wupatki National Monument?

Mead: Very little. Ken Cole really did more on the middens from that park, Wupatki. I never really did that much for those parks. Maybe because they were too close sort of thing. You don't know your backyard, but you know something further away. So no, I don't really, I haven't done that much with it. They would find a thing or two, a bone or two. They would bring it to me and I'd tell them what they have. But that's pretty much it. Same thing with Sunset Crater area and all that. Just never really did that much there. It was more archeological. The typical thing of as soon as something was shown of interest in a park in that area, they'd go, "Well now you're going to have to get an archeological permit" and all this sort of thing.

And I said, "Whoa, whoa, whoa. Okay, so, look. If you want me to do it, you give me the permits. But if you're going to make it difficult, and I have to do all this for you for free, catch you later. I've got a lot of things going on." So a lot of times I'd back away just because of all the regulations that would force archeological aspect on something that's clearly not archeological. So I just said, absolutely no.

But in other places, it was very easy. Grand Canyon, not that much further away, that that was incredibly easy, depending where it is. Now of course, now the caves, every cave is a sacred place to every nation of Native Americans. So it is a little bit difficult. Even though the archeology is clearly of the near, of dust on the surface, it becomes labeled and therefore very difficult to do work in there. Maybe understandable. Whatever. I guess if I was nineteen and looking for a career, this would be a real problem for me. It's like okay, one less thing I have to do. I guess I'm getting old and crotchety, you guys.

Santucci: (laughs) Great. So, what we're doing is we're coming back to the bullseye of Grand Canyon. But we want to work our way in peripherally. Had you done any work at Lake Mead National Recreation Area?

Mead: On the lake lands itself, no. But as you guys know, I'm missing the name. Not Glen. Oh, what's the – you guys know it. We put it in our proboscideans volume. What's the land just outside the park of Lake Mead? And the Lake Mead has the remains of it. But it's not, the bones actually aren't from park lands, they just administered it.

Tweet: There was a Glendale site.

Mead: Glendale. That's what I was thinking. Yeah, Glendale. I was thinking Glen Canyon. I knew that wasn't it. Glendale site. And that's, the much of it worked on quote "Lake Mead stuff" is that site. And that whole area needs to be looked at. There's more stuff that could be in Lake Mead land, but nobody's really looking at that. So who knows what's going to happen there?

Tweet: There was, I think Larry excavated a few bones from Virgin River early '90s

Mead: Mm hmm.

Tweet: I think there are, somebody at Set Lake, probably Erin Eichenberg may have been poking around, trying to find out what had happened to those.

Mead: Yeah. No idea on that. I remember [unclear] 51:24 and he'd say, "Yup, they called me out to look at some mammoth bones." Yeah, so the Virgin River area does have that. Clearly up in the hills there will be a lot. And again, nobody's really done that at all. But as far as the lake land, that area, no, no. Where that used to go into the Grand Canyon, you know, at some point we'd have to have Lake Mead permits to work in the Rampart Cave area. But all that, has of course switched on over to Grand Canyon and so forth.

Santucci: Excellent.

Mead: I guess to answer your question, really, I guess, would be no, I've not really done anything in Lake Mead.

Santucci: Okay. Super. So, moving, then, to Parashant National Monument. We talked briefly about it on Monday but I wanted to come back to that and talk about it in a little greater detail.

Mead: Yeah. You know, when they made that BLM/NPS park, they of course knew that there were things about caves. Let me step back a little bit from that. When Rampart Cave burned, we wanted to find a new Rampart Cave, if we could. So I did a number of helicopter trips all along that whole cliff area there north of the river, which would now be in, basically, the western-facing cliff of the Shivwits. And looking for another cave by helicopter. And it became obvious that yeah, you might see a little hole, but you can't land. And that little hole could be phenomenal or just three feet deep. So it proved that hey, there's a lot out there. But it was never,

we never went further with it. And it was difficult to work in that region, just due to how to get there. And we were doing so many other things that I just never, never went back out there.

Now when Shivwits became a park area, Grand Canyon-Parashant, Voyles would tell us that hey, there are some caves here, can we go look? So we immediately went out there and looked at just a grunt load of caves. But pretty much all those were gypsum solution caves, that will be very, very young. So if the story is, and the question is Holocene, well, yeah, there's a lot of stuff out there for that. If you're looking at Pleistocene, I'm not sure those caves are going to provide the answer. Or they're going to be really rare and you'll have to look at all of them.

Now, the cliffs right nearby will have packrats. So the packrat story out there could be equally as, could be tremendous. That hasn't really been dealt with all that much.

