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Natural Resource Stewardship and Science

National Park Service Paleontology Program

Oral History Interview – Robert J. Lillie

Natural Resource Report NPS/PALEONTOLOGY PROGRAM/OHI—2020/022

ON THE COVER
National Park Ranger Bob Lillie at John Day Fossil Beds National Monument in 2016 (Herald & News Photo)

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August 2020

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

The National Park Service, Paleontology Program publishes a range of reports, plans, oral histories and other documents that address a range of paleontological resource topics. These reports are of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The NPS Paleontology Program disseminates comprehensive information and analysis about paleontological resources and related topics concerning lands managed by the National Park Service. Given the sensitive nature of some paleontological resource information, such as the specific location of fossil sites, some publications are intended for specific audiences and are maintained as restricted access. When appropriate, sensitive information is redacted from reports in order to allow greater access to these reports by NPS staff, partners and the public. This work supports the advancement of science, informed decision-making, and the achievement of the National Park Service mission.

This oral history transcript is available in digital format and is maintained within the NPS Paleontology Program Archives and Library through the NPS Geologic Resources Division. If you have any questions regarding this transcript, please email vincent_santucc@nps.gov.

Please cite this publication as:

Santucci, V.L. and J.K. Kenworthy. 2020. National Park Service Paleontology Program: Oral History Interview – Robert J. Lillie. Natural Resource Report NPS/PALEONTOLOGY PROGRAM/OHI—2020/022. National Park Service, Fort Collins, Colorado.

NPS 2020/022, August 2020

Background

Interview with Bob Lillie: This interview was conducted on Monday, August 3, 2020. The primary speakers are interviewee Bob Lillie (Lillie), Vincent L. Santucci (Santucci) and Jason Kenworthy (Kenworthy) as interviewers. Bob is a retired professor of Geology at Oregon State University. Bob's research has focused on plate tectonics and has published two books on plate tectonics in the National Parks.

Lillie, R. J., The Story Beneath the Scenery: Plate Tectonics and the Landscapes of Our National Parks, Philomath, Oregon: Wells Creek Publishers, 162 pp., 2020.

Lillie, R. J., Parks and Plates: The Geology of Our National Parks, Monuments, and Seashores, New York: W. W. Norton and Company, 298 pp., 2005.

Bob has worked seasonally with the National Park Service as a volunteer or park ranger in 10 different National Park Service areas between 1994 and 2016. Below is a list of the parks in which Bob worked.

Crater Lake National Park (1994, 1995, 1996)
Blue Ridge Parkway (1998)
Sunset Crater Volcano National Monument (1998)
Gulf Islands National Seashore (1999)
Haleakala National Park (1999)
Mt Rainier National Park (2000)
Olympic National Park (2000)
John Day Fossil Beds National Monument (2006, 2007)
Petrified Forest National Park (2014)
Yellowstone National Park (1999, 2016)

This interview was conducted over the telephone from Bob's home in Oregon. Vince was at his home in Gettysburg, Pennsylvania. At the time of the interview, Vince was the NPS Senior Paleontologist and Paleontology Program Coordinator. Jason participated from his home in Denver, Colorado. The interview was recorded on a digital audio recorder and a mp3 file was created. A written transcription of the interview was produced from the digital audio recording and this document contains the discussion during the interview. Bob signed a release form for the National Park Service for the preservation and use of the interview in the future. If present, PII has been omitted.

Narrator: Bob Lillie
Interviewer: Vincent Santucci
Date: August 3, 2020
Signed release form: Yes
Transcribed by: Teresa Bergen
Reviewed by the interviewee: Yes

Transcript

[START OF INTERVIEW]

[START OF RECORDING 1]

Santucci: Let's begin. Today is Monday, August 3, 2020. My name is Vincent Santucci, senior paleontologist for the National Park Service Paleontology Program. Today we are conducting an interview with geologist Bob Lillie, retired professor at Oregon State University. Bob's career has involved a wide range or projects involving National Park Service geology. The interview is being conducted by telephone from Bob's home in Oregon. And I am at my home in Gettysburg, Pennsylvania. We may be joined shortly by geologist Jason Kenworthy from the National Park Service Geologic Resources Division. So thank you very much, Bob.

Lillie: Yeah. Thank you, Vince. I'm so happy to be doing this.

Santucci: So, the first question is going to be the easiest. When and where were you born?

Lillie: (laughs) Let's see, I was born in Louisiana. So I grew up in the Cajun country along one of the bayous in southwest Louisiