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# Vincent Santucci
# September 26, 2022

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# Transcript

[START OF INTERVIEW]

Gorski: Today is September 26, 2022. My name is Julie Gorski. I am sitting here with Vince Santucci. Vince, why don't you go ahead and say and spell your name for us?

Santucci: Okay. My name is Vincent Luke Santucci. Last name is spelled S-A-N-T-U-C-C-I.

Gorski: All right. And we are recording today for the oral history of the Trackways. Researchers here at White Sands National Park. Do you consent to this interview being recorded?

Santucci: Oh, absolutely perfect.

Gorski: All right. And Vince, what is your title and your relationship to the project?

Santucci: Sure. So I'm the senior paleontologist for the National Park Service, probably one of the best jobs on the planet. I provide support to the national parks across the country and specifically 283 of those parks where we have documented fossils. We provide a whole range of support to parks where they have needs from basic inventory and monitoring, through looking at research proposals, museum collections, interpretation, education, and, unfortunately, sometimes even law enforcement investigations associated with paleontological resource crimes.

1:17

Santucci: Okay.

Gorski: Also, and what was your background prior to being the senior paleontologist for the National Park Service?

Santucci: Sure. So I grew up with a family that loved the national parks, and so it really inspired me to look for opportunities for that in my career. So, I did my education at the University of Pittsburgh looking at geology and paleontology. Had the opportunity of having Carnegie Museum in my backyard and working with paleontologists there. And so when I was looking to do my graduate field work, the location was in Badlands National Park.

Santucci: And so I took a chance and I filled out a Seasonal Ranger application. I was offered a position that provided me the opportunity to work as a Ranger, an income, and have a place to live and then be able to do my field work on my days off in the evenings.

Gorski: Awesome, awesome. So—so what made you decide to be a paleontologist then, or what got you interested in geology and paleontology?

Santucci: Having Carnegie Museum sort of meant my backyard was great. So I lived a stone's throw away from both Carnegie Museum of Natural History and Forbes Field Baseball Park for

the Pittsburgh Pirates. And it was a hard choice, whether I wanted to go play baseball or go into paleontology. And so one of the things I did during the summer is I had a little notebook where I went in the museum and I sketched some of the dinosaur skeletons and took notes on some of the exhibits, and it just stuck with me. I never outgrew that passion.

Gorski: Did you have a favorite dinosaur at the Carnegie?

Santucci: Probably Tyrannosaurus rex, because they had a very, very famous specimen of Tyrannosaurus rex there.

Gorski: So I grew up not far from Chicago, so I'm familiar with, like Sue.

3:10

Santucci: Excellent.

Gorski: All right. So how actually, we're going to backtrack. So what—what was the kind of the background, the context for having a paleontology study here at White Sands National Park?

Santucci: Okay. So part of our job for the National Park Service Paleontology Program is to identify which parks have fossils. So we do inventories and inventories essentially look at trying to determine the scope, the significance, the distribution, both in terms of geographic and temporal distribution and the management issues. And so, we reached out and we look at every national park to see if there are fossils there.

Santucci: Even Gettysburg National Military Park has fossils. It has some dinosaur tracks and an old stone bridge. So we didn't have a whole lot of information regarding White Sands. And so when David Bustos joined the staff, he had contacted me and-and brought to my attention that he thought he was seeing these fossil footprints in these ice age lake deposits.

Gorski: Okay. And before David arrived here at White Sands National Park on staff, were there any stories or just – like local stories, you know, of people who maybe saw something or thought they saw something?

Santucci: Yeah. When we're doing our inventories, we look at any potential source of information. So things like scientific publications or are there museum collections at a museum from a particular park? But we also look at a range of other things. We look at fossils that occur within a cultural resource context. So for example, there are archeology sites that have fossils in them.

4:59

Santucci: There are projectile points made out of petrified wood, you know, in the arid Southwest that they originally were fossils. And so we look at fossils on all contexts. We weren't finding a lot for White Sands. We were finding some references to possibly Pleistocene

Holocene remains of some plants and some pollen. But we weren't finding a whole lot. There were some references to possibly fragmentary remains of mammoths or other animals, but we didn't really get any hard evidence until we started speaking with David Bustos.

Gorski: Okay. And so when the decision to move forward with research began, what were you kind of expecting to learn? What was the reason for going forward with that.

Santucci: At White Sands? Yeah. So this is a extremely rare occurrence of these Ice Age fossil mammal footprints that are preserved in these lake deposits. And of course, before we did inventories, before we were able to do some analysis, we didn't really know the full scope of these resources. And so over several years, we, and mostly David, were able to document more and more fossil tracks to the point where we realized that this may be probably one of the most important and—and largest number of fossil tracks from the Ice Age, from Ice Age mammals that are largely extinct from anywhere in North America.

Santucci: And so what we did is we determined that this area is something called a mega track site. That means it's a site with thousands, maybe tens of thousands of individual footprints. And so from that standpoint, it's extremely important scientifically. It provides us opportunities to look at aspects of the paleontology that we don't really have in many other places.

Santucci: One thing that is interesting about fossil footprints as opposed to studying bone—so bone are the physical remains of an organism that tells you what the knee bones connected to the leg bone and all that sort of thing. How big the animal was, the identification of it, and how it changed over time. The footprints are different. They're not the physical remains of an organism. They're evidence of biological activity. Walking, running, sitting down in the mud, rolling over all those sorts of things. And so what they do is they provide an opportunity to look at aspects that we may not otherwise be able to capture through paleontological research. And one of those things is diversity. So the different kinds of track makers that we're here.

7:53

Santucci: But when you're looking at a fossil footprint, you're looking at a relationship that's 1 to 1 between the sediment that it left its footprints in and the living animal. So there's really wonderful opportunities for paleoenvironmental, paleoarcheological studies because it's the same environment. I'll give you a completely different environment. So one of the most famous fossil sites in the National Park Service is Dinosaur National Monument.

Santucci: And the quarry face that the Carnegie Museum studied and excavated back in the early 1900s has this wonderful collection of dinosaur bones and a couple of turtles and crocodiles. But the thing about it is that it's a death assemblage. That means that those animals that died, they were carried down a high energy river, transported from the environment they lived in and accumulated on a sandbar in an environment after their death.

Santucci: So it's called a death assemblage. So the relationship between the living organism and the sediments that they're preserved in doesn't exist there because it's after their death. So again,

the importance of trace fossils provides us that 1 to 1 relationship; a moment in time where a footprint was left, where we can look at those sediments and compare them to the footprints to be able to make those paleoenvironmental comparisons.

Gorski: Okay. Yeah, that's great. Thank you. I wanted to follow up on a lot of things in there. So. So here at White Sands National Park, what kind of track makers were you studying? Like, what did—what kinds of tracks did we find out there?

Santucci: Yes. So when David first called me in late 2009—I had never spoke to David before—and he was on the phone. And, you know, if you know David, he's—he's a very polite, wonderful, soft spoken person. And he said, "I wanted to introduce myself. I've been here for a couple of years. And, you know, we monitor through all sorts of air photos the shifting white sand dunes." But he said, "What I'm finding is that beneath the sand dunes that are constantly moving are these Ice Age deposits that represent this ancient playa lake". And he said, "And I'm finding what I think are footprints". And I said, "Wow, well, that's interesting! Can you send me some photos?". And I remember like it was yesterday when I opened David's email and saw those photos.

Santucci: I'm thinking, "Oh my goodness, he has really found something here". These are, in fact, you know, they really look like from the photos, some of the Ice Age animals, mammoths and camel and other things. And so I immediately called David back and said, "How soon can I get out of there? I want to come and see these". And so David is very he's a wonderful host and a caretaker for the resources here and invited me. And so we came out and met and David gave me this first orientation to the—to the fossil tracks of White Sands, which then we could check off. White Sands is one of our 283 parks that has fossils for sure. And that's all due to David's good work.