Now when you get to the part where it's starting to hunker right on the edge of the Grand Canyon and the cliffs that go down into the canyon, now you're starting to get quote "better caves, real caves." We're doing a couple right now. Pigeon Canyon. There's to me, it would be very easy. As I mentioned the other day, it wouldn't be that difficult, I think, to get something as cumbersome and clumsy as the mammoth to walk into the Grand Canyon on that one big bench. The [Senip?] 55:15 Plateau is kind of, it's sort of like the platform at the eastern end. The tunnel platform. It's a sub-platform within the upper cliffs but above the bottom of the canyon. And there, that whole area, I think that would actually be more Grand Canyon than Parashant. But I think that there's a tremendous story out there. And I think we're going to see different environments out there. It's a lower area. It's different climate. And you can get different hikers getting in there. So again, I think you're going to get more camels, different types of camels and peccaries. And the potential out there I think is tremendous. And that's also, I think, where we're going to get, if there is one, I think you're going to get a record of, say, the pika moving from Cedar Breaks and as it's quote "cold" and whatever during the glacial, they're going to move downslope. And they could have swept out across and dropped into the canyon or close to it, across the Shivwits to the south. So I think there's another story out there that we don't have a real glimpse of at all.

Too often, okay, I talked with the Grand Canyon people and they would say, "Well, we already know the canyon, the Grand Canyon."

I'd go, "Well, we know the eastern end. We know the eastern eighty, ninety miles, kind of, in a corridor and a little bit up a couple of side canyons. But from there to mile 277 and north to the Utah border, we don't know squat."

"Well, this should all be the same."

Well, why? I mean, I've never known nature to follow rules. So to me, there's an entirely different story out there. Elevations, topography, everything. So I expect it to be totally different. But our assumption it will be the same as eastern Grand Canyon. Which is, again, mainly Marble Canyon. That's where most of our story is. And then a little bit as you turn the corner and start heading west to [Adam?] 57:35 Ranch and that sort of area.

Santucci: Yeah, that western edge of the Grand Canyon, where Parashant and, there's an intersection between Parashant, Lake Mead and Grand Canyon, you know, it's essentially the southwestern edge of the Colorado Plateau, going into the basin and range province.

57:55

Mead: Yeah.

Santucci: And so, both ecologically and biologically, there's going to be some interesting things going on at that transition point that hopefully are recorded in the fossil record.

Mead: Sure. Well, and I think we already see that and we didn't realize it, right? Where is the only place you find Shasta ground sloth? It's right there at that corner, basically. And how high up could that sloth or maybe other sloths, or some other related things, have gone up onto the plateau and such? So, yeah, I think you're right. That whole area at the edge of the plateau, and scooting in of the basin range things is going to be very interesting. Unfortunately, of course, we flooded that entrance tongue, the lowest part of the river. But if you look at the old topo maps, there was a very wide terrace areas bordering the Colorado River as you got that far west. And we're finding, I haven't published this yet, but we've got a couple little shelter deposits from the ring-tailed cat that show that the desert iguana had zoomed into the canyon here and there, and the gecko and some other things were coming in. But now we've destroyed that habitat. So we don't see it today. And we just haven't done enough with the fossils in that area, other than Vulture Cave and Rampart Cave. So, yeah, there is a big story of the corridor. And then get up out of the corridor, onto the Shivwits itself to get higher elevations and different environments. I would hope that at some point, that park would say, let's really dive into this, and understand it.

Santucci: So time to go back to Grand Canyon National Park. And I'm going to ask you a question that's probably not going to be one that's easy to answer. (Mead laughs) But from your firsthand experience and your knowledge of the cave paleontology of Grand Canyon, can you share with us which caves you feel are paleontologically the most significant in Grand Canyon?

1:00:23

Mead: The ones that we know of, you mean?

Santucci: Yes.

Mead: I mean, because I think every cave out there is going to have a pretty cool story. And the ones that we said, "Well, let's go into the Daw Cave and take a look at that real seriously, well, lo and behold, there's a lot of cool stuff in it. I don't know if you've been in the Daw Cave, but you can enter it from the bottom. And it's a huge entrance, big thing you see a long ways away and go, "Oh, wow, look at that!" And then if you go in there and keep crawling around, you pop out above the cliff, the Redwall. So there's an avenue through there. And Native Americans knew that. Must have been scared as the dickens, but there's artifacts going all the way through that thing.

Then probably the earliest first paleo-ecological study in the Grand Canyon, a serious one, would probably have been Douglas Schwartz' work at Kaetan Cave. He was going for the

archeology. But again, the archeology, which was split-twig figurines and a few little sundry things here and there, was a veneer. And what they took out of there was a lot of mid-Holocene and then Pleistocene material. And the pollen profile that they reported on is probably the earliest good pollen stuff from that end of the Grand Canyon, if not really some of the earliest stuff in the Southwest that's well dated.

So I went back into Kaetan Cave and did some work in there because of the mountain goat and all. And of course, boom! Beautiful, detailed study their stuff there. I mean, it's all over. So you kind of go well, that's a cool cave. And then, I'm not sure I'm pronouncing the name right, but deSaussure's work on the caves in that region of the canyon. And he'd say, "Well, this one has horse, and this has marmot and all that." All those caves are going to be the same thing. I looked at a few of them and like oh my God, yes.

And then Horseshoe Mesa has all these caves. And of course if you really go into them, you kind of go, oh, I can go in this entrance and come out over there. And there's stuff all through there. So that hasn't been looked at more than just the packrat middens. And that's another whole, oh my God.

And then the work we did in Marble Canyon region, that Steve Emslie and I did. We did a forty-day river trip, leapfrogging down that, and worked in Sandblast Cave and all these other caves. And each one of those like whoa, look at this story! Whoa, full of [unclear] 1:03:15 and that sort of thing. So that's where I kind of developed the bias that said if you want to impress me, Park Service, give me a cave that doesn't have something in it. They'll I'll be impressed. Then I'll just walk away, too, because it's not interesting. But you know, there's just so much stuff.

And of course in our discussions about some of the new caves in the canyon on the north rim that have bat material, that just kicks the door open. I mean, to me, it's kind of like yeah, there's cool bats in there. We've got a bat specialist working on it. But there's going to be a lot of other cool stuff in there, too. And maybe not in the entrance that everyone wants to go in. That's obviously a real screamer to get into. But the other entrances will be equally as good.

The work we did in Stevens Cave and Rebound Cave and all that, that whole peninsula, that whole butte, is riddled with caves. And we try not to let people know, but if you go in one entrance, you come out the other one. That's the story of these limestone plateaus that stick out with a canyon on either side. They're going to be riddled with caves and they're full of stuff. And archeology will be just a little dusting veneer on the top. And there's something that's three thousand years old next to something that's twelve thousand years old.

If you go back in [Bedaw?] Cave, right where the lower entrance ends and becomes a tunnel, or a typical cave, and that's the last place you see any light coming from the outside. And there's a whole bunch of bedding depressions there lined back in the '70s, lined with mountain goat dung. And those are all dating 18,000. So just a tremendous record.

I can't pick a best cave by any means. Each one is having a tremendous story. And it's not always the bigger caves that are quote "better." Vulture Cave is just an itty bitty, just you look at it, kind of why the hell would I go in there? And just phenomenal record of stuff in there.

And of course that's right above Rampart Cave. So you're speaking western end of the canyon instead of what's typical of the eastern end.

And again, we typically are doing corridor stuff. Rarely do we get significant away from the river and higher up. Job security for people.

1:05:58

Santucci: Do you have any observation—

Mead: That didn't answer your question, did it?

Santucci: I've got a lot more, based on what you just said. (laughter) So just the simple question, and I'm not sure that there's an answer to this, either. But do you have observations in terms of any differences in the Pleistocene cave fauna going east to west in the canyon? Or is that not something that's detectable?

Mead: The things that I see, of course, are my bias and our bias in view of where they are. But we're almost comparing apples and oranges for a couple of reasons. But western end, and when I say western end I'm actually talking from about mile 100 clear to 277, right? So that's certainly not half. River miles, of course. We really only know Rampart, a little bit of [Nualt?] 1:06:57 and then Vulture Cave. Well, that's down the corridor. And then at the eastern end, then we have Bedaw and Kaetan that are halfway up the cliff sort of thing. And then middens all over the place from Ken Cole's work. And then of course we have once again dropped into a corridor of Marble Canyon and all the phenomenal stuff there. And then at [Manqui?] 1:07:22, of course is where we have Stevens Cave and all that. And that's of course at the top of the cliff.

So to me, there is a definite variation from east to west. But we don't know it well enough. And our transition to east and west, unfortunately, covers a huge part of the Grand Canyon. So I think we know enough to say yeah, we really don't know it. But I think we know it well enough to say okay, if we approach Ice Age reconstruction and then fossil resource, nonrenewable resource on a question base, then it's going to take looking at that middle region. Kanab, Canyon on down. Of course, we can't work the south side because of the reservation, unfortunately. But that's going to have a tremendous story. But at least on the north side, there's stuff there to look at. And you can actually hike down to the river at, say, mile 206. Now, you're going to know it. And that's going to be a butt buster of a hike up. And as long as you didn't trip at the top and roll down in, but you can get in and out in a couple of places there. And the Native Americans do that. So therefore, the fauna knows that. And so there's tremendous questions. There's definitely an east-west variation. And there's definitely a high elevation to river corridor variation. And we do not know it. But we have a good glimpse of yeah, the record's there. Just got to go do it if it needs to be done.

Did that kind of help a little bit?

1:09:13

Santucci: Oh, yeah. Definitely. Can you tell us the story about Rampart Cave, briefly? The background work before Mary Carpenter's project? And then Mary's work with you? And then also the story, as you know it, related to the fire.

Mead: Yeah. Well, I got introduced, as I mentioned a little bit last interview thing, to the Rampart Cave area. And there's no question that Rampart Cave is just, and Muav Cave, although we really don't know that at all, is phenomenal because of the sloth dung. And of course I was developing my routes and figuring out how do I stand up straight in paleontology by going to those places. So I was growing very rapidly there. To me, Rampart was being done so well and so much, it's kind of like well, why jump on that wagon? There's other wagons. That's when I found Vulture Cave. Which was easy to do. I'm climbing around these cliffs going oh my God, here's a little cave, here's a little cave, and here's cracks and middens. And I kept seeing this vulture flying around, and then it would disappear into the cliff. And I go, huh. That must be my vision or something.

Anyway, I work my way up to it. And lo and behold, here's this little crawlway that goes into a cave that opens up where the vulture was. And like a youngster, not knowing what the hell to do, I didn't take a light with me. You know, kind of stupid. I learned at that point, you always take a light with you. But I crawled into the cave as much as I could. And I just closed my eyes and start smelling. And I could smell old midden. I knew I had old middens because of the strength of the smell. And I yanked off one chunk of midden because it looked like there was something glittering on it in the little bit of light I could see. And it turned out to be a camelops tooth. And juniper. And then when I turn around and look around, there's no juniper. I didn't see any camelops, needless to say. So I knew I had Pleistocene. Well to me, that said this stuff's all over the place.

So then we kept working that area. And then there was the fire. And I never dealt much with the fire. I heard about it. It was horrible. And of course Paul Martin and [Austin Long?] dealt a lot with it. Once they had boarded it up to smother the fire, because they knew that if you pump a lot of water in there, you're going to put the fire out and then you're going to introduce water and decay everything that has been preserved. So we basically avoided the place. And then finally they said, "Well, it's out. It needs to be assessed."

About that time, I was at NAU. And I said, "Okay. Well, if you want, we'll go in and we'll assess what's happened. And maybe more importantly, what's preserved."

And of course the excavation back in the '40s, that excavation—hold on one second. Hold on a second. [pause] Sorry about that. So, we went in there. But the excavation which was done went clear to the bedrock floor. Well, that made a fire break. So actually, the excavation that quote "destroyed the deposit" in some ways, by taking it all out, was the thing that saved it. So there is stuff in there, tremendous amount in there.

So at one point, Mary Carpenter said, "I really, I like everything." Which is good. "And I want to work in the Grand Canyon." Because she'd gone on a number of our trips into the canyon.

I said, "Well, you could review what is and is not known about Rampart Cave. Pull it all together. But it's probably too big for a thesis."

"Oh, no, I can do it." And it's kind of like oh my God, you're not going to get tenure. You've got to get finished. (Santucci laughs) She was on a six-year route. And typical of Mary, very detailed. And having a hard time to say, "I am finished." So I kept pushing on that. But she went to the Smithsonian and looked at this and looked at that and did various, and pulled together her monumental thesis, which I think should be published, and it could be published as a unit or as fragments. Some of the materials that she has is already know. But she presents it in a way that it's almost kind of new material. It's new look at this stuff. And then of course she found the old notes and the old map and all this. So to me, if I were the Grand Canyon—you know, very biased—I'd say, "Okay, we're going to take your thesis, Mary, and we're going to make sure it's published, because this data has to be out there." Otherwise, it's just another tremendous thing that's now lost in the archives. So I really think she needs to get that out. Again, it can be done in chunks, like taxonomically. Here are the birds, and here is the historic side, and here's this, and here—or it could just be done as one big thing and get it out there.

And I would help doing that. I know we can't wait on Mary to do that because that's Mary. She'll take it 40%, 60%, and then needs the energy from outside to finalize it. So I harass her about every three or four months. But that needs to get out there. If nothing else, for the Park Service's sake, if not the Smithsonian's sake. But I think it just needs to be out there. Tremendous story in there. And some stuff, again, already known. A number of things were lost in the field notes until, typical of Mary, she rooted around and just asked enough questions to irritate people that they went and found this stuff. And now she has that. The map and all that sort of thing. So Mary Carpenter, I think, has done a tremendous service to the system on that. For sure.

So, Rampart Cave is, it's not dead. But I really think the question, any more work in there ought to be question-oriented that can't be answered by the material that Colleen might have in her cabinets at Grand Canyon Museum archive area.

Santucci: Thank you for that.

Mead: You've got other questions about Rampart on that?

1:16:28

Santucci: Justin, anything from you?

Tweet: We can probably spend all day on Rampart.

Mead: Yeah. And then there's Muav Cave, right? Muav Cave is just another [Schwastic?] 1:16:49 cave that's just packed full of stuff. The entrance was dug. And not really reported on very well. But you have the Floss study a little bit. And it's assumed of oh, yeah, well, it's the same thing. And it isn't! Because it's down by the river. Rampart is way the hell up from the river. So it's going to speak a different ecology. But now you can't work in it because it's an archeological place. And I agree. It's definitely archeological. Crawling back in one of those tubes, crawling through and looking at sloth dung I have known and loved, and then here's an

obvious turquoise-painted trove, you know, Anasazi or whatever you want to call it, Pueblo artifacts. So I mean, there's stuff in there, for sure. It should be looked at more seriously, and not just by an archeologist, because they'll miss the boat.

1:17:48

Santucci: Justin? Anything else?

Tweet: Not for me.

Santucci: Jim, you had an opportunity to work with Steve Emslie. And his work on the condors is pretty exciting, important work. Have you seen any condor or other avian nests from that, are believed to be from the Pleistocene within caves at Grand Canyon?

Mead: Definitely. Yeah. There's no question. Battleship Rock. So go to the South Rim tourist area in one of the little jutting out plateaus there is called Battleship. And on the west side is a cave that the park knows about. And they were interested in it because the released condors, they may have found a new roost to start roosting in the Grand Canyon again. So they went up and did their thing on that. And they were telling me about what's in there. And they pulled out some of the things that the condors were eating. And I said, "No, you got two different condor things going on. You've got the modern one, and all that string and this and that, and this and that is definitely your modern condor putting a new nest in there. But it's on top of a Pleistocene one. And the bones and things you guys pulled out are Pleistocene condors and a Pleistocene horse and this sort of thing."

I recently saw, when I was back at Colleen's area, and nobody's worked that up. So I said, okay, the next time I can get down to the Grand Canyon, I want to just write up that stuff. Steve Emslie wants to do the condor material, of course. And that won't take all that much. And then I want to do the few other things that have been pulled out. But that's definitely a Pleistocene condor nest that the modern condors are going well, it's good enough for Great Grandpa, I'm going to take over now. So, yeah, that's the logical one. And I think those would be fairly common in the Grand Canyon.

Santucci: And just a random question. But do you think that there is any difference in vertebrate use during the Pleistocene as to whether the aspect and opening of a cave would be north-facing or south-facing, or any observations about that?

Mead: I would think there is. But I don't, I can't think of anything that's really dictating that. I think we don't know it well enough to really say that conclusively. I would think certainly for condors and maybe the teratorn, they're going to need a big opening high up so that it can leap out and then catch the uplift. But that's not really north-south facing so much as an aspect on the cliff. I do think the North Rim will have some boreal species that you're not going to find on the South Rim because of elevation and because the river has made a barrier that it can't, boreal species can't cut clear on across that low and then occupy the South Rim.

Now, going the other direction, it's my understanding that the peccary, the live javelina, when we have the not cold winters for a while, they're able to, the javelina were able to jump from basically Walnut Canyon, which was their kind of their northern limit due to cold weather,

and jump over the, if you will, jump over the plateau where it's cold and then got into the canyon. Once they got in the canyon, well now we don't have to worry about cold winters.

And at one point, I was shown a jaw. Yeah, I think it was a jaw. No, it was a skull. And they said, "What is this?"

And I said, "Well, where did you find it?"

And they said it was in a canyon across the river. North side of the Colorado River in a little cavity and some hikers had found it. Well, it was a javelina. So the javelina have gotten across the river, and who knows what they'll do? I think it's an excellent example of things moving in. And of course I point that out to Jan Balsom and other parkees of the Grand Canyon during the bison issue thing. And I think that's why they probably rightfully don't care for me all that much. Only because I bring up the fact that there's a lot of things that are moving in more recently. Elk is relatively recent. We don't know when elk moved in. And things like that. So there are things in the canyon, things are going to come north. And the river will be a barrier. But for other things, it may not be. And then we're going to have things coming down from the highlands of the plateau during the Pleistocene that, again, won't run into a barrier. So I think there's some neat north-south stuff. But we haven't sampled well enough to really say that conclusively.

1:23:44

Santucci: Thank you. So, although you haven't worked in these two parks, per se, we have recently, within the past five years, added two new additions to the National Park System. Tule Springs Fossil Beds National Monument in Nevada and Waco Mammoth National Monument in Texas. I know you're familiar with the resources. Do you have any thoughts about either of those two National Park Service sites?

Mead: Well, I think they're tremendous. Incredibly important. I'm so glad they're saved. They both speak a little, I mean, other than the fact they both have mammoth, they both speak a little bit different languages for their areas. Incredibly important. I think they could be looked at in more detail with a different set of eyes. That's not something that I would dive into myself unless a park unit said, "Hey, we have this. Could you help us with that? Either do it yourself or tell us who to go to." So I always want to be a resource for questions like that. But I think those two parks, it's incredible that you guys have saved those.

Now I don't know how much Waco is going to continue doing exploration across, I know it's not a big park and that sort of thing. So they may, instead of wanting to look for big bones, start doing more on climate and that sort of thing. And maybe they are. I know they did some re-dating to find out a better age estimate. But the story might actually be outside of the bones and more with the sediments and the environment. Tule Springs might be the same, although so much has been done at Tule Springs. But there's always more stuff to look at. But I think it's great that those were preserved. Kudos to the park.

1:25:51

Santucci: And so as a student, do you recall Vance Haynes ever talking about Tule Springs and his work there during the 1960s?

Mead: (laughs) Pretty much all the time. (Santucci laughs) Because that's really where he got his, he really developed his thinking a lot there. As did Pete Mehringer. You know, Mr. Pollen Guy. And that's why I ended up going up to Washington State University for one year, because, so he got his paleo feet sort of thing by working out at Tule Springs in many ways. Of course Vance would always bring up, "Well, at Tule Springs, we found," you know. And that's of course where I really got into well, the Great Basin, thinking about it in a sense that also includes that part of Nevada. Clearly there's another whole story up there with artesian springs and fluvial lakes, using that older term, and all that sort of thing, let alone what's up in the hills. So, yeah. Vance, he being on my committees and then a professor and then working with him at Lehner Mammoth Site, it was just phenomenal.

So I mean, they were critical people to my, to my education and developing my ideas. And I'd develop an idea along what they're saying. And then I'd keep looking at the stuff and go, hmm, that's not right. You know, and they would say, "You don't have to agree with me. If you disagree, find the data that shows that. But make damn sure it's critical, good data. Don't just give me your thoughts." And so they helped out a lot with how you think, and how you present a difference of opinion.

Paul was very much that way, too. At one point, Paul Martin said, "You know, I really don't care if I'm right or wrong. And it could very well be that I'm wrong about the blitzkrieg model and extinction." But he says, "Nobody else is questioning this stuff. So my approach is to be the irritant that gets everybody so pissed off that they'll go find the data to disprove me." He says, "I don't care. That's fine. But they've got to do it carefully. They can't just say, 'Well, but I have a site that dates twenty thousand.' Well, you did a shitty job at it. So why should I believe you?" So they really pushed how you think about the Ice Age. And I think that was critical.

1:28:39

Santucci: Good. I'm getting down to my last couple of questions. There's one more national park I want to just ask your opinion about. And that is White Sands National Monument and the discovery of these late Pleistocene vertebrate mega tracks that occur there. Do you know much about it, and do you have any thoughts about that locality?

Mead: I've been out there. I haven't been out to the footprint. I've just been the turista and going, oh my God, this is another whole huge story. And then we were reading about the footprints and all. It's kind of like, that is fantastic. I don't know what to do with footprints. I was with Lockley down in Mexico. We had an Ice Age archeological meeting to go to and basically at the Cuatro Cienegas region. And he was out there and we had a field trip to all the footprints out there of all kinds of things, including people. And I said, "When you see these footprints, what does it tell you?" And it was interesting. He was saying well you can of course tell the speed and maybe the weight and the direction. And I go, "What do you do with that, though?" And I've never gotten a real good answer to that, but I don't know if I really have to have one. I think it's phenomenal that we're getting this kind of preservation. And the fact that we're now getting it, we're now realizing it, I guess, better, at White Sands, that, too, needs to be studied

more. I know there's that wonderful little report out there with the sloth and the humans. And I think that is a wonderful story by itself as long as each of those can be definitely proven to be tied together, the sloth and the people. And I think it can. And I think those things need to get out there more. I think White Sands might be the best one that we know of, at least in the USA, to capitalize on. So I think that needs to be looked at more. Now, is there more data out there? Don't know. I have not really been out there. I'm anxious to go out there. But you know, besides footprints, well, maybe there's a dead animal or two. Those ought to be described more before they get blown up by the navy or whatever. But I think White Sands would be great, but I do not know that place.

1:31:22

Santucci: Thank you. I'm going to ask you one random question and then I'll have a final question. And I'll check in with Justin to see if you have any questions before we get off. But to me, I find it extraordinarily interesting that we have Holocene occurrences of mammoths in the Wrangell Islands off the eastern coast of Asia dating, reliably dating to about four thousand years ago or so. That really dispels old beliefs about mammoths becoming extinct at the end of the Pleistocene along with the other megafauna. Do you have anything to share in regards to your contemplation of having four thousand year-old mammoths as a relic species out on an island?

Mead: Yeah. To me, it's not much different than the island pygmy mammoths of Channel Islands. I do feel that that might be a good example of a population under incredible stress, and then people show up. I think that's a very plausible thing for the Santa Barbara area. I don't know that. I'm just saying, hey, throw out that question, then I'll go out and test it. Everything should be tested. So the questions have to be testable hypotheses.

The Wrangell Island ones, and of course the other ones on the north side of that area. It's not a surprise. They're high mountains. The elephants went up and they were obviously under stress. We've read that. We see that. But apparently there wasn't that final coup de grace of stress until about 4,000. We don't really have—I mean, if we didn't have people, could that have been the same thing as Santa Barbara? Don't know. You know? I don't know how that is. They're close enough that why couldn't they swim back to—you know, little elephants, could they not swim back over? Or were they small enough and light enough that once they got to the Santa Barbara current, you know, boom, off they went down the current? So in some ways, that doesn't bother me.

But see, I don't look at the extinction as an event. This is kind of where I'm growing up with Vance and Paul. An event is sort of like boy, that Thursday was a horrible day. Or that thousand-year period was a horrible time. We had this happening and that happening, and then these two-legged things came by. It was just bad ass and a lot of things died.

I see it as a process. And I don't know how long that process is. And it may have been, you know, based on taxonomy. Some things are so tied to a very strict diet. And if that diet changes, you're out of luck. You know, if all you eat is McDonald's hamburgers and that company disappears, you can either change your diet, you can travel to where something is similar to it, or you change your diet all together. And I see this as a process. And I don't know how long it lasts.

Now, I just submitted—Wade Miller, I know you guys probably know Wade Miller.

Santucci: Yes, uh huh.

Mead: And he, I guess it's okay to mention this. He has Stage 4 cancer problem. And so he got hold of me because he found a site in Mexico that has horses. And it appears that they're very young. And he said, "What should I do?"

And I said, "Well, you need to date this, this, this, this and play this game."

And so he did that. He wrote a manuscript and it got rejected. And he said, "Could you help me?"

So I said, "Let me read it." And so I read it, and go, "Yeah, I see why it was, it's not developed for this kind of an argument. You developed it as a paleontological thing, but not as an extinction thing."

And he said, "Well, I want you to rewrite it. Could you do it quickly because I want to do it before I go."

So it's like, oh, shit, okay. So let me drop everything and let me dive into this. Because I've not been to the site. But I know the data. And it is a bunch of horses. And they do go up, basically to the modern. And I think it's well-dated as throughout the Holocene, as horses. Back to 44,000. So it's either there's some issue with all the dating, different ways it's been done. Or, horses are an example in some places that they were able to hold on—and of course a horse is a very durable animal—they were able to hold on and there just weren't enough people, I guess, to kill it off the way that maybe it did the mammoth in most of the mammoth areas. I don't know. But I do think the extinction thing is not an event, but a process. And now I think we need to approach the process thing a little bit differently.

It seemed like the arguments are either, it was either humans or climate. Well, what is it about climate? Well, you know, climate. It's like no, I don't know. Let's look at climate a couple of different ways. Why does the extinction thing have to be this or that, white or black? Why can't it be this huge gray area in the middle? And now you've got to start formulating questions. And then go to particular places that will answer those questions sort of thing.

So, that's my approach. I could be way off. And who knows what's going to happen to this manuscript we submitted? I tried to write it so that people could be open-minded and go with this. It won't answer anything. It will be another data set that's out there.

But there's other places that have younger horses into the early Holocene. Alaska and Yukon have examples that appear to be well-dated of horses lasting into the Holocene. Well that, to me, kind of opens the door of maybe horses are a resilient taxon. Which we see on the BLM lands today very easily. So maybe horses are part of the whole process and they did last a long time. I don't know. But I do think the extinction thing as an episode is a process. That's my bias.

1:38:17

Santucci: Thanks very much. That was great. Justin, I'm going to go ahead, before I ask my last question, I wanted to see if you had any other questions.

Tweet: Well, just mostly some comments of things. Going back to Tule Springs and the Great Basin, well now it seems like we're finding similar spring-fed wetlands environment in several of these other parks. Joshua Tree, Death Valley. Maybe [unclear] 1:38:51, we'd have to look at that some more. But it seems like it's kind of a widespread thing, actually.

Mead: Yeah. Okay, so what is your question on that, actually, I guess. Restate it.

Tweet: I guess I didn't really have a question. I was just making an observation.

Mead: Yeah. I think there's a lot to be studied and looked at. I think some parks that don't have a record, I think, you know, they deserve a look at. I know that most of the rock, well, a lot of the rock units in, say, Joshua Tree are not conducive to caves. But there are middens out there. And the middens will hold a cool record.

I think there are a lot of parks that their mission has been people and pretty this and pretty that. But haven't realized, hey, you know, you might have a tremendous resource that you must look at. But nobody's pushing you to look at. But by being Park Service, you need to conserve it. And before you conserve it, you've got to know what it is.

I've been pushing Badlands. Sharon Holte and I are pushing Badlands. Because they go, "Well, you know, we really don't have Pleistocene." Well, yeah, you do. You've got bison out there. "Well, yeah, but that's really not part of our mission." Oh, yes it is. Because it's a fossil resource. It's just not the typical stuff that you guys are saving. And now that Rachel Benton is retired and there's different views of the deposits, lo and behold, yeah, there's a lot of bison out there. And the fact that there's an archeological Paleo-Indian site just off of that that's been studied, [unclear] 1:40:49 site, there could easily be a lot of cool things out there on park land that will take a little different viewpoint to look at.

So I think a lot of the parks might be pushed a little bit within reason to say hey, we might have a resource that we do have to take care of, but we don't know what it is yet. So maybe some sort of survey or whatever to take a look at that.

You haven't brought up Yosemite, those parks in that area. They have caves. Tremendous records! That's another area that is wide open to, no different than the Great Basin type of caves in many ways. They're wet. They have rivers in them. Or they're kind of wet/dry, but there's old river stands in there that will have bones. And we did a quick article on one a number of years ago. It's not all that old, but it points out oh, yeah, there's going to be a lot of stuff on these parks, too.

So I think all the parks have them, they just may not want to look at them, don't have the resources to look at them, don't have the expertise to do it, and don't really want to ask for help, because my hands are full with people. You know, that kind of thing. A biased rant.

1:42:20

Santucci: So I think it was two years ago, Justin and I saw you at the Society of Vertebrate Paleontology meeting. I think it was the Albuquerque meeting. And we cornered you and talked about this inventory of National Park Service sites for Proboscideans.

Mead: Yup.

Santucci: And so that occupied you for a year's time or a little longer. (laughter) But that was finally published, thanks to your efforts. And we really appreciate that. Through that process, did anything pass your way that you felt was particularly valuable about that project?

Mead: Yeah. I think what you guys are pushing, are moving along, is important. I know it's an overview of, in some cases, an overview of stuff already published. But there's also a lot of data stuck away in parks, or associated or disassociated museums that I think we all need to know about. And when we did that Proboscideans manuscript, a couple of the reviewers – now, granted, we did it in an eastern paleontology journal, right? And most of the record we were talking about spoke mid and west. So some of them were like, "Well, why should this be in this journal? It's not eastern." I don't think that makes a bit of difference. It's pointing out what's out there. And from the park's viewpoint, it's a resource. And I think it forced some of the parks to go, "Oh my goodness. Yeah, we actually do have some of these critters. And therefore there is a record there." And I would like to believe that any sort of resource manager or park superintendent sort of person would go, "Oh my God, I wonder what else is out there that I should be guarding, that I should be inventorying, that I should be doing something with." So to me, the value of that was really more of a prod to say, "Hey, folks, this record's out here. No, there's not a lot in the east, but there's not a lot of parks in the east. But some of the parks in the east do have this."

And so, I enjoyed doing it. Although I must say it's the most different article or manuscript I've ever written before. But it was fun. It was entertaining to see what the record is. I think those are important. I know you're doing one with Gary Morgan, or have done with Gary Morgan for Carlsbad. And I think that's really important. I think these parks need to do these things. You know, we've done the Grand Canyon Ice Age one. What's needed is you guys pull together all the different ages of paleo for the Grand Canyon region.

I do think we do need to realize, the Grand Canyon's the one we think of the most in that we were pushing for Grand Canyon National Park. But that's not what the ecology of the area, ecology doesn't care about park boundaries. So I was kind of pushing to include areas around it, too. Just because that's the ecological aspect. And I know others were, you guys were saying well, we need to look at the park boundaries. And I think it was a good compromise to show that we could do a little bit of everything. So I think what you guys are providing is very important and needs to keep happening. And then it rolls into the parks where, "Hey, you guys have a record here. You're not doing anything with it. We need to find funding. We need to find the person that will do this, or the people that will do this." And I think it will keep rolling through. So I think you know, kudos to you guys, for sure.

Santucci: Well, thanks very much. I think we've captured almost three and a half hours of your time through these interviews. And I could go on and on. You're a good storyteller with integrity and you have an understanding of what's important to us as land managers as it comes to

understanding these resources. You know, on behalf of the Park Service, and me personally, thank you very, very much for all the work that you have done. The research, the science, the stewardship. The training for park staff and increasing awareness of park rangers in terms of these nonrenewable resources. We're very much indebted to the good things that you've done for us.

Mead: Well, I appreciate it. And I hope we can keep doing that. And as I get older and phase out a little bit, the mammoth site's going to keep with it. Especially along the lines of caves. Caves as a resource. In many ways, we can, because we're not owned by any agency like that, we can say we don't care what agency wants to come here. We care about caves. And so we'll teach about all types of things from caves. So we want to start offering more, as I was saying before, workshops. So, Sharon Holte, we will be doing that sort of thing. We'll be doing more and more of that. Speak caves, speak Ice Age, speak Holocene. And if you're Park Service in California, fine. If you're Forest Service of Great Basin, don't care. Anything from here or wherever, back east, too. Doesn't make any difference because we're doing it more topical than agency wide. And I think that's an advantage for us, I think. So we'll keep doing that sort of thing.

Santucci: We're going to keep watching you and see where your bucket list takes you for your next adventures.

Mead: (laughs) Thanks so much, you guys. I appreciate it. You guys be safe and hunker down, okay?

Santucci: Thank you. You, too. And really appreciate your time.

Mead: Okay. We'll see you guys later. Bye-bye.

Santucci: Have a nice day. Bye-bye.

Mead: Bye.

1:48:57

[END OF RECORDING 2]

[END OF INTERVIEW]

Total time = 205 minutes