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Gary Morgan
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Interview conducted by Vincent Santucci
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Transcript

[START OF INTERVIEW]

Gary Morgan: Fine by me. It sounds like you've done this before, obviously. You told me that you'd interviewed – I really enjoyed your telling me about the super-secret World War II facility there near Mount Vernon, and all of the old guys that had been sworn to secrecy their whole lives. I guess you interviewed a lot of them that have since passed away. I thought, man, that's history that would have been lost if you wouldn't have talked to those guys.

Vince Santucci: Yeah, that was a fun project, thanks.

Gary Morgan: Didn't sound like it had anything to do with paleo, but I know it was something you were really interested in.

Vince Santucci: The best non-paleontology project I've ever been involved in, thanks.

Gary Morgan: Yeah, that was just so interesting. Who knew, right?

Vince Santucci: Yeah.

Gary Morgan: Until you started digging, people knew, but they were sworn to secrecy.

Vince Santucci: Absolutely.

Gary Morgan: What we do isn't so politically sensitive.

Vince Santucci: Very good. Let's get started. Today is Friday, February 28th, 2020. This is part of the National Park Service Paleontology Program's oral history interviews. My name is Vince Santucci, I'm the senior paleontologist for the National Park Service. Today I'll be interviewing paleontologist Gary Morgan. Gary works at the New Mexico Museum of Natural History and Science, and has a real great history to share with us regarding research he's done at Carlsbad Caverns National Park. Thank you very much, Gary.

Gary Morgan: Oh, you're certainly welcome. Glad to do it.

Vince Santucci: The first question's a simple one. Can you give us a little bit of background, when and where you were born?

Gary Morgan: I'm 67, I was born [in] a little town [in] Ohio. Northwestern Ohio, little bit south of Toledo. It's not that tiny a town, but anyhow, just a typical Midwestern upbringing. My mother was a homemaker, my father was a local attorney. Anyhow, that's – anything else? I could go on forever, but at least – I grew up, I was born there and lived there all the way through high school, and then went away to college also in Ohio, at Miami University, that they always call Miami of Ohio even though it's much older than University of Miami in Florida, it's the one

that no one's heard of. Anyhow, that's where I went to college. First 22 years, I was in Ohio. Haven't been back to live there since, however.

Vince Santucci: Your undergraduate degree, was it – in what field?

Gary Morgan: In biology. It was just kind of a high school thing, I had a really excellent high school biology teacher, got me really interested in natural history, not necessarily paleontology. He was an ornithologist, so I'd go on bird watches and things like that. There wasn't a whole lot of natural history around where I grew up, it was mostly corn fields, but he found some little woodlots and places like that, and I enjoyed natural history.

Anyhow, went into biology, but I had been interested in paleontology as a kid. My father was more interested in lapidary, we'd go places and collect geodes, and look around for agates and things like that, that he could cut and polish and make into jewelry. That didn't interest me very much, but some little places we went – it was all Paleozoic, but I would find Paleozoic invertebrate fossils, so I had a fossil collection going when I was a kid. That's something I thought about when I went to college at Miami, but I was disappointed when I got there and found that there were no paleontology classes in the biology department. That shows how naïve I was, that I didn't bother to leaf through the book of classes for the university and look in the geology department. It wasn't till I met a student in one of my classes, and she said, hey Gary, wake up. There's plenty of good paleontology classes at Miami University, you just have to take them in the geology department.

Then I ended up getting – I think it was a minor. I don't know if it was official but I took a lot of undergraduate geology and paleontology classes in my last two years, once I realized that that was something I could do. From that point I was hooked.

Vince Santucci: Excellent. Then once you graduated, how did you pursue your career?

Gary Morgan: I met – there's always some mentor or professor involved. In the geology department, I met a Dr. Roy Reinhart, who had been a PhD student at Berkeley with Stirton back in the 50s, right after World War II. He'd been a World War II veteran and ended up back at Miami University. I think he grew up in the Cincinnati area. He got me really interested in paleontology, and going on for a career doing graduate work. He'd studied under Stirton at Berkeley, he'd studied fossil marine mammals, sea cows and whales, things like that. Actually, sea cows and these weird things that are called desmostylians, I don't know if you know what they are, but they're weird sort of hippo-like marine mammals that are only known from the west coast.

He had gotten involved – Clayton Ray at the Smithsonian had been working with a collector out in Oregon and Washington by the name of Douglas Emlong. I don't know if you've ever heard of Emlong's stories, but anyhow, Emlong had collected a bunch of these desmostylians from Miocene and Oligocene rocks in Washington and Oregon, and had sent them to Reinhart to have them studied, because nobody in Washington was interested. I studied the desmostylians for my undergraduate honors thesis at Miami. Then between Clayton Ray, who I'd gotten to know, and this Reinhart guy, my mentor, they thought that Florida, at the University of

Florida, working with Dave Webb, would be a good place to go for grad school, so that's what I did.

Once I got there, it turns out Webb had too many students, and I started working with another guy who was at the University of Florida, who was interested in West Indian cave fauna. That's actually where my cave influence came in, I stopped working on fossil marine mammals, and from that point really on to the Carlsbad, the rest of my career, I've done a lot of work on late Pleistocene cave faunas, first from the Caribbean and then from Florida, and pretty much all over the place, including New Mexico.

Vince Santucci: Okay, so that was my next question, how did you become involved and interested in cave paleontology?

Gary Morgan: Yeah, that was – this guy, Thomas Patton was his name, the professor at Florida, had done a summer and done some field collecting in caves in the Cayman Islands, small island group. Everybody's heard of the Caymans, but they probably don't know where they are; in the Caribbean, halfway between Cuba and Jamaica. He had never really studied these fossils, so he wanted me to do that for my master's. Then I ended up not only studying what he had, but I thought I needed to do some field work, and so I spent about a spring break and a couple weeks extra when I was a grad student down in the Cayman Islands, collecting fossils. You'll never guess who my field assistant was. Greg McDonald.

Vince Santucci: Great.

Gary Morgan: I know I've told you that Greg and I were grad students together, I'm pretty sure I mentioned that.

Vince Santucci: Yes.

Gary Morgan: Of course you know Greg from years of working with the Park Service, but he and I were grad students together, and he helped me out. It was great help, because he had some vertical experience in caves that I didn't have. He was very helpful in the field, collecting fossils for my master's.

From that point on, whether it was the Caribbean or other places, I was always interested in caves, and got interested in fossil bats also, because there were a lot of fossil bats in the Cayman Island sample that needed to be identified. That just interested me, and then wherever I went after that, of course caves are very – that's where the bats are roosting, so you're likely to have fossil bats.

Vince Santucci: Was David Webb your graduate advisor?

Gary Morgan: He ended up being my graduate advisor. That's kind of a long, ugly story, but this Patton guy that was my supervisor wasn't very reliable. In fact, right in the middle of my graduate career, he just up and quit, even though he had a PhD, and went to law school. Academia wasn't paying well enough, so he went to law school and became some sort of a sleazy

lawyer, I don't know. He wasn't a very good individual, I'm kind of glad I ended up getting back then associated with Dave Webb.