11:21

Gorski: Right. So what kinds of like, track makers were there? These Ice Age mammals that.

Santucci: Mostly mammoth, and there were some camel, and then it was a cat track. And then there was some other oddities that we weren't quite sure of at the time. And so the thing that I think that was one of the most important and frightening observations was that here we are. We have these wonderful evidence of, you know, walking around and running around and playing in the mud during the ice age by these animals. But they were so fragile and we refer to them as ephemeral in that because of the sediments that they're preserved in these gypsum-rich sediments that are subjected to changes in moisture and humidity that they very, very rapidly weather and erode. And so we scratched our head a lot and said, "Well, you know, we're not going to be able to collect all of these".

Santucci: And it's logistically difficult because they crumble. That we need to figure out what techniques we would want to use for preservation. And so from our first conversation, we talked about one of the tools for documenting and monitoring would be photogrammetry—three

dimensional photography—that allows you to capture an exact replica that provides qualities that you can look at the dimensionality of these different tracks to get a clear picture of their morphology and provide you a baseline. Because realistically, the day that you discover that track is probably going to be the time that it's in the best preservation ever. So you want to try to capture that as a normal part of the protocol, because the day after or the week after or the month after or three months after, they are going to slowly or sometimes rapidly degrade and lose some of the quality morphologic features that we would want to be able to preserve.

Gorski: Sure. To follow up on that, weathering and erosion is something that happens here every, every day at White Sands National Park. It's a fundamental part of how the dunes are formed. And so every single day, the wind and water, different forces are shaping the white sands and creating more sand coming off of the alkali flats area and, you know, breaking apart those selenite crystals and shifting them onto the dunes eventually. So how —how does the weathering and erosion really affect our availability to see the fossils? Is it uncovering more or is that sand creation recovering in others?

14:15

Santucci: That's a really good question, and it's fundamental to our concepts and understanding of a dynamic earth in geology or sciences, and particularly for fossils, is that we have occurrences where fossils at the surface that are subjected to the forces of weathering and erosion, whether it's wind, rain, glaciers, human traffic, whatever, that at the surface they're subjected to these pressures and they influence the stability in the condition over time. They degrade, they break up, they disintegrate. And so that we needed to develop strategies that enabled us to try to document those as early as we can. But at the same time, we realized that part of these processes not only destroy fossils, but they also create opportunities to view more because they be because additional fossils become exposed.

Santucci: And with the shifting dunes, we found that many times that underlying lake deposit, you know, as soon as it's uncovered, then you've got these beautifully preserved fossil tracks that we wanted to try to document as quickly as possible. So David was very, very hardworking. Ambitious. Dedicated. Hired interns. Hired other staff, and got out there as frequently as he could to be able to document many, many of these—these tracks.

Gorski: Okay. So I want to again, shift gears a little bit. Let's talk about—so obviously you were involved in the project as well as David Boosters. And so what about the rest of the team? Who else was involved in this project?

Santucci: So it's interesting. This this is such a complex problem from so many aspects. There's a geologic component. There are many geologic components. There's a paleontological component. And then there's even an archeological component because we've eventually determined that there were, in fact, human footprints and presence here, that is important because there is a contemporary co-occurrence of humans alongside fauna that went extinct. You know, at the end of the Pleistocene about 11,700 years ago. So we knew that we were at least 11,700

years in age because of the occurrence of human footprints as part of this, ichnoassemblage. Now, I'll define that the science of studying fossil footprints is called ichnology. So if you're studying fossil footprints, it's called paleoichnology.

17:10

Santucci: If there are people who study modern footprints, you know, of living—of living fauna. And so they're called neoichnologists. So you've probably seen the field guides to fossil mammal footprints. You know, that is a very equivalent science using the same methodology. It's just paleoichnology versus neoichnology. Ichnology is the study of traces, footprints, tracks, burrows, all those sorts of things.

Santucci: And so that – that is one of the fields of study that we were looking at here is the technology of these Pleistocene traces. But because these fossils which represent activity of previous living organisms during the Pleistocene, they're within a geologic context. So they're within these playa lake deposits. And so there are many aspects of that geology, of the depositional environment, and even how old they were that were basically questions that were geologic in nature.

Santucci: And then, of course, because they were human components and then there's artifacts or remains in the area that we wanted to make sure that archaeologists were involved. So we built, over time, a multidisciplinary team. The first most urgent need was that the NPS Paleontology Program was involved, to provide guidance and technical support. David was here to supervise the activities of interns and others.

18:45

Santucci: There was a whole series of tests—testing that was suggested and got funding and went forward. But we needed to build a multidisciplinary team based on what was being found and what was being documented. So people were specialists and geologists, archaeologists, paleontologists, and particularly paleontologists that deal with tracks. But there were other people that got brought in as well. So, for example, we were able to recruit some of the Department of Interior staff who are experts in flying unmanned aviation vehicles, UAV, or drones. The reason being is that we wanted to get an aerial view of the distribution of these tracks because David was showing us trackways that seemed to be a mile in length. And you know, that is also a very, very rare occurrence to having not only individual tracks, footprints, where you look at all, all the morphology of it.

Santucci: But to have trackways because the trackways then tell different stories. They tell, you know, the gait and the stride of the animal, relationships between various organisms that are interacting. So sloths, human or baby mammoth and mama mammoth. And so having those trackways and such long trackways enable us to tell stories that are very rarely able to be told because they're not well preserved in the fossil record.

Gorski: Okay. And so what would an average day of field work look like? Not everyone may be familiar with what it's like to be doing a painting to a logical study.

20:31

Santucci: So I think this was a good partnership between the Park and the Washington Office, the NPS Paleontology Program. David is a very bright individual. He is a wonderful host and he's very open. You know, he's not territorial and said, this is my resource. And, you know, everybody stay out. No, he was welcoming, bringing people in. He wanted any expert that could help to contribute to the understanding of the resources to be part of this project. And he successfully has done that. And I've used a lot of my connections at the U.S. Geological Survey or elsewhere also to invite and so David and myself started, you know, phone call in 2009, leading to a first visit in 2010. And then there was a lot that went on in 2011 to 2013, different studies, new individuals brought in, bringing in the team to be able to bring the drones and get the aerial views, to get some funding to do ground penetrating radar light are all sorts of studies that would help us to better document and assess these resources.

Gorski: Okay, so but like what—so on a on a daily basis, you get out there. What does that look like? Like, what do you—what do you do?

Santucci: So David's—David's the person to ask that question because David's here on a daily basis. In fact, I don't think he's taken a day off in 12 years. He's always out there and he's—he's a great steward for the resource. My role is mostly long distance in communicating, setting up planning, setting up conference calls between experts, bringing us all together so that we can bring these new perspectives into the dialogue, into the discussion, to determine planning. When we do go out in the field, it's once or twice or three times a year. Others come more frequently. David has all the logistics worked out. We either go through the Air Force base and go through the check-in, the security checks, and come around the back or that Dave—David takes us across country and in an all-terrain vehicle on a very adventurous drive across the dunes to get to the fly like deposits.

Gorski: So—so you've mentioned that not only is the team multidisciplinary, we have geologists, paleontologists, archeologists, all of that, but it's also interagency. You mentioned some outside agencies as well. And the U.S. Geological Survey, which is a part of the Department of the Interior—

Santucci: Yes.

Gorski: —but it's even interdepartmental. Cooperating a lot with the Department of Defense Home and Air Force Base, our neighbor. Yeah. So how has that relationship played out?

23:26

Santucci: I think what was nice about it is that everybody was so excited about the new—new resources. Everybody wanted to contribute and make things possible. So your superintendent,

Marie Sauder, was working with the, with the Air Force, the White Sands Missile Range, in terms of their understanding and awareness of the significance of this resource. Getting permission for us to travel to get to the sites, even to get permission to fly drones in restricted airspace. You know, it took six, more than six months to get permission to do that. But this is probably some of the most protected airspace in the country. And so be able to get permission is a testament to the good diplomacy and communication that Marie had with the, with the Air Force and the missile range.

Gorski: Absolutely. So this next question actually talks about some of the—the tools that would be used to complete the survey. So you've mentioned a couple, the unmanned aerial vehicles, drones, in the more common vernacular. So, many people don't know this, but you and I do that. Drones are not allowed in national parks for visitor use and even oftentimes restricted for just general use for the park. So it was kind of rare that that was allowed. So what was kind of that process? And then also, as you mentioned, we do have restricted airspace with Holloman Air Force Base as our neighbor and White Sands Missile Range on the other side. So as you said, this is very restricted airspace here. So—so what led to that decision of using a drone, which is incredibly rare.

Santucci: So in part, it's all based on the fact that we—we were able to articulate what an incredibly rare resource was being discovered and how the ability to use these tools was going to really help us to document, study, understand and preserve these resources. So again, at one level, there was Marie who was communicating with the Holloman Air Force Base with the Department of Defense. She was communicating with the region. And then my role is, I work for the Washington Office. So those are the big bureaucrats in Washington, D.C. And so we have a different type of communication. And so I was communicating within our agency, trying to emphasize to our leadership how important it would be to be able to—to utilize a drone, provide them solid justification.

26:08

Santucci: You know, we're not just out there just to have some fun, but—but actually it was fun. But we were doing so to capture data that was not able to be captured through any other technology and how that was going to enhance this project. So we were successfully able to market that within our leadership and the Park Service and then being able to bring in USGS, the BLM, and they provided the technical expertise to be able to—to utilize this technology that everybody aligned and said, “yes, let's go for this”.

Santucci: This is an important justified administrative use to support resources management and research within White Sands National Monument. Monument at the time, Park today.

Gorski: Yes. All right. And so what are some of the other—other tools besides the drones that would have been used? You mentioned in some of your notes ground penetrating radar. So like what other scientific tools are used?

Santucci: Yeah. So this is a great story. And so David, when David told us that he had these strange bipedal tracks, you know, we're thinking what is bipedal? Okay, so there's birds, maybe ground sloths, and humans. And we said, “No, we don't want to go there”. We are going to put on blinders because we know that the archaeologists will—will not easily accept the fact that we're finding, you know, Pleistocene humans at White Sands.

27:50

Santucci: So it wasn't our focus, but we realized that we had to do things to conserve and document these regardless of what they were, because there was some track maker that was—was producing them. And so that—that's when we began our endless pursuit that we continued to the day to try to understand how to stabilize, how to preserve, how to document, how to slow down Mother Nature and erosion to protect these. And there was one section where, David, we kept calling, you know, frequently saying, “we've got these 27 footprints and we think that we might have more” because it's on the edge of a gypsum dune field that the tracks are emerging right from that. And so there was a test case where if we knew that the stride of the these potentially human footprints, these bipedal footprints was X number of centimeters or inches. We would go in and clean off the sand where we think that there should be another footprint.

Santucci: And we found one and we found another. And so that led to the discussion to say, well, we're not we don't have a broom big enough to sweep all this white sand away. So we decided that perhaps the use of ground penetrating radar may be able to tell us what is subsurface, because, of course, the sand is unconsolidated and loose and it'll have a different signal. And the playa-like deposits are going to—are going to be a little different consistency, have a different signal. But the tracks themselves, because there was a mass that was pressing down, it compressed the sediments a little bit. So maybe that compression would cause a little bit more compaction that could be differentiated on the ground penetrating radar, which basically sent sound waves into the ground.

Santucci: And then because of how velocity in those sound waves changes, it records a different signal when it bounces back and is recorded. And so, lo and behold, the ground penetrating radar, you know, out of view with the visual sight, detected that there were, in fact, additional footprints beneath the shifting gypsum sand. And that was a little victory day that, you know, this is just, wow, we can use this technology in ways to inform us so that we can make decisions in terms of resource management and preservation.

Gorski: All right. So I want to ask this question to give some context to the time when these footprints would have been made. So let's see. You mentioned a date of about 11,000 years ago. And what's significant about that date?

Santucci: So according to 150 years of paleontological studies, maybe a little longer, that paleontologists tend to agree that by the time we got to around 11,700 years ago, there was this tremendous faunal turnover of ice age mammals, particularly the larger mammals: the mammoth, the mastodon, the ground sloth, the camel, the original horse that was here before the

reintroduced horse, the saber tooth cat, and several other groups of organisms. They call it the late Pleistocene Extinction Event, that it's also a scientifically debated topic of whether or not these large animals went extinct because of natural processes, climatic change, or the spread of humans across the continent. So until relatively recently, the paradigm in the archaeological community that all the textbooks reveal is that they felt that humans came into the new world sometime around 13,000 years ago, and they spread across the continent and they were a new predator.

31:59

Santucci: They were a new predator with a new kind of hunting technology, these spear points, Clovis points. And so they felt that that perhaps this new predator caused a, you know, imbalance in the ecosystem, possibly leading to the extinction of these megafauna. Now, there are this is hotly debated, and there—there are really strong points on—on the various sides of this discussion. I don't know what the answer is, but what I can tell you is that at White Sands National Park, because of multidisciplinary team patiently over the past 12 years, not jumping out and making claims, but carefully brought the right people together to do cutting edge science that we have confirmed the contemporary day occurrence of humans and late Pleistocene megafauna back to between 21 and 23,000 years ago.

Santucci: Significant because that's the last glacial maximum contrary to the previous beliefs by the archaeologist. And in all archaeological textbooks that, you know, these ages just weren't possible. Because of David Bustos observation we are rewriting all of those textbooks. Thank goodness we're proactive in the work we do in the National Park Service to define paleontological resources and understand them.

Gorski: Absolutely. So to sort of provide more context. So between 23,000 years ago, which is the date that that we are now at and 11,000 years ago, what—what did this region look like or what—what would the environment have been like, the climate?

Santucci: Yeah. So you're probably aware that during the Pleistocene, that's that most recent time before what is called the Holocene or the recent, was a period of a very dramatic periodicity and fluctuations in the climate. And there were four major, major glacial periods. And then between the glacial periods, there were these warming periods called interglacials. So at the last glacial maximum, approximately 23,000 years ago, that means that the glaciers, the continental glaciers spreading out from the poles, were at their maximum. And ever since then, they've been retreating. So when glaciers advance there, obviously there's going to be changes in temperature, it's going to influence the flora and fauna that live on the continental surfaces by one, forcing them where there's, you know, glaciers half a mile thick, you know, plodding around like bulldozers. But realistically, because of the changes in temperature, may push them biogeographically further south, displacing them to well beyond the periglacial areas which they're more adapted to.

35:11

Santucci: So since the last glacial maximum, we are heading now towards a warmer period. In fact, it's—it's quite warm these days because of other factors. But the Pleistocene to the recent, particularly with the melting of the glaciers, there was probably increased precipitation because of greater atmospheric water. You know, with the glaciers melting. So probably a little bit more vegetated, obviously more—more permanence to the standing bodies of water that were in the area and probably quite different than—than what we're seeing today. When the dunes came in? Others can probably answer that question, but it seems as though the dunes may be a postglacial maximum occurrence.

Gorski: Yes, that is correct. So—so what you're saying is that this area would have been had more moisture, more maybe precipitation, more vegetation, would there have been different kinds of vegetation in this area? What kind of vegetation would we have found?

Santucci: So because of the gypsum, geochemists agree that we're not seeing a lot of plant remains. We are seeing some plants, a plant called root beer. We use those seeds to do a lot of carbon-14 dating, but we're not quite sure what that vegetation would be. I think we need to—we haven't really done much of it but look at the pollen record. The pollen record may help to inform what the local vegetation was like. Because I'm not a specialist and because we haven't really done any focused studies yet, I don't think we can answer that question now. But I'm glad you brought it up because I'm going to bring that question up at our future meeting and I'm crediting you for making this turn to our multidisciplinary team.

Gorski: Great, great. I can't wait for that. So it would—so Lake Otero is, was the historic lake that was here during that time. And so it possibly had some sort of grasses. But we're really uncertain. So of the megafauna that came through here, the mammoths, the sloths, what would have brought them here?

Santucci: Yeah, that's a good question and we don't know. So given that there was water here, that it probably was a wetland. There probably were vegetation here that, you know, the large herbivores were going to be able to feed on. We're seeing so much evidence and—and spread over thousands of years that there must have been vegetation types that we just don't have evidence of today or we don't know how to find that information at the moment that drew them here.

Santucci: Just like, you know what drew the humans here. If we've had a record of humans here for thousands of years, which when you look at the stratigraphic profile where they opened up the trench and that period of time represents thousands of years. This is the earliest evidence of humans in the New World to date. But it's not just a moment in time. It's thousands of years that they were either visiting this area or lived in this area. To me, I kind of think of it as sort of like the Mesopotamia of the New World. It's the cradle of civilization. That's where, you know, these first ancestors seemed to—to congregate and they left evidence of them being here. So until we find other evidence—you know, in paleontology, when you think about the scientific method, one of the things that I teach when I'm teaching paleontology is our knowledge of the fossil record is only as good as our previous field season. And what we may find next year may help to

inform and change our perspectives and to keep that open-mindedness is really important. So I think that applies here and this is a huge, huge new understanding that has come forth by the research that was caused by David Bustos.

Gorski: David seems to be a leading character in this story.

Santucci: Yeah, he's my hero.

[39:59-40:06 Technical difficulties]

Santucci: So we recorded all of that? We didn't lose it? Do you have more time on your tape?

Gorski: Oh, I think so. All right.

Santucci: So does that answer your question?

Gorski: Yes, it did. So we're going to—we're going to shift a little bit here, because I've been trying to very intentionally talk about the megafauna track. But in the research, in the course of this field study, as you've mentioned, you found the human footprints here as well, which, as you've mentioned, has been just a phenomenal discovery. And so you've talked in a previous question about some of the prior interpretations or theories of how people came to inhabit the North American continent. Would you mind like going through that again?

40:59

Santucci: Sure. So, you know, when I took undergraduate Introduction to North American Archaeology, you know, I learned the traditional beliefs based on the archaeological record at that time. And I think a lot of people really hold fast to that because it's sort of—it's the paradigm. It's what everybody has been trained to think. And that is that because of the advance of the glaciers, you know, over time, particularly, you know, if you think about the last glacial maximum is the farthest south, you know, the North Pole extended down, blocking corridors for transportation.

Santucci: Unless you're really skilled and can climb up, there's big glaciers and long walk—long distances. It seems like a very hazardous occupation to do. But for a period of time, that whole area in Alaska extending across to Asia, the Bering Land Bridge, would have been covered with ice. And so it doesn't seem as though that provided a really easy corridor for humans to transport from Asia into North America.

Santucci: And so it wasn't until pathways opened along that corridor where it wasn't—there wasn't a physical barrier like the, these big ice sheets that it could have occurred. And I think that was the basis of most of the assumptions that were tied with no humans prior to 13,000 or—or so, thereabouts, could made it to the new world because it was a big barrier not allowing them to get in.

Gorski: Yeah. So you mentioned the Clovis civilization at about what, date range were the archaeological evidence for Clovis people.

Santucci: Sure. So, yeah, New Mexico is an incredible place because a lot of North American archaeology has been written here. You know, the work of Dennis Stanford and Vance Haynes and others. Paul Martin looking at fossils as well. You know, the kill sites, the Folsom sites, the—the butcher sites of mammoths and the Clovis points are all around this epicenter.

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Santucci: And it may not be coincidental. It may be the fact that because we—we had populations of humans pre-Clovis that were living in these areas that eventually developed these stone that were useful against large, large prey species, things that they would be hunting. And so we—we brought Dennis Stanford. Dennis Stanford is really well known, one of the most well-known North American archaeologists that talked about Clovis and pre-Clovis cultures.

Santucci: We brought him to—to see these track sites a few years ago before he passed away. And he was very, very excited about what we were finding here because he was of the minority view that there were pre-Clovis cultures, that humans probably existed in the New World earlier than 13,000. But his entire career consisted of him being beat up by the majority of the archaeological community that said, “oh, that's a pipe dream. That could never happen”. And so in some ways, you know, when we were able to get carbon-14 dates pushing these dates back, one of the first things that came to my mind was Dennis Stanford. This is for you.

Gorski: Yeah. So. So if we're talking about the Clovis people and again, there were some archaeologists who—who maybe were outliers here. Was there any archaeological evidence that was an outlier when Clovis was the prevailing theory? Were there any sites that were like, “Hmm, that seems like an odd date”.

Santucci: Yeah, that's a hard one for to answer because, you know, I studied those things 30 years ago, and I'm sure a lot of new information has come up. So I'm not as familiar with the archaeological literature, but I do know that we have seen in the field and David has taken myself and others, including Dennis Stanford, and showed them some incredible material culture, some archeological sites that we're not sure the dates on these. I guess some of the assumptions were that they may have been post-Pleistocene, they may have been early Holocene, but there is enough potential out there that it seems like there is a pre-Clovis material culture in the Tularosa Basin that contributes to the story.

Gorski: All right. So, once the—once the initial field research was done and you were awaiting those radiocarbon dating results from the seeds found between the trackways, when you received that, that result leading up to that, what was the anticipation like?

Santucci: So back around 2012 or so, when we made the decision we're going to collect one of these big cat tracks and we're going to collect one of these bipedal, possibly human tracks that we did so at the same time collecting some seeds. It seemed as though that beneath some of these

footprints there were concentrations of these ruppia seeds. Ruppia is the genus. That obviously they're organic, rich material that could be a good source for carbon-14 dating and because they seemed to be at the bottom of the track, it means that, wow, these were compressed. These may be very contemporaneous with the footprint being formed, you know, the weight of a—of a giant mammoth coming down and squeezing that sediment. And we were finding these layers of compressed sediment with the seeds in it that we used that to say, “This is likely, you know, a good date to be associated with these footprints”.

47:40

Santucci: And so for the first dates that we got back when we got 18,000 years, we're thinking, “Oh, no, this makes this whole story worse”. Because, you know, again, we were excited about the paleontology and this mega tracksite and—and all the fossil animal footprints that we didn't want it to get caught up in the consternation and debate involving humans that just complicated this whole matter.

Santucci: It is what it is. And we eventually were able to bring in individuals to help us with those questions because we realized our limitations. And that was outside of our comfort zone. But we got an early date back in 2012, indicating about 18,000 years, and that took our breath away. And it led us to the hope that maybe this is right. Maybe we've got a whole new story here. And it proved to be right by a very, very rigorous, diligent research done by some of the brightest minds in the field.

Gorski: So the way that we're able to date these is, you know, with the—with the seeds in mammoth tracks and then human tracks interacting among that same level as well with the mammoth tracks.

Santucci: So the initial testing back in 2012 was based on sampling at the base of the footprints, the more recent sampling that was done undertaken by Jeff Pigati and Kathleen Springer from the U.S. Geological Survey. They were brought in this team because we give them all our hardest problems to solve in the Park Service when it comes to geochronology. We had the benefit and opportunity to open up a trench and that trench went down a meter.

Santucci: You know, it was—it was more than ten meters in length. And what it did is it exposed this beautiful cross-section of layers that hadn't been seen for thousands and thousands of years. And so they meticulously went through. And as they excavated, they were finding footprints, human footprints, megafaunal footprints throughout that sequence. Now, going back to the fundamental principles of geology is that whenever you have deposition of some of these sediments and you get layers in a normal sequence, unless there's earthquakes and things tumbling them over, the oldest layers are at the bottom and successively younger layers sort of layered on top.

Santucci: It's how they were deposited. And so these are clean, very beautiful sedimentary sequences that have aeolian and perhaps lake or fluvial wetland deposits within them that are

quite stratified. And you can identify the layers. There's changes in coloration and hardness and texture and sediment, grain size. And so they were finding tracks and they found tracks in eight different horizons. That means that spanned time. So we don't know if these were all deposited in a month or they were deposited in a longer period of time. But we've got tracks interspersed. And so what Jeff and Kathleen did is they went through and they mapped this microstratigraphy. They put a mark where which horizons included that had tracks preserved.

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Santucci: And then they sampled and they sampled above and they sampled below the track horizons to bracket them in. So to determine a minimum age and then a maximum age for that particular trackway. And then went through and there's a series I think we published on seven of them, but I think there's at least eight that that have dates to them that are that—that help to find the age of the track horizons that are presented in them. Does that make sense?

Gorski: Yeah, yeah that makes sense. So, the initial radiocarbon dating, those seeds, those were stamped into the footprint by the megafauna. And then in layman's terms, the, the later scientific study, the stratigraphic study that was kind of like, if there's a footprint at a certain level, anything below it is older—

Santucci: Yes.

Gorski: —and then anything above it. So if you date those two things below, theoretically is an older, above is theoretically older. So you can kind of get like a middle ground for that footprint age.

Santucci: Yep. And in geology, it's called the principle of superposition.

Gorski: All right.

Santucci: And so just to state that at the time we took the samples from the bottom of the mammoth footprint that's compressed, we didn't have permission to do excavation. You know, we could only collect sufficient remains doing ground disturbance because we didn't want to disturb an archaeological site. And so we had to go out and get a permit. And it took a lot of scrutiny to be able to develop these very long, deep trenches in order to expose the profiles of the sedimentary—sedimentary sequence that we can map and sample from.

Gorski: All right. So you've mentioned this previously. So as a paleontologist, how was there—how was the paleontology received by the community? I feel like it's not as controversial as maybe the archaeological community was, but we'll get to that.

Santucci: Yes, so I think that paleontological community is very exciting—excited particularly those that, that are ichnologists that study fossil footprints. I think there's consensus that we've got perhaps the best place to seeing fossil mammal footprint area from North America and that

being able to put age constraints on it is exceedingly important and it's consistent with what we know from the bone record.

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Santucci: So we haven't found any surprises of anything yet that we don't know from the bone record. But it's an extraordinary resource and it's a mega tracksite. We have just scratched the surface. Most of what we're going to learn is going to be down the road. It's going to be the junior paleontologists that grow up and come in behind us that will be making discoveries. They'll be—they'll be in new information forthcoming over the next many decades, maybe hundreds of years of work as new things emerge at White Sands.

Gorski: Scratching the surface is a good turn of phrase for here. So paleontology community excited but not shocked?

Santucci: No.

Gorski: The archaeological community. What was their response?

Santucci: So yeah, that was a much more sensitive topic and we've recognized, you know, we're paleontologists and, you know, so we don't do brain surgery and—and there are other things we don't do. And out of respect for, you know, of the profession we brought in archaeologists. We brought in archaeologists that works in the Washington Office, Dan Odess who really helped us a lot. He networked with the archaeological community. And that was—that was the issue that was going to be the one that was going to be the most sensitive when we start talking about humans. So if you're familiar with the publication record based on – on the most recent research that just wanted to point out that the first publication that was published in April of 2018, it took ten years to get the nerve and the science to be able to publish that.

Santucci: And what's interesting about that is that we knew that the one question that almost everybody in the scientific community, in the media, and the public are going to ask is how old is it? And other than saying it's probably late Pleistocene, when that was published in 2018, we didn't have good answers to that question. So you'll notice that in that publication we don't touch upon, we don't give a date or anything else because, you know, one of the things we needed to recognize is that, you know, here we are, the National Park Service. We're largely loved by the by the community. Rangers have a lot of integrity and if Ranger tells you something, it's got to be true. So if we're going to report on something, we need to make sure that we're reporting on something that we have a fairly high level of scientific support to address. And so, in that 2018 publication, we published on the contemporaneous co-occurrence of humans and late Pleistocene sloths that are extinct, that influentially will tell people that we're in the late Pleistocene because we don't know of any occurrence anywhere in the United States where we have the remains of a ground sloth post 11,700 years ago.

57:11

Santucci: And if that's our boundary marking the Pleistocene from the Holocene, then we are, by default, in the Pleistocene somewhere. And so that 2018 publication, again, was really important because we've been holding back for ten years and we were being able to make an announcement that we were confirmed—that we could confirm and stand behind and that is contemporary co-occurrence in the Pleistocene. What—why is that possible? It's because through rigorous, detailed field investigation, we documented individual trackways of humans and individual trackways of a ground sloth that interacted but within those trackways, there were footprints where the human footprints are stepping on the sloth footprint and in the same trackway, the sloth is stepping on the human footprint. There's only one way that that could happen, and that is contemporary co-occurrence but at the same time, within, you know, minutes that they were interacting. And that was absolute evidence that we could confirm human presence at White Sands during the late Pleistocene. That was an important—that was the first publication in the series of publications that was put forth.

Gorski: So the initial, the initial foray into publication for archaeological evidence was a was a bit apprehensive. It took ten years to publish that research and then, even then, it was with—with some qualifications there and then and then later when it was—when it was fully published with the, with the dates, what was the response then.

Santucci: So we had to go through an extremely rigorous peer review process. So the editor of the publication sends out the draft manuscript for peer review. And of course that individual knows this is a controversial topic. So they would send it out to people, they could really scrutinize it and it was heavily scrutinized. And I have to say, great credit to Matthew Bennett, to Kathleen Springer, to Jeff Pigati, to Dan Odess, the rest of the team, to Dave Bustos. They went through successfully—went through the peer review process and addressed the questions that needed to be addressed. It required a team to go back out during a COVID pandemic, to get back out in the field and to sample, to be able to meet the questions that were being raised by one of the peer reviewers. Now, of course, you know, at some level that's frustrating.

Santucci: You know, we know what we have. We want to publish it. But what it did, it strengthened the results. It strengthened the statements that were being made by having this additional corroborative science done to support this effort. Again, we didn't want to go out there and stick our neck out until we had the smoking gun and we were able to get that. And again, it's—it's amazing to be part and to watch the members of this team address very, very important scientific questions utilizing new technologies and patience and lots of other—other qualities.

Gorski: Yeah. So I, we've talked about the paleontology community, the archaeology community. There was another very important community that's included in the course of the research and that's the indigenous community. So what was their involvement in the project?

Santucci: Yes. So again, that's where Marie, the superintendent, and David and the region worked very, very well and diligently in engaging the Indigenous peoples from the area. I, I wasn't directly on-site or present, but I listened in our meetings and our conversation and how

well that went. My understanding was that, you know, if you think about this, the indigenous people, what we're uncovering is part of their—their heritage, their ancestry, their story.

1:01:55

Santucci: And I couldn't think of something that probably would be more important to them. And I think my recall was that it was very positive. I mean, if they're looking at the footprints, you know, from their ancestors who walk before them, that that must be very, very powerful. And that, I think that the perspective was we are in gratitude to the National Park Service and the scientists for helping to uncover this our story, our story of our ancestry and that's my understanding.

Gorski: So, to shift back a little bit within just the past couple of months, a similar human trackway was discovered at Hill Air Force Base. And so what does it say with these two, two discoveries taking place within a similar—within a very short amount of time? So what does that saying about the research that's being done elsewhere in the United States?

Santucci: So it's very serendipitous that two Air Force bases come up with similar resources. All I can say is early people must have liked the areas that had qualities that the Air Force values today. But that is a very interesting scenario. So, could you repeat your question?

Gorski: Yeah. So just within the past couple of months, they've made a very similar discovery of human trackways at Hill Air Force Base. And so, so what does that say about the research that's being done throughout the country? What does that say about how the research done here influenced other research?

Santucci: It's a very good question. So, you know, every day around the world, there's science going on, looking at trying to cure pediatric cancer or to resolve issues related to energy and—and it needs. And so here we are in 2012, looking at issues that we didn't know a dozen years ago, applying technologies that we haven't applied before. And it's not just finding the resource through inventory, studying it to capture the data, but we're publishing it, we're sharing it. That's part of the science. You know, if we just kept all that secret to ourselves, we didn't tell anybody, how is that going to benefit humanity? How is that going to benefit anybody? And so being able to share the story is a really important part of it. There's lots of rules and guidelines to get things published through the scientific process, but publishing it then allows others from their perspectives to say, "Wow, this may relate to something that we've been contemplating" and give them more confidence. If we're saying we're finding evidence of humans back to 23,000 years ago, then maybe somebody that was shy about publishing their 14,000 year old footprints because they didn't want to get beat up by the archaeological community. Now can do so with more confidence because we're telling one story here. But that story may be uncovered in the future elsewhere. Where we connect Arlington Man and Channel Islands National Park, which there are dates of 16,000 years of human remains there, and the caves in Mexico that are getting these very old dates that now we might go forward with a little bit more open mindedness to say we're not going to be biased by the way we used to think, we're going to say that this is like the

Age of Enlightenment. And through this great work at, at White Sands National Park, we're going to overcome those past perspectives to have a greater understanding of what might be possible in the future.

Gorski: Take the blinders off and just go forward with an open mind, like you said. So this is a personal question. So, from your time working on the project, do you have a favorite memory or something that you remember very, very distinctly?

Santucci: Yes, and there are several of them, but this one is an important one. So, the date that we finally published that first publication and thank goodness for Matthew Bennett, because we brought Matthew Bennett into this project in 2017 because we were—he's the world's expert on human footprints. And so we brought Matthew in there his first day. He said, “Oh, I'm not sure if you have human footprints here”. And then, you know, in a little bit more than a year, a year and three months, he invested himself to help us demonstrate and prove that we had human footprints here. And so I think it was like the 18th or 20th or something of April in 2018.

1:07:10

Santucci: It was very exciting because this was the first time that we could say anything, in 12 years. We were keeping everything top secret and we finally had a publication out there and it was hitting the media and the scientific community. There was feedback about the human co-occurrence. And so, you know, David and Matthew are on the phone with media answering questions from around the world. And it was a very exciting day to say the least. But we—and driven by David and Matthew, they want to still get out in the field that day. And so we're out there looking at the long human footprint that it's 1.5 kilometers long. The two—the two parallel footprints and you probably know the story that that the smaller footprint—so if we had a larger footprint of a smaller footprint, let's say maybe it was an adult and a juvenile or a male and a female or something. The smaller print had an asymmetry to it. So, when you're walking down and you're looking at the footprint, there was an asymmetry. It looked like it was shifting from left to right.

Santucci: Didn't know if this person was injured, that they were handicapped, that they're walking with a cane or what. And so didn't really have an answer to that question, but we continued and we were out there and Matthew and David showed their technique of being able to uncover the footprints. And so I was down there doing that. And in the process I just finding, boy, this is a really small print. It's a really small print. I didn't say anything to anybody, but the more that I cleaned off the more I realized and I could feel it in my heart. I could think of my granddaughter's only three years old. I'm thinking, this looks like my granddaughter's footprint. You know? And it turns out when I cleaned it off, I'm thinking I got the confidence enough to maybe see if they agree with me.

Santucci: And once it was raining, I called them over and I said, “What do you think this is”? Baby toddler. And it was like, I'll never forget this moment, you know, again, thinking of my granddaughter Lily in the context, because her little foot is about the same size, my heart

fluttered thinking that we just had an encounter with a little child from the Pleistocene and thinking, “What are the Native American people going to think when they see this”? This is, you know, to me, this is an important new discovery that helps tell another story. And it may be tied to why this asymmetry in the gait, carrying a baby on their hips from one side to the other, and then finally laying the little child down and it takes off. And I'm moved by that story.

1:10:05

Gorski: Yeah. That as an interpretive park ranger here at White Sands National Park, we do public programs. And my public program does focus a lot on the on the Trackways Discovery here. And I mentioned that particular story in my program. Well, and it was so funny just the other day I was doing the program and I talked about the toddler footprints. And I always point out, parents, that's a story you're familiar with. You relate to that. And no more than 2 minutes after I said that, one of the little junior rangers that was accompanying us on the stroll darted out behind us. And sure enough, the mom went out, scooped up that little kid. And I said, “That's the—

Santucci: That’s cool. That is really cool.

Gorski: —That's it right there.

Santucci: It's the, the human dimensions of the study. You know, it adds so much to it to be able to relate to the early people that, that were here.

Gorski: Yeah. And that's, that's so incredible that just from—just from footprints.

Santucci: Yeah.

Gorski: Footprints in the sand. And already those human connections there's—there's not much else out there as far as archaeological evidence of those people that were there, just, just their footprints. And so even a track can tell a story.

Santucci: Yeah.

Gorski: All right. So as a paleontologist—

Santucci: Those tracks are speaking to us.

Gorski: Yes, they do. As a paleontologist, what do you find most valuable about the discovery here at White Sands? Whether that's the—the megafauna, whether that's the human footprints, that's the human and megafauna interactions.

1:11:41

Santucci: So I've been enriched so many ways on this project, just being able to work with this incredible scientific team, you know, each one that brings their own skills and insight to be able

to learn that and then allow me to apply them elsewhere. So for example, Tommy Urban, who who's doing our GPR work here, you know, three weeks ago he was with us at a Tule Springs Fossil Beds National Monument, helping us to look underground resources there. And on Thursday of this week, you know, when we're done here, we're driving up to Salinas Pueblo Mission's National Monument to help see if we can relocate a mammoth skeleton that's been missing since the 1930s that's in the monument. So, you know, it's—it's being able to grow and expand and enrich ourselves from the experiences that we've shared here and are all benefitting from the park services, benefitting from the work of these here so that we can apply them elsewhere where it's relevant and applicable.

Gorski: And then my final question for you is the mission of the National Park Service, of course, is to preserve resources for future generations. And so, so what do you hope future generations will take away from the research being done here?

Santucci: I just wanted to make a note here because I've been intending to write something down.

Gorski: That's okay.

Santucci: So your question intrigues me because it's—it's inspired an article that I want to write in the future, and that is for future generations that's what our Park Service is about. And so my job is studying the past and the relationship between what we're studying in the past and carrying it forward in the future is a day to day process. You know, with all those individual days of discovery and—and things that we learn, it's—it's a very rewarding job.

Gorski: All right. So I like to give you the opportunity that if you have any thoughts that you'd like to record.

Santucci: Sure.

Gorski: —Anything that maybe—

Santucci: How's the tape; is this a digital recording?

Gorski: It is.

Santucci: Okay. So there's limited amount of space.

Gorski: There's—there's plenty of it. I was checking the batteries earlier, but—

Santucci: Sure.

1:14:05

Santucci: So I—I think a couple of try to fill in the gaps that were—very, very good questions. I wanted to just share a little bit of background information. So what was understood before David Bustos made his discoveries around 2009. We can go back to the 1930s and there are some

historical accounts in little county historical societies and in fact a few photographs where it shows people looking at these old footprints thinking, oh, these are footprints from giants. And it's, you know, sort of a myth, mythological approach because they, they didn't really connect the dots of these perhaps being very old, maybe related to extinct animals that used to live in the basin. So that's kind of an interesting way to to—to begin to tell this story. In 1934, there's a partial mammoth's skeleton that was discovered in the southern portion of the White Sands Missile Range. So that's—that's kind of intriguing to us because we're not finding much bone. We're thinking that the gypsum probably helps the decomposition of bone and so we're finding the tracks, but we're not finding the bone. The fact that there was a mammoth skeleton found in 1934 means continue to look. Maybe we'll find something in the future. There was a publication in 2002 by paleontologist Gary Morgan and Spencer Lucas where they reported on 14 late Pleistocene fossil localities on the White Sands Missile Range.

Santucci: Although they weren't working on the monument, looking just outside of the boundary and similar age units is a good indicator that, wow, they're finding it that close. Maybe we're going to find it here. So 14 late Pleistocene fossil localities recorded some of those within what we refer to as Lake Otero and it included two kinds of footprints: mammoth and camel. And then there was actually partial skeletons and teeth of mammoth, horses, equids, camels, and other small vertebrates. So that leads us to think that we're eventually going to find more bone within White Sands. In 2007, Spencer Lucas, Bruce Allen from the New Mexico Bureau of Mines, Gary Morgan, David Love and David Bustos. They reported on the first Pleistocene mammoth and camel footprints from the lake deposits within the monument.

Santucci: So that was, you know, also part of the beginning of the story. That was in 2007. And then, of course, then David contacted me in 2009 and we began the new chapter, which has led to where we are today. I want to emphasize the story is not over. You know, we are just beginning. We have just scratched the surface. This is a big area, there's lots of resources. We've got teams out there working today. And what's exciting is that, you know, it's not like, you know, we've achieved the learning curve and then now only smaller pieces are going to come forward. If anything, there's still a trajectory of things that are new and that we're learning at a rapid pace. And so it’s very motivating as a science and resource manager to know that we're uncovering a really big that we haven't completely uncovered yet in a unit of the National Park Service. The chronology also is kind of an important thing. Are you—are we okay to move on?

Gorski: Yeah.

1:18:04

Santucci: So I wanted to sort of just summarize the chronology for you because I think there's some significant things that occurred along that way. Again, you know, if we talk about 2009 to today, we had a pandemic during this time period and that really crippled—it slowed us down a little bit in terms of this research project. So in 2010, David invited me to come here. That was my—I had been to White Sands previously, but it was the first time here to be able to actually, physically, see these late Pleistocene footprints. Kevin Schneider was the superintendent at the

time. He was extremely supportive and gave us a lot of liberties to be able to have David's time to invest in and making the most of this whole process are. After our first visit, we made a series of recommendations to the superintendent, and the focus was to say that this park is worth investing into inventory and monitoring strategies to assess the resources which are—are very fragile, important to scientifically and quite ephemeral.

Santucci: And so offered our support from the Washington Office, the NPS Paleontology Program, so that we can help to, to try to protect, preserve these resources and try to find strategies not only to understand them scientifically too, but also to conserve and preserve them because they are rapidly weathering. Another recommendation was to hire two paleontology interns. Two interns were hired; they found a lot of good things, did really good work. The one issue that came up that that wasn't so positive is that they were they were very hard working and enthusiastic but one of the individuals was so enthusiastic, you know, that he was inclined to go ahead and post photographs on Facebook and—and present this information to his classmates and tell lots of people.

Santucci: And that was sort of contrary to where the Park Service wanted to be for a couple of reasons. One, we didn't want to reveal that this resource out there to cause this rush to the park by visitors to go out and find them. So it was a resource protection issue. And second of all, we didn't have all of our science worked out yet and we want to make the mistake of going ahead and reporting things prematurely. And then it wind up being an embarrassment to the Park Service. I mean, maybe these were footprints that were made five years ago, you know, by exotic species in the park. And so what it forced us to do was to develop for the entire intern program that the Park Service managers, it was called the Geologist in the Park program at the time, it's now called Scientists in the Park. But we developed confidentiality agreements that we had in terms signed so that they were not inadvertently posting on Facebook photos showing localities and reporting things without the consent of the National Park Service. Let's see. And then David and myself worked in, in trying to identify what scientific studies were needed. So the GPR and the LiDAR and the photogrammetry, the UAV. And also then to begin to build our multidisciplinary team, because we realized there were things that were well beyond our knowledge and capability. And to know your limits is really important.

1:21:42

Santucci: But we, we wanted to bring in some really good minds to add credibility the project because we knew there was going to be some controversial issues that we wanted to be able to address them with a high level of scientific integrity. Just a quick diversion. When I came onto Petrified Forest in 1991, I was hired there as the paleontologist, curator, chief of resources and the government's only pistol packing paleontologist. Law force and commission. That I inherited a problem that predated me with the previous administration. And that was that in 1985 and ‘86, they discovered these dinosaur remains in Petrified Forest, a specimen called Gertie, a very famous specimen that's on display. And at the time, the investigators that were there, some were tied with the University of California at Berkeley and elsewhere, they were being put before the media and they were making big claims like Petrified Forest has the world's oldest dinosaur.

Which is not true. The oldest dinosaurs come from South America. But here they're standing next to the park superintendent. And, you know, the eyes of the world, the media came there. So if we had the world's oldest dinosaur that was newsworthy, wasn't it? You know, and so it was on BBC and NBC. And, you know, it was just a huge blitz of media interest.

Santucci: And, of course, the people in Holbrook, Arizona, you know, a little tourist town are thinking, oh, my gosh, we've got the world's oldest dinosaur. We're going to bring the world in here. And they're going to stay in our hotels and eat in our restaurants and buy our souvenirs. And so when I got there, it was a mess because the people in the town of Holbrook, Arizona, said, we need to get this dinosaur back. We want this big dinosaur. And meanwhile, it's a small dinosaur and it's only a fragmentary remain. And it's not the oldest. And so their big dreams of, you know, all this wonderful tourism that was going to result was quite disappointing. So we when we speak from the Park Service, we want to make sure that we have the highest level scientific integrity, that we do the diligence that we need to be able to make sure that we're applying the best science possible. And we've done that. This is probably one of the best examples that I know of—of applying a multidisciplinary team of specialists that help us to answer these questions.

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Santucci: So because of the sensitivity, because the superintendent didn't want to have mobs of people coming here looking for the resource, that we had to keep this sort of top secret about a decade. And that's why in 2018, when we got that publication, it was, you know, we finally were able to tell the world about this incredible resources. One of my roles was communicating this to the Washington Office. So we wanted to have the support of my director at the Natural Resource Stewardship and Science. We wanted to have the support of the Director's Office, the Office of Communications. And so I served as the liaison to make sure that we got a big story we can't tell you yet. You got to trust us. We're going to tell you. And we had to do briefings and give them a little bit of information because, you know, they were going to release some funding to support work. And we had to keep tell them, you need to be patient, we'll tell you more but we're not quite there yet. But getting that support, because the Washington Office, one of the things they don't want to be blindsided. They want to know what's going on in their parks; good, bad, or indifferent. And this was a good one. And they were really interested because, you know, they have to deal with a lot of hard issues and they wanted positive news and this was very positive.

Santucci: So a lot of excitement. Being able to do those briefings with these leaders in the Park Service was so rewarding. Speaking on behalf of David and the research team, you know, what an honor that was for me to be able to share this news for the first time with the Park Service leadership and being embraced for it. So we were very careful to make sure that all of our work had the highest level of scientific integrity. We looked at policy issues, we underwent a peer review on and on before releasing any information. So I think that's kind of an important thing to include here that will be lost by, you know, being overshadowed by just the scientific information itself. The questions related to whether or not we had a human footprint or not, we

really took that slow and so we—we made sure that we included the archaeologists and the cultural resource program in those discussions.

Santucci: I wanted to say that the period between 2011 and 2012 was important because there was work still going on. And that's when we started to observe the—the compressed seed layers, and that's when we got the first C14 date that was pointing to eighteen thousand years that scared us. Also during this time was when we finally decided, you know, should we touch this? Should we, you know, if they're humans, should we touch these? And so during that time period, we collected the first specimens, that big cat footprint and one of the human footprints that are in the collections today. So those were decisions that didn't come easy. We had a lot of consultation, talked to a lot of people got approval from the superintendent and made it happen.

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Santucci: Between 2012 and 2013, a couple of important things, we were able to get the—the soil survey done by the Forest Service that came in and Soil Conservation Agency. And they were able to build trenches and they did them right outside of the park boundary. Since we couldn't—we didn't have a permit to do them on the park boundary. They were able to go down almost three meters in these big trenches and we could look at profile and stratigraphy and make observations and measurements. And so that occurred. That got us really excited, it formed future work. And then that's when we did the first GPR study. So that was focused on looking at whether these 27 footprints that on one end are buried by a gypsum sand dune, if we could detect those, those additional footprints if they were there through the use of GPR technology. And that was really a positive outcome from that work. In 2013, we also discovered the first ground staff footprints. Now why is that significant? One, because we know ground sloths died at 11,700 years ago. So it helped us with age refinement. But it's only the second occurrence of ground sloth footprints in all of the United States. There's only one other occurrence of sloth tracks, and that comes from Carson City. The area is now a jail. They—they put, you know, concrete over the old site. And so they're not even accessible. So to have—have these sloth resources provided opportunities for new study, new understandings. And we brought our paleontologist, Greg McDonald, who specializes in fossil sloth. He came down here and looked at them and helped to confirm them with us. During 2013, as we went through a six month process with DOI—with DOD, DOI, USGS, BLM, and Park Service in order to get permission to fly in some of the most restricted airspace in the country. We got permission because of the excitement about what potential lied. And we flew in January of 2014. When we did that, there's lots of really cool things that that, you know, we learned. But one of the things we learned is that these tracks are even more extensive and spread out than we had realized before. And so that was, I remember the day clearly, I brought it up to the group.

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Santucci: I was going to say, if this is the case, then we have a mega track site. And so that's important to the paleontological community because it represents—a very significant and in this

case, the most significant Pleistocene mammal track site in North America. So this is kind of an a sigh, this is an awe. This is one of those mythology things that goes on.

Santucci: So when we got the drone out, of course, the DOD knew that we were out there and they knew what we were doing. And so about an hour afterwards—after we're up there flying these drones, we see in the distance one of the fighter drones that the Air Force uses coming our way. And getting closer and closer and doing a flyby not far from the drone. And we're thinking was above it higher, but thinking, wow, that was weird. And when it circled around and did it again and it circled around and did it again, they must be practicing. They must be testing out their technology on our drone. So lo and behold, David calls me three days after I got home and he said, "Vince, remember that drone that was flying around"? It crashed on White Sands in the area that we were working and we're thinking, "what the heck"? And of course, we never learned what happened to it, but we're wonder if something related to them and their interest in the drone was a contributing factor. We'll probably never know about that, but it's kind of an odd thing that happened along the way. It will always remain a mystery.

Santucci: So the work went on, the documentation went on, and we finally decided that, you know, we've got so many important things that need brainpower that we need to address geologically, geochronologically, paleontologically, and archaeologically that David and Marie and the rest of the team decided, we need to have a workshop and we need to bring all these experts together. And we did. And there was almost 40 people and David and myself had been on phone communication with Matthew Bennett.

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Santucci: Again, he's the human footprint expert, fossil footprint, on the phone. And he was very interested in coming. And so we timed Matthew coming here with this workshop to give him more of a reason so he can interact with the other researchers and we could all get out in the field and work together. So in January 2017, we hosted workshop. And it was hosted in Las Cruces. There was a day that we went out and spent in the field doing field work, having everybody look at the resource. That's when we recruited Matthew Bennett. That's when we first brought on Kathleen Springer and Jeff Pigati from the USGS and a multidisciplinary team of experts. And we were divided into three teams. There was a geology—geochronology team; David oversaw that. David oversaw that. There was an archaeology team, Dan Odess oversaw that, and then there was a paleontology team and I oversaw that. And so we had separate breakout meetings and then we got back together and just so much came out of that. It was a really healthy environment. And we've got photos of these 40 people standing out in White Sands and discussing these—these really complicated, interesting, important discussions.

Santucci: And so then getting Matthew involved was really important because, you know, he brought the expertise, the confidence, the—the methodologies forth for us to be able to, to take this research in a new direction. And Matthew led us there, and we're really indebted to him. You know, he's traveled back and forth so many times and, you know, he has a young baby and a family and things like that. He's very dedicated to this project. And we're—we're so lucky to

have him part of this. So we host the research. By April of 2018, we had a peer reviewed approval to publish the first publication, and that's the one on the co-occurrence of the sloth and human footprints that occurred in April 2018. As I told you previously, on the same day it was published, we went out to the field and I was—I was thrilled to be able to find this first toddler footprint in White Sands, that helped to reshape the interpretation of that site and those resources.

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Santucci: The next publication that came forward was in 2019. Tommy Urban was the lead on that. That was publishing on the successful use of ground penetrating radar to detect subsurface fossil footprints because that that was brand new. That could tell us what we're not seeing that might be below there; a very important contribution to this study.

Santucci: Let's see, December—December 20th of 2019. I put that in there because it's significant. And you know what happened that day, right?

Gorski: I sure do.

Santucci: That was the date that White Sands National Park was designated for White Sands National Monument, a day we all celebrated. And I just want to have a footnote that as part of the enabling legislation in redesignating White Sands, the specific language for the significant and archaeological resources are in the law. That's great, because that makes White Sands the 18th National Park that references fossils and paleontology and it's enabling legislation. And why that's important to us, is that we now focus on these fundamental resources and values in what we interpret. So we've developed and went through this whole process of developing foundation documents, they replace the old general management plan, and in there they go through the legislation to define the principal resources and their values. And now White Sands can state, based on what Congress said was important, fossils and archeology are an important part of this park, and they really are.

Santucci: The September 2020 was the publication on the bipedal trackway. A meter—no, I'm sorry—a kilometer and a half long set of—two sets of human trackways. And then the first reference to the toddler tracks in that paper. 2022 we were hit with COVID. It did slow down research, you know, restricting travel, particularly international travel. But very determined group of researchers continue to make things happen. On September 24th, 2021, after extensive peer review, we finally had sufficient data and approval to go forward on the geochronology. One of the most important questions that we couldn't address in the previous papers because we weren't ready to do so, and we needed to protect the integrity of the Park Service.

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Santucci: So we were able to confirm that the dates of the human footprints extend back to between 23 and 21,000 years ago contemporaneous with the late glacial maximum, redefining the antiquity of humans in the New World. No subtle topic of conversation. Anyways, I would

say that—I'll just restate that, you know, I've worked in the National Park Service since 1985 and I've been privileged to be able to work with a lot of great people and seeing and discoveries of things that had never been known; new to science, new species. It's hard to top the work that has been done by this multi-disciplinary team of supportive staff at the park, at the region, at the Washington Office, colleagues from other agencies and academia. I'm just so proud of what we have done together to tell the story, which is not completely total yet. Not yet.

Gorski: Because work is still ongoing, even up to today, September 26, 2022. Thank you for your time today. It's just been an honor to get to talk to you and to understand your background in relation to this project and how these projects move forward from a management perspective, from a fieldwork perspective, getting to preserve not just the trackways themselves, but the stories of the people who are out there and doing these discoveries. That's valuable information. And so, once again, thank you for taking the time to share that with us today.

Santucci: And thank you being a front line park ranger that interacts with the public. You know, thank you for sharing the story.

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[END OF INTERVIEW]