Even though Dave had a bunch of students at the time and he was overwhelmed, he agreed to take me on as a student because it was an unfortunate circumstance that my major professor had left, and there was no one else. Even though Dave didn't really know much about West Indian cave faunas, he did what he could to serve as a good advisor, and ended up being a mentor and friend for the rest of our careers. I think you may be aware that Dave passed away last year, last October he passed away. He was in his 80s, and he'd been retired from paleo many, many years.

Vince Santucci: Yeah, I had the pleasure of meeting him earlier in my career, and he seemed like a real gentleman and a great person.

Gary Morgan: Oh, he's a real gentleman, and one of those guys you almost never hear a bad thing about. He was really good to his students, and provided them with good background for going on to careers. Greg McDonald, of course, was one of Dave's students, and of course he's had a good career in paleontology, but there are many others of us.

Vince Santucci: Very good. How long were you in Florida before you moved west?

Gary Morgan: I was there for three years and got my master's. Then I was contemplating going on for a PhD, but I mentioned Clayton Ray. You've had a chance to – do you know Clayton, or have you met him?

Vince Santucci: Yes.

Gary Morgan: Okay. Clayton had been associated—he actually had his first job as a curator at the Florida Museum of Natural History. After about three or four years, he'd made a name for himself and was offered a job as curator in paleontology at the Smithsonian, so that's where everybody associates but his first job was at Florida, so I was kind of following in his footsteps. Anyhow, there was a job available, actually in mammalogy, at the Smithsonian in the late 70s, 1977 it was, after I got my master's. Clayton helped me get that job. What he wanted was for me to come and eventually work with him in vertebrate paleontology. He thought, well, at least you get your foot in the door at the Smithsonian, we'll get you to get a job here and work in mammalogy. I loved mammals. In fact, even though I worked with modern mammals for four years there at the Smithsonian, and I learned a huge amount that's been very helpful for the rest of my career, after about four years it became pretty clear that there just wasn't going to be a job that would come available in paleontology, vertebrate paleontology at the Smithsonian. People in Florida, Dave Webb and Bruce MacFadden—who's still there—but he arrived after I'd gone to the Smithsonian – had a big NSF grant, collection improvement grant is what they used to call them. Now NSF has another name for the – providing money for improving paleo collections, or biological collections in general. They hired me to do that, and that eventually worked its way into a permanent position as the collection manager in vertebrate paleontology at the Florida Museum of Natural History. I did that from 1981 to 1994, so 12, 13 years, something like that.

In the meantime I met my wife, she was a University of Florida student. I met her, and she got a job as an attorney here in New Mexico, so we kind of had to make a decision. One of us was going to have to move, and I decided, okay, I'll – New Mexico sounds like a fun adventure. Even though I had a good career going at Florida, I picked up and moved out here, out to New Mexico with my wife, and luckily was able to land a curatorship position here at the New Mexico Museum of Natural History. Rather than Florida, New Mexico, same thing, state museum of natural history. I've been here ever since, so what is that? That's 25 years, more or less.

Vince Santucci: The year again that you moved to New Mexico?

Gary Morgan: 1994.

Vince Santucci: Okay.

Gary Morgan: I was actually – I've been a curator since 1996. I was here for two years, I worked on actually BLM, US Bureau of Land Management contract. It was working on Permian footprints. You're aware of the whatever, Prehistoric Footprints National Monument, which has since been designated, within the last 10 years. I worked on the original fossil collection that came from—well, it was BLM land then, which has now become a national monument since then—for two years on a government contract. Then I got my job as a permanent curator here at the New Mexico Museum of Natural History.

Vince Santucci: Great, thank you. Before you came to New Mexico, is there any opportunities that you had to work in or with collections from national park areas?

Gary Morgan: I did, yeah. I think I may have mentioned that to you when we got together in October. I'm going to say it was in the late 1980s, but Bill Wall, who was at – I knew him when he was a grad student at the University of Massachusetts, and my girlfriend at the time had also gotten a grad degree at the University of Massachusetts. She knew Bill Wall, and he'd gotten a permanent faculty position at Georgia College, in Milledgeville.

Going all the way back to his graduate work on rhinos, and—what are they called, amynodonts—he'd always done work on fossils from Badlands National Park. I don't know how long Bill had a permit. You know Bill, and know that he worked at Badlands for many, many years. He invited me to come along on a summer trip with him – a summer field trip. I spent two or three weeks collecting with him in Badlands. Bill was really interested in big stuff, rhinos, [*Gigantamynodons*?], really large animals, and hadn't really focused on small mammals from the White River group, from the Badlands. That's one thing that he—and my girlfriend also was a specialist on microvertebrates, micromammals—so we spent two weeks with him in the park, collecting and building up the collection of microvertebrates.

Vince Santucci: Excellent.

Gary Morgan: That, I believe, was my only other experience, and I enjoyed—It's funny, because collecting fossils in Florida is a very different experience from out west. There are no extensive

badlands, you can't go wander miles and miles of public land looking for fossils, because everything's private land and it's all covered with either vegetation or water. There are plenty of fossils there, you just have to use a different search technique. It's not the same. The Badlands was really one of my first experiences ever with getting out in the West to an area that had extensive geologic exposures, and just doing what we call prospecting, gumshoeing, looking for fossils.

I had also done that a little bit with Bruce MacFadden, a couple field seasons in Bolivia. He had some interesting fieldwork he was doing in the mountains, in the Andes in Bolivia. That was also badlands collecting. Those were my first two experiences with doing anything other than caves or digging in sinkholes in Florida.

Vince Santucci: Okay. Once you wound up in New Mexico, how did you get involved with work at Carlsbad Caverns National Park?

Gary Morgan: Well, it was a little bit serendipity, maybe. Carlsbad Caverns is such a famous place. I had to go visit, I had never been to the caverns. My whole life living in Washington, Florida – or, Ohio – had never done much western travel. A couple, I think it was 1996, something like that, just a few years after I got here, my wife and I went on a weekend trip down to Carlsbad. Since I was interested in fossil bats, I had read Barbara Lawrence's paper that was published in 1960, where she described a sample of an extinct free-tailed bat, *Tadarida constantinei*, from what she called New Cave which I then learned was actually, according to the Park Service at Carlsbad Caverns, they called it Slaughter Canyon Cave – that they led, you could pay a little extra and they would have a ranger-led field trip to that cave.

In addition to, of course, taking the standard public tour in Carlsbad Cavern, we signed up for the Slaughter Canyon Cave tour. Just like when we were there, remember after we were done there was a tour? A couple rangers showed up and they had a tour. I was part of one of those, and they were taking us through the cave. The trail goes right by the big guano piles. I kind of was peeking out of the corner of my eye, and noticed, gosh, it looks like there are fossils poking out of the side of that cliff over there. I didn't know it was guano at the time, but I kind of figured it was.

I kind of wandered over there and was looking, and the woman who was the ranger yelled at me. She said, “What are you doing? You're off the trail”. I said, “I was over here looking at the bat fossils”. She was clearly irritated because A, I was off the trail, and B, I'd kind of taken away her thunder because that was going to be the next thing she was going to talk about, was all of the thousands of fossil bats that had been found in the caves. Anyhow, that all worked out.

Then I went back home and I thought, well, there must be all kinds of publications, this is just such a spectacular – you guys all experienced it in October. There are thousands of bat fossils there, there must be all kinds of publications. Well, that wasn't true, just the Barbara Lawrence paper from 40 years earlier was all that had ever been written. I looked through, found out who was the cave specialist at Carlsbad Caverns, it was Dale Pate at the time, and contacted Dale about how would it be possible for me to get a permit, get permission to go and do some

sampling of this wonderful bat fauna from Slaughter Canyon Cave? It started out as a public tour, and then evolved into something that looked like a really interesting research project.

Vince Santucci: Prior to your work, were you aware of any other paleontological work at Slaughter Canyon Cave?

Gary Morgan: I was not. Other than just Barbara Lawrence's work, and she never went there, so it was one of the cave – one of the, I don't know if he was the cave specialist, but a guy named Denny Constantine. And of course the bat was named constantinei in his honor; he had collected the fossils, I'm going to say in the late 50s, and had sent them—I'm not sure why he sent them, what the connection was—but he sent the fossils to Barbara Lawrence who was at Harvard University, at the Museum of Comparative Zoology, to study. That was the only collection of fossils I was aware of.

Now, since then, and it was almost, once again, by happenstance. I was at the University of Nebraska, attending a conference in the early 2000s, shortly—yeah, I can't remember, I think it was after I had done my fieldwork in Slaughter Canyon Cave—but anyhow, I was at the University of Nebraska. I was looking at a fossil collection that I knew they had from New Mexico, and I opened up the cabinet and there's all these fossils there from what they called New Cave, but Slaughter Canyon Cave, that had been collected in, I want to say 1937 or 38. Remember, I gave you guys copies of some field notes from a guy in Nebraska, I think his name was Harry Tourtelot.

Vince Santucci: Okay.

Gary Morgan: You should have a copy of that. Rod, Scott, whatever, should have copies. Remember I brought a pile of literature with me when I came in October, and you had copies and scans made of all of those. In and amongst there, I gave you all a copy of this guy's field notes from the Nebraska State Museum. He collected not so much bats, he collected some of those, but the most interesting thing was two complete skeletons of an extinct mountain deer called *Navahoceros fricki*. One of those is on display in the Nebraska State Museum to this day. I've got a nice photograph of it. In fact, that's something I was going to send to Scott, that I thought he might want to include in the report. George Corner, do you know George at Nebraska?

Vince Santucci: I do, and that would be a great addition.

Gary Morgan: George kindly took that, went into the exhibits, and took a picture of that specimen for me. That collection really isn't well known, but that—from the '30s—you'd have to check the park records, but I'm thinking that may not even have been – I don't think that was part of the national park at the time. I think it was probably private land because they were doing guano mining in Slaughter Canyon Cave at that time. I'm assuming the guano mining stopped once it became part of the national park, but I'm not exactly sure of the history of that. Erin or Rod or somebody would know better than me. At any rate, it was in the '30s when this Tourtelot guy from Nebraska did that collection.

Then between that, and then Denny Constantine in the '50s, and then me in the 2000s – there were a few other small collections. There's a guy named Donald McFarlane, and he was cited in Scott's report. They did a study of the age, they dated the – whatever, that flowstone deposit that sits above the bat guano. This is in the '80s. The list of permits, Scott at the end had an appendix with the permits, people who'd done research, and Donald McFarlane from the LA County Museum is listed there. He made a small collection of bats, which for some reason he sent to me. I have those, I'm outlining this in the report, because I want Erin, I guess Gearty, or whatever, to know that there are some specimens out there that they may not know about. For some reason they sent them here. Also a University of New Mexico professor of biology by the name of Scott Altenbach, who's a famous bat biologist, also made a collection in the '80s. That also ended up in our museum. It was at the University of New Mexico, but it's been transferred here.

I think that's, as far as I know, the two major – well, whatever that is, five different people or groups have collected in Slaughter Canyon Cave since the mid '30s. I don't know of anybody else.

Vince Santucci: Did Tourtelot ever publish anything on his work?

Gary Morgan: No, and that's why nobody knew about it. It wasn't very well known at all. The only – Bjorn Kurten, the famous, whatever, Finnish Ice Age paleontologist, he wrote a paper naming the new genus Navahoceros for this fossil mountain deer that—I think he mainly was studying specimens from San Josecito Cave in Mexico. He knew about the skeleton in Nebraska, and he included Slaughter Canyon Cave when he wrote that paper, included it as referred specimens for this new species. As far as I know, that's—then Kurten and Anderson, in their Pleistocene Mammals of North America, mentioned Slaughter Canyon Cave as a locality for Navahoceros. That's really all I know that was published from that, and they didn't really give catalog numbers. I don't even think they gave credit to the Nebraska State Museum as having – or Tourtelot's name.

I think I told you I'm trying to finish up a paper reviewing the Slaughter Canyon Cave vertebrate fauna, and I'm going to go through all this history and give people credit who'd done fieldwork in the past there, because they haven't been given credit in any past publications.

Vince Santucci: Thank you. Would you be able to summarize your research, in terms of what you feel the more significant aspects of the fossils from Slaughter Canyon Cave?

Gary Morgan: Sure. I guess – maybe I should just – I don't know if it's another question, but just the actual fieldwork and research, I don't know, I didn't really mention much about that.

Vince Santucci: Please.

Gary Morgan: I worked with Dale. Dale wanted me—Pate, he and I worked out a program, or I came down I think in 2001 for a trip, and I met him, and he took me into Slaughter Canyon Cave. He wanted to know, before he issued a permit, he wanted to know exactly what I wanted to do, and where I was going to dig. He was incredibly helpful, because I just didn't know

anything about the cave, and I was really focused on the bats. You saw where, this past October, where I dug. I had a permit from Dale really to only do those two excavations, the one two meter thick trench through the large pile of guano, and then the smaller place off to the side where there's that little wooden ladder, kind of a three foot thick section where we found all of the wonderful little bat skulls on the surface. Those are the two places I dug.

I had a permit for 2002 and 2003, and I had a field crew of three or four people, Patty Daw, Glenda Dawson, and then Carol Belski. Carol was from Carlsbad, but the other two, Patty and Glenda, were from Albuquerque. They came down on two different weekends over those two years and helped me collect all of the sediment samples. Mostly it really was carefully bagging bags of sediment, and then carrying them down. Most of the work ended up being, as you know from micro, most of the work is in the lab. Washing, picking, sorting, curating, that sort of stuff, most of it was done in the lab, and really just bagging up sediment in the cave. When we did find things like those teeny delicate little bat skulls, they were very carefully wrapped. We had the little plastic film containers that film used to come in, and I – I think we wrapped up nearly 100 of those skulls in just two weekends. There are obviously many, many more left.

That was the sample that we had, that then ended up back in Albuquerque, and I've been working on it ever since. It's a daunting task. Somebody asked me to estimate, but I have at least 10,000 fossils, and that is probably a gross underestimate. Just from 400 pounds of sediment, I think I had about 25 bags, and over 10,000 bat fossils to process.

I had a couple different things that I've been working on. One, I've been interested in the whole fauna from the cave, so including the mountain deer skeletons that were found by Tourtelot back in the '30s. I also, I probably have about 10 other species of vertebrates I've found, maybe more like 12 species, in those samples. I was a little surprised there weren't more. It really is *Tadaridas*—I'm sorry, Constantine's extinct free-tailed bat is 99.9 percent of all the fossils, but there's a little bit of pronghorn in there, there's a swift fox. What else? [inaudible 00:29:06] are the two other extinct things. There's a couple small rodents. There's a land – a little gopher tortoise, desert tortoise, and a little bit of reptile and bird. Surprisingly, not as diverse a fauna as I would have guessed.

I should say that Dale was very specific about my permit. Since I was working on the bats, I really only had permission to dig in those two places. If it would have been up to me, I probably could have found a wider variety of fossils. If I could have gone all around the cave and looked in different nooks and crannies and sampled different places, I would have probably found more than I did, but that's not what Dale wanted me to do. That's probably a Park Service thing, and I think it's not bad at all. He wanted me to have a very specific project, and dig in a very specific place, and so that's what I did.

Then the other thing is, then I got some bat studies going too. This is such a huge sample, it's giving me an opportunity to study the evolutionary history of the Mexican free-tailed bat. There's no question that Tadarida constantinei, this extinct thing, is very closely related to *Tadarida brasiliensis*, the modern Mexican free-tailed bat that occurs in – it's the one that occurs in Carlsbad today, but it's a distinct species, so there's something interesting going on with the

evolutionary history. The fact that we found tens of thousands of fossils would suggest that in the past, this species lived in huge colonies, just like *Tadarida brasiliensis* does today. It lives in larger colonies than almost any other living bat. Do you know the estimate, is it half a million that are in Carlsbad Caverns? I'm not sure. Bracken Cave in Texas is estimated to have 20 million individuals of that same species. Anyhow, that's—

Vince Santucci: Quick question—

Gary Morgan: —part of what I've been interested in studying. Both the relationships, but also the ecology. How has this thing changed through time, and also, why were there so many thousands of bats living in Slaughter Canyon Cave then, but not today? Whatever the environment is in the cave today, it's not suitable for those bats.

Vince Santucci: Quick question. Of the 10,000 or more bat fossils that you indicated, there were no other taxa of bats?

Gary Morgan: Oh there are, yes, I'm sorry. Yeah, there are – I'm going to say there are four species of bats. The one, maybe the most interesting one is, there are a few specimens that are of a smaller Tadarida that are exactly like Tadarida brasiliensis. That maybe suggests that my theory needs to be re-examined, that this may just be a large extinct species. It's related, but it didn't necessarily evolve into the modern Tadarida brasiliensis, if it was already there. That's something I'm looking into, but there does appear to be the living species and this larger extinct one. Then there are two Myotis. They're very difficult to work with. You can separate Myotis into categories, have a small species, medium size, and large, but actually being able to tell which species you have is almost impossible without a skull. I only have probably half a dozen elements, a jaw here, a humerus there, of those rarer bats. I'm going to say four species of bats.

I was really hoping that I would get vampires. The true vampire bat is known from at least one fossil locality in New Mexico, and several in southern Arizona and Texas. It's the right time period, but they're not there. For all the thousands of bat bones that I've sorted through, the vampires are very distinctly different, and there's nothing like that at all in there.

Then another part of the research is – you probably saw the name in Scott's report, but P-O-L-Y-A-K, Victor Polyak has done a bunch of research, I think in Carlsbad. In Grand Canyon, but also in Carlsbad Caverns. He's a geologist looking at the sediments and the cave formation. I've been working with Victor on the age. He's the one that came up with the idea that Slaughter Canyon Cave is way older than people thought. People had always thought early on that, because those skulls and the bones were in such beautiful condition, that they must be late Pleistocene, they couldn't be that old. According to Victor, they're as much as half a million years old, so that's actually an early Irvingtonian deposit, not Rancholabrean. It is similar to maybe Mammoth Cave, I know there's some publications by Rick Toomey and some others showing that the bats coming out of Mammoth Cave are pretty old also, maybe Irvingtonian.

Oh, and I forgot to mention, my original work that I did there, at least the first trip in 2002, Rick Toomey was part of my field crew. You of course know Rick from his work at Mammoth Cave, but at the time he was the cave biologist at Kartchner Caverns in Arizona. He

came over for a weekend and helped us dig. He had done a cave in Texas for his PhD, and was very, very helpful in setting up a grid, and how we should go about sampling, and that sort of thing. I want to make sure that I get Rick in there, because he's a hardworking, dedicated Park Service employee, but has always been very helpful to me.

Vince Santucci: Is there future work that can be done in Slaughter Canyon Cave?

Gary Morgan: Oh yeah. We barely touched the surface. I'm not sure what else – unless there was a targeted study on the bats, if somebody wanted to do any kind of an anatomy study or whatever, the specimen – I've got 100 complete skulls here, and 100 specimens of every element you could think of. Any kind of an anatomical study, people could just use the collections that I have here, but there may be some other kind of study. The other thing I mentioned is Dale had limited me to just those couple areas of working, so somebody maybe could do a survey throughout the cave and see if there were some other places where there were bone accumulations of things other than bats, or some other kind of a bat besides the Constantine's free-tailed bat. That's the one thing that occurred to me.

Victor Polyak has done some interesting – he's a geochemist, so he's done a geochemical analysis of the bones of the bats, and also of the sediment. He also sampled the cave formation, that's kind of where he got the idea – not only the flowstone, but some of the other formations in Slaughter Canyon Cave – that the site was much older than we thought.

Oh, and just one other interesting aside that I may have mentioned or may not have mentioned when I was there in October. One of the earliest attempts ever at radiocarbon dating by – his name was Libby. What was Libby's first name? Richard Libby, Robert Libby? The fellow who invented radiocarbon dating.

Vince Santucci: Willard—

Gary Morgan: At the University of Chicago in the late '40s and early '50s.

Vince Santucci: Willard Libby.

Gary Morgan: One of the very first samples he ever tried to date was from Slaughter Canyon Cave. Maybe it was this Denny Constantine guy that sent him some bat bones and some sediment samples from there to date, and he published that date in the Journal of Radiocarbon in the early 1950s. It's not really paleontology, but just in the history of radiocarbon dating, that Slaughter Canyon Cave played a role in that also.

What it turned out is that he had what we call today an infinite date. At the time he said it was older than 17,000. I think at that time, Libby couldn't date anything older than 20,000. Now of course that's up to 50, and we know that the sediments are half a million years old, so it's no wonder he was unsuccessful getting a radiocarbon date from those specimens, because they're way, way older than radiocarbon dating. He didn't know that at the time, he was just sampling many, many different sites, and many, many different kinds of material, bones, sediment,

whatever. That may be something interesting in the history of Slaughter Canyon Cave, that people may not be familiar with.

Vince Santucci: Willard Libby, he—

Gary Morgan: Willard, Willard Libby, right.

Vince Santucci: He was the recipient of the Nobel Prize in 1960 for his work on radiocarbon dating. The paper that you referenced from the 1950s, the Journal of Radiocarbon, do you have a copy of that, by chance?

Gary Morgan: I have the reference. I don't think I have the paper. I think I tried to find it. I don't think that journal even exists anymore. It probably exists in libraries, it's probably online, but I don't know, for whatever reason, my museum doesn't give me really good access to online journals. Most universities, the library will allow you to download just about any scientific journal, individual articles, PDFs. I can't do that at the museum here, so I end up having to find somebody at the University of New Mexico or someone else to download an article. That's one that I would love to have a copy of. I have a feeling there's not a great deal of background information on Slaughter Canyon Cave, but I'd like to see it.

Vince Santucci: If you send me the citation, I'll try to find that.

Gary Morgan: I can send you the citation, for sure. I want to say it's 1952, radiocarbon. Some of those things literally – were just lists of dates. A list of the date, material dated, and a locality, and not a whole lot more information than that. It still should be in the record, and that's something I wanted to – I was going to actually put that in my review to Scott, to go ahead and put a citation about that in the paper.

Vince Santucci: Yeah, that would be very important.

Gary Morgan: Actually they released two other attempts after that. McFarlane tried to date the bones, and somebody from the University of California Riverside in the early '80s, everybody kept trying to date bones, or sediment or whatever, from Slaughter Canyon Cave, and nobody was successful. It wasn't until—actually McFarlane—there were two papers, McFarlane and Victor Polyak both published in 2006 who dated the flowstone with uranium-series to show that it was 200,000 years old. Of course the sediments are below that, so there was no radiocarbon date to be had, but an interesting dating history, nonetheless. I think only the Libby date, and then the Polyak and McFarlane dates, have been published.

Vince Santucci: Okay. Yeah, that'll be important to get the Libby paper.

Gary Morgan: Yeah, yeah. Yeah, Willard Libby, that's right. It'd be interesting to get that paper. One other – I don't know, it's not Slaughter Canyon Cave, but Victor Polyak is the guy that's come up with the idea that the caves in Carlsbad Caverns are way, way older than people ever thought they were. Some of the ones, there's the Cottonwood Cave, I think is the one that's the highest in elevation, could be as old as 12 million years, according to him. He's actually got

some dates from sediments that show that. What happened is the caves formed at sea level – or at the water table, and then they've been uplifted as part of the Rio Grande lift. The caves that are highest above in elevation are the oldest. Slaughter Canyon, I think he has – he wasn't able to get a date out of Slaughter Canyon, but he thinks the cave formation is late Miocene, it's about six million years.

To me, it occurs to me, having lived in Florida where we would get older karst deposits – we're getting Pleistocene, late Pleistocene, Holocene, and maybe even middle Pleistocene with Slaughter Canyon, deposits out of these caves, but it'd be interesting for someone to look for older, maybe Pliocene or Miocene karst deposits in these older caves that date to the Pliocene or the Miocene. I haven't done that, but I'm just thinking for a future project. I'm not sure it would be successful, but how cool would that be if we could get Miocene sediments out of some of these caves, instead of just very late. That's something I was going to even put in the report, for future reference, a recommendation for possible future research. I don't know if it would be successful, but it'd be worth somebody to take a look.

Vince Santucci: These would be very valuable comments to include in the report, so thank you for that.

Gary Morgan: Yeah, as I've been working on this over the years, I keep thinking, what should we find, or what haven't we found, or what would be an interesting thing? Virtually all western caves are – they're Irvingtonian, or they're mostly Rancholabrean deposits. They don't really have anything older, whereas the Florida caves, a lot of them aren't caves anymore, they're just karst pockets, and chimneys. They do limestone mining, and they uncover these things, and they go all the way back to the Oligocene, which is kind of what you find in Europe. You get a lot of Oligocene, Eocene, Miocene karst deposits.

Well, we don't get that in the caves in Carlsbad or anywhere out west, but I think it may be that people haven't been looking for them. They have the wrong search image, they have a search image looking for soft, unconsolidated sediments on the cave floor. Maybe little isolated pockets up in the ceiling, or in the side of the caves, may be where some of these – if there are older Miocene karst deposits, they'd be in a different depositional situation that people aren't used to looking for. Considering if you're in Slaughter Canyon Cave or Carlsbad Cavern, the ceilings can be many, many tens of feet about your head, it'd be hard to do any kind of survey of that. Just a thought, anyhow.

Vince Santucci: Any other thoughts regarding Slaughter Canyon Cave?

Gary Morgan: I don't know – I just think the caves in general have a lot of potential. The other thing you and I talked about, but you mentioned a site that had been discovered fairly recently, whatever, in Grand Canyon, that had all the mummies, mummified bats. You said some of them were as old as 30,000?

Vince Santucci: 35,000.

Gary Morgan: 35,000. Well, it'd be interesting to do – I read about the Mummy Room and the Mausoleum Room, some things that Pat Jablonsky had surveyed and found quite a few mummies in Carlsbad Cavern proper. I wonder if that would be something – considering sampling, doing some DNA and also radiocarbon sampling of those. Who knows, maybe those are as old as what you're talking about as well. Maybe they're in the Pleistocene. They all look modern, they look like they died last week, but then they date out at 35,000 years. I just wonder if that similar situation might apply in Carlsbad, that's something that might be worth a future research project by someone interested in such things.

Vince Santucci: Then, moving on to the greater Carlsbad Caverns, have you observed or studied fossils from other localities, other cave localities in Carlsbad Caverns National Park? Lechuguilla or elsewhere?

Gary Morgan: The main cavern?

Vince Santucci: Yes.

Gary Morgan: You know, I've never done any paleo work there. There really don't – there's a lot of – I was really interested and excited, whatever, when we went to the headquarters there in Carlsbad, and Erin and Rod showed us the collection. I'd never seen the small paleo collection they had there. I finally got a look at this juvenile *Nothrotheriops* that's been mentioned in the literature several times. It'd be interesting for – Greg had actually seen that. If you remember, there were handwritten notes from Greg McDonald where he'd identified a lot of the elements, so he'd obviously been there and looked at those. He included them in one of his review papers.

That's about it. I've never had a chance to look at any of the bats. I was looking, and there really weren't any bat specimens from Carlsbad Cavern in the cave paleo collection, so I'm kind of wondering, where are all these – people talk about all these specimens, maybe they were never collected. Pat Jablonsky had quite a few studies in the '90s where she studied these things, also from Lechuguilla, and then this paper by Baker way back in the '60s. They all mention mummies, or lots of bat bones from Carlsbad Cavern, but I've never had a chance to look at any of those because they don't seem to exist in any collection. I'd love to compare those to what I'm getting from Slaughter Canyon Cave. Are they the regular living *Tadarida brasiliensis*, or are they this larger extinct constantinei thing? What other species of bats might be in the sample?

Vince Santucci: Very good.

Gary Morgan: Anyhow, the answer is I haven't had a chance – I haven't done any collecting in Carlsbad Cavern, but I haven't even seen any specimens. I think Pat didn't collect anything, I think she was just observing, but leaving everything where it was. Just a question for you. You interviewed Pat, right?

Vince Santucci: Yes.

Gary Morgan: Is she doing okay? I don't know if I told you, I was hoping you would pass along my greetings, because I haven't had a chance to talk to her for a long time. I didn't know where she was or what she was up to these days, but I kind of miss interacting with her.

Vince Santucci: Yeah, she's doing very well, enjoying retirement, doing some traveling.

Gary Morgan: Oh, she's retired, okay. Yeah, she's a little older than I am, so I guess she would be retired.

Vince Santucci: Yes, and I passed on your greetings, and she extended the same back.

Gary Morgan: Oh, thanks so much. Is she in Michigan still?

Vince Santucci: No. She is in Colorado.

Gary Morgan: Colorado, okay. All right. Cool. Nothing against Scott, but I noticed for some strange reason, throughout the report from start to finish, he misspelled her name. Her Jablonsky ends with a Y, not an I. That's just one minor point, he can do a global change on that. For some reason he got Pat's name misspelled.

Vince Santucci: Hmm. I'll make sure we get that correct, thank you.

Gary Morgan: Yeah, make sure. It is Y, isn't it? It's S-K-Y at the end, not S-K-I.

Vince Santucci: Yes, that's correct.

Gary Morgan: Correct. He had it S-K-I throughout, and I changed it. It's no big deal, it's just – I'm not one to be critical of other people's work. I have nothing but glowing review of Scott's report. He did all the work, most of the work, and we're helping out, but I thought he did a bang-up job. I thought he really did a great job of summarizing everything.

Vince Santucci: Oh, that's great to hear, thank you.

Gary Morgan: What did you think? Anything you were hoping you'd see?

Vince Santucci: No, I'm pleased with the report overall, and appreciate your contributions to it.

Gary Morgan: Mine will be, they'll be a significant contribution, mainly—I haven't really added that much, there's some places where I finish some corrections and some additions, and some other interpretations, but I didn't want to add too much more. I thought that there may be a couple places, and maybe some of the recommendations like I just said about the bats, and maybe someone possibly looking for older deposits, I'll mention that. Scott might want to put a few sentences in about that. For the most part, what I don't know is who exactly the reports are intended for. Some of it, particularly about the invertebrates, seem to be very, very detailed. It might be a little much for non-geologist NPS employees. I'm not going to suggest that he

changes it, it's great information, I enjoyed reading it, but it could be a little bit much for somebody who doesn't know anything about paleontology or geology.

Vince Santucci: The primary audience is the park staff, current and future park staff, so that they have a reference to go to, to look at the scope, significance, distribution, and management issues related to the fossils, that can help them with their day to day work. Secondarily, it could help park researchers in the future that are doing geologic or paleontologic work. As you have experienced yourself, the data is widely distributed, but it's a pretty robust amount of information and research that has gone on. Through this effort, we're trying to compile it all so it's in one place, in an easy to access reference, so that people – that'll facilitate their work and decision making in the future.

Gary Morgan: Well, he's done a wonderful job of that, I learned a lot. One thing that I thought was really – and I knew the name, because he's published a lot, this Harvey DuChene, is that how you pronounce his name, DuChene?

Vince Santucci: Yes.

Gary Morgan: He had done a lot of geologic work in Carlsbad Cavern, but he provided Scott with those early spectacular photos of invertebrates from Lechuguilla Cave. I was just blown away by how spectacular those fossils are. I think Keith, somebody, some invertebrate paleontologist should jump on that. It's just amazing, the quality of the preservation. The problem is, it's not easy to get into Lechuguilla, it's not an easy place to work.

Vince Santucci: Right, yes. Harvey DuChene also reviewed the manuscript and provided feedback, in addition to the photos. It was very helpful to be able to pull him in to review.

Gary Morgan: He apparently did a survey of the invertebrate fossils that are preserved in the walls of Lechuguilla Cave, and has many, many more photos than Scott put in, as a survey but also extra photos that weren't in the survey were in Scott's report. That's a really amazing resource to have.

Vince Santucci: Absolutely.

Gary Morgan: Yeah, that was – I didn't know about that, so that's something that's really good to know. Some people could contact him if they needed more detailed information about that particular topic.

Vince Santucci: Yes, for sure. Thank you.

Gary Morgan: People are more than welcome to contact me too, whether Park Service or otherwise, if they want any suggestions or any information. Some of the pictures that Scott had, I tried to provide a little bit more help on the identifications, but as you know, it's kind of a jumble of bones in a cave, it's a little bit hard to tell exactly what you're looking at. If you don't have the specimen in hand, it's hard to tell the orientation or even the size. I tried to give a stab at a few things, a few of the pictures he had in there, at least a little bit of a help. I can help if they find –

send me pictures, or find a bone that they want to send to me for an identification, I'm more than happy to help out.

Vince Santucci: Much appreciated. Just a few more questions. Outside of Carlsbad, then, are there any other National Park Service areas that you've been involved, either directly with fieldwork or review of specimens?

Gary Morgan: Okay, let me see. In New Mexico, I've done a little bit – the one place would be White Sands. I've done some work with David Bustos on the tracks, early on. You've been part of, and other people have been part of the more recent studies that have gained a lot of media attention, and also been published. I wasn't part of that, but early on, Spencer Lucas and I here at the museum, and Dave Love from the Bureau of Mines, worked with David on some elephant tracks from White Sands National Monument, now National Park. That study was published. I'm still interested in the footprints. Whenever you were talking about a trip out there, sometime in the spring, I'm really looking forward to that. I know there's a lot more better preserved tracks and a better diversity of tracks there that have been found since Spencer and I just found the big – looks like dinner plate sized elephant tracks that you find out there, that's what we studied.

Then I also mentioned my first two years here, I worked on what's now become Prehistoric Footprints National Monument. That's Permian reptile, amphibian footprints, near Las Cruces. Those are two National Park Service areas besides Carlsbad where I've done paleontology in New Mexico. I think that might be it.

Vince Santucci: Let's go back to White Sands, then. Can you give me a little bit more detail then, in terms of the early communication with David Bustos, the field observations and documentation which led to the publication of those late Pleistocene tracks?

Gary Morgan: Dave Love and a couple people, John Holley is another name, back in the '80s had been working on the White Sands missile range. They had found a number of both elephant and camel footprints. David Bustos, right about—I don't remember, was it the early 2000s when he–I think that's when we published, I'm trying to think of when he showed up at White Sands. He contacted me at some point and said they were doing a paleo survey, and he knew about our work at White Sands missile range, which of course is contiguous. In fact, I think it more or less completely surrounds White Sands National Monument, or National Park. He thought the same sediments that we found, the Pleistocene lake sediments with the elephant tracks—the proboscidean, we don't know, mammoth, mastodon—probably extended onto Park Service land, onto White Sands land.

Sure enough, David was out – had gotten interested. I don't think he has a paleontological background, I think he's a wildlife biologist. Anyhow, he's interested, and called us up and said – had Dave Love from the Bureau of Mines come out and look, and thought that he had found some elephant tracks, and wanted us to come down. He of course, we met him at White Sands, and then he took us out to where the tracks were preserved. He wasn't sure that's what they were, but they fit the description and fit the photographs that we had published earlier. We published an earlier paper on the tracks from the missile range. Sure enough, he was right on. You can't miss these things. They were so extensive, it was obvious this elephant was walking along the

edge of the lake, and you could see what was very obviously – I don't know how many tracks there were. We got the trackway and the size and everything in a publication.

I think that's what initially got David interested, that he'd found those. From that point on, he took the ball from that point. It was me, Spencer Lucas, and Dave Love, who's now retired, but was with New Mexico Bureau of Geology and Mineral Resources. He may have been part – have you met Dave? He may be part of the second—

Vince Santucci: Yes.

Gary Morgan: Anyhow, then working with David Bustos early on, that's what got him excited on the footprints. I'm not trying to take credit for Dave's work, because he's the one that did all of the tracks that were found subsequently. I had gotten involved in other projects, and never really felt like I was a footprint expert.

To be honest—don't put this in. You shouldn't put this in the interview, but Spencer has made a lot of enemies. Some people like Spencer Lucas, a lot of people don't like Spencer Lucas, and he had somehow gotten under the skin of somebody with the Park Service, and they didn't really want to work with the museum. I'm sure it wasn't me. At any rate, at some point somebody encouraged David Bustos to, yeah, this is a great project working on these footprints, but we'd rather you worked with someone other than the people at the New Mexico Museum of Natural History. There's some politics involved in why I or Spencer weren't involved in the later, more spectacular discoveries at White Sands. Dave turned to other people, I know Greg McDonald, you helped out, there were other people. It's fine, I don't consider myself a footprint expert, and I don't hold any animosity towards anyone. A great group of people ended up doing the research, I just happened not to be part of it for political reasons, I guess.

Vince Santucci: What do you think of the current findings from White Sands?

Gary Morgan: I'm not sure if I'm – are these the ones that have been published?

Vince Santucci: Yes.

Gary Morgan: Or things that I don't know about? Certainly the ones that have been published recently by you guys are just amazing, spectacular. I guess I can't comment on the human interaction, I'm sure that has – in fact I know from talking to people that's been the most controversial part. Are they tracks, or if they're human tracks, are they contemporary with the ground sloth? Is that right? It looked like there was an interaction between the human and the ground sloth tracks?

Vince Santucci: Yes. The reason – yeah. Just to answer that simply, we pondered that for a decade, trying to figure out what is the relationship, if any, between the humans and the late Pleistocene tracks. When we found an individual set of trackways of a human crossing footprints of a sloth, where within the same individual trackways of both the sloth and the humans there were times where the human footprint stepped on the sloth tracks, and in the same trackway, the sloth stepping on the human footprints. That is what—

Gary Morgan: That's obviously the most important. If you've got the one underneath is older, it came first, and the sloth is on top – You've convinced me. I think it's great, and I think it's really good data. I'm just saying, any time you get an interaction between humans and Pleistocene or Ice Age animals, you're going to get people that poopoo that, that don't believe it. I've heard some of that, "I don't think they're people" – they're just being skeptical. I don't even think these people have seen the footprints, they're, oh, are those really human footprints? I don't think they're footprints, or that sort of thing. I think it's just kind of off the cuff, it's not something that's ever been published. I don't know, has anything been published that's been critical of the – this is just people talking off the top of their head, and not many, just maybe two different people. These are people that are always critical of everything, so I wouldn't take it too seriously.

I thought it was great work, and then of course all the other interesting – the saber cat, and dire wolf, and other kinds of Pleistocene animals that are not well or not at all represented by footprints anywhere else. Those are the kinds of things I haven't seen, and I'm really looking forward to seeing things like that when we go down in the spring.

Vince Santucci: I have one other question.

Gary Morgan: I don't know how—the one thing I always had a problem with, and we can prove this through what's happened but the fact that the tracks, you see the tracks, but then they're really subject to erosion. They're kind of a renewable resource. Okay, there'll be an elephant track, and you go back and it'll eroded away, but another will have shown up. Still, I don't know if there's a way to preserve them, or to collect them. Otherwise they just go away.

Vince Santucci: How we've dealt with that is that – the preservation is a real challenge. These tracks are quite ephemeral. We've found—

Gary Morgan: They're in some soft gypsum sediments. How do you preserve something like that?

Vince Santucci: We found that at this point, the only way that we're successfully preserving them is through photogrammetry. We're capturing imagery of high resolution detail the moment that we see them, knowing that every moment afterwards they're going to be a little less pristine, in terms of their preservation. Part of the plan for inventory and monitoring is that once we identify important new trackways, we get photogrammetric 3D images of those, because other ways of preservation haven't worked.

Gary Morgan: So you tried other things, and they just haven't worked?

Vince Santucci: No, it's been very difficult. Future work is to—

Gary Morgan: We'd gotten permission from—this was on the missile range. There were a couple places where Dave Love had found some footprints. Some of them were a little semi-indurated, and I think particularly the mammoths, because this huge weight, several ton animal stepping down into the sediment caused it to be a little bit more indurated. It formed these little funny mushrooms. There'd be a footprint on top, and then softer sediment beneath. We thought, if we

soak the thing with Paraloid or Vinac or something like that, we might be able to make a jacket and get a few of these things out intact. We never actually did it, we got into some difficulties with permitting with the army, because it was on the missile range property, but I thought maybe somebody else had attempted that.

Vince Santucci: We're beginning to consult with some geochemists that deal with gypsum minerals, and we're trying to come up with some greater understanding of the geochemistry of gypsiferous deposits, and how inert subjects may be able to help adhere those minerals together to retain the morphology of the tracks.

Gary Morgan: Yeah, so you're really taking it to the next level, and that's what you need to do. Just the standard, okay, you go out and you find a bone, and you put some Vinac on it, or put some Paraloid or whatever we normally use in vert paleo, that just doesn't cut it with gypsum sediments. You got to come up with some special kind of a consolidant that will work with that particular mineral composition. That was beyond my expertise, or whatever, so we just didn't ever do it. It would be—me being a specimen-oriented guy—it'd be helpful if we could have some of these things preserved in a museum collection somewhere. Especially the fact that, okay, maybe it's not encouraged to go out and collect a lot of fossils in National Parks, but in this case, if you don't, they're going to be destroyed by erosion, so what do you have to lose?

Vince Santucci: Yes. I had one last question. Because of your broader work documenting Pleistocene paleontological resources throughout New Mexico, I wanted to ask you a specific question regarding Tularosa Basin. We'll probably talk more about this. One of the projects that we wanted to try to do is that, because we have this diverse late Pleistocene ichnofauna, there are things that stand out. We have tens of thousands of tracks in this megatrack site, but we're missing some of the late Pleistocene mammals that were likely there. For example, horses, we have no evidence of equid horses there, but it seems likely that they should be. My question to you—

Gary Morgan: We didn't have Equus from—I have some bone. I published a couple papers, and some things haven't been published, but we have some bone specimens, jaws, teeth, things like that. Not a lot, but we do have horses. There's an Equus species that we've gotten from sediments in that area, so there were horses living in the Tularosa Basin at the time. I've seen horse footprints that were really distinctive, so you'd know them if you had them.

Vince Santucci: Yes. My question is —

Gary Morgan: —explanations, maybe it's just they're animals that favor grasslands. If they got too close to the lake, maybe they'd get stuck, but heck, you see zebras in Africa, they're not that different from horses that would have been there. You see them in muddy water holes or whatever, taking a bath or getting a drink or whatever. Horses can navigate their way through soft sediments and not get stuck.

Vince Santucci: Yes. So, my—

Gary Morgan: Even if that's not their favorite habitat, but they got to have water. They're out on the grassland or the savanna or whatever, and there would have been plenty of grasslands in the Tularosa Basin area, but I'm talking about where the footprints are. Clearly, for some reason, the horses avoided that area. I don't know why. They were there, it's not like horses weren't around.

Vince Santucci: Yeah. Today in Death Valley there's modern equids, there are mules and donkeys that survive in that arid environment. My final question is that, what we're going to try to do is to try to compile the vertebrate bone record from the Tularosa Basin from the late Pleistocene, so that we know the cast of characters, the diversity of fauna that is known from the bone record from Tularosa Basin, so that we can use that to infer what might likely occur as ichnofossils from White Sands. That's a project that we feel that if you had interest, you would certainly be able to contribute greatly to that research.

Gary Morgan: Oh yeah. I think whatever specimens are out there, most of them are probably ones that Spencer and I collected that are in the museum here. It's not a great sample, but there's some interesting things. There's actually a student, Kate Ziegler, does that name sound familiar? She runs a consulting firm.

Vince Santucci: Yes.

Gary Morgan: She had permission, somebody had an archeologist doing a survey on White Sands, had found some elephant teeth a few years ago. They hired Kate on a contract, and it turns out it was an American mastodon, not a mammoth. That's the first record of American mastodon from the Tularosa Basin. She's got a student that I'm working with, who's doing an undergraduate honors thesis on this site with the Mastodon. There are half a dozen other vertebrates, mostly small things, that also occur in those same deposits. We'll be adding – in the process now of adding some more information to that bone record that you refer to. I'd be happy to help out. I don't know if you're talking about just summarizing the record that exists, or out there – I don't know why there wouldn't be more bones to be found. David Bustos is out prospecting or looking around, he's kind of got his search image on footprints, but he ought to keep his eye open for bones and teeth, more traditional fossils, while he's at it.

Vince Santucci: Very good.

Gary Morgan: If we were finding them on the other—he's more on the east side of the Tularosa Basin or Lake Lucero, there's two different lakes. But Lake Lucero, we're on the western shore of Lake Lucero, on the missile range, which is where we found most of the bones. That same lakeshore should be on the other side, there should be some bones in the National Park. I just don't know that for a fact.

Vince Santucci: Yeah.

Gary Morgan: He sent me a couple, through the years, a little fragment of mammoth enamel or something. He's looking, but he hasn't found much in the way of traditional bones slash fossils, out of the National Park, that I know of. It may be not looking in the right place, or may not quite

have the search image. Anyhow, I'm willing to help in whatever you need, certainly all the resources we have at the museum are available.

Vince Santucci: Perfect. Hey, I also wanted to ask you, had you ever been to any of the caves in the Guadalupe Mountains, say in Guadalupe National Park?

Gary Morgan: I have not.

Vince Santucci: Okay.

Gary Morgan: I sure haven't. I talked to – when we were putting the field guide together that didn't happen, for SVP, I talked to Jonena Hearst about that. She came and she and I talked, she and I were going to work up the paleo together for Carlsbad Caverns, and GUMO, and then it didn't happen. She was talking about—and you talked to Lloyd Logan about the caves in Guadalupe Mountains. I've never visited them, but they both assure me that they're pretty small caves, they have really nice fossil deposits that Lloyd found and worked on for his master's, and published on. They aren't extensive caves by any means, compared to the caves in Carlsbad Caverns proper. I just know about them from talking to Jonena and Lloyd, I've never been there myself.

Vince Santucci: Okay. Then the final question, is there anything that you want to share that we haven't discussed yet?

Gary Morgan: No. I kept thinking of things that came up, like the Libby connection, and the connection with Rick Toomey that I wanted to make sure – I appreciate the help from the Park Service, Dale Pate, and there's a guy named Dan Allison, I know he was mentioned in Scott's report. I think he may work for the BLM now, he doesn't work for the Park Service anymore. And a fellow named Tom Bemis. Anyhow, when I was doing my work down there, just really appreciated the help from everybody in the Park Service. Of course now, Erin—I guess there are two Erins, right? Erin Lynch and Erin Gearty, and Rod Horrocks, all of them in the more modern context, and more recent context, have been really helpful. I wasn't doing any fieldwork, but certainly appreciated Rod leading us up there to Slaughter Canyon Cave on that trip. Anyhow, that's just the last thing I'd say, that I appreciate all the help and support I've gotten from the Park Service, and particularly from the good folks at Carlsbad Caverns.

Vince Santucci: Very good. Well, I want to thank you for your time, both with the Carlsbad Caverns National Park Paleontological Resource Inventory Report, and then coming out in the field with us, visiting Slaughter Canyon Cave, and also this interview.

Gary Morgan: Oh, you're more than welcome. I'm happy to help out. I think the Park Service was good to me, giving me permission to go and do my work there. I had lots of fun, but got lots of good information, so I figure it's the least I can do to help out, do my part to help out. If you're in communication with Scott or whatever, or Justin, let them know that I probably will get the report done by Justin's deadline. I'm more than half done with it now, and I've got a couple of the other projects done, so I'll have that report done.

Vince Santucci: Great, thanks so much.

Gary Morgan: That's my contribution and review of it, for people to go over.

Vince Santucci: Thanks very much. I will get a written transcript of this interview, the audio interview, and I'll send it to you so that if you have time to look at it and want to make sure we captured everything accurately, certainly you're welcome to do that.

Gary Morgan: I'll certainly do that. Like I said, I appreciate you sending me the one of Lloyd's, that was really informative. I learned a lot, I didn't know as much about his work in the Guadalupe Mountains as I—and also the fieldwork that he did in Musk Ox Cave too, so it was good to have that. Appreciate it. Yeah, thanks so much. Let me know whenever you guys come up with a date for your trip down to White Sands, I look forward to that.

Vince Santucci: Definitely. Yeah, I'll definitely be in touch. If you could send me that reference for Libby, I will track it down.

Gary Morgan: I will. I've got it right here. That paper that I'm trying to finish up, reviewing the Slaughter Canyon Cave vertebrate fauna, I've got the citation in there. I'll just get it out, I'll send it right on to you.

Vince Santucci: Thanks again for everything.

Gary Morgan: All right, you bet. Vince, good to talk to you.

Vince Santucci: Likewise.

Gary Morgan: All right, we'll be in touch again soon.

Vince Santucci: Look forward to it, thank you.

Gary Morgan: All right, take care.

Vince Santucci: Bye.

Gary Morgan: Bye-bye.

[END OF INTERVIEW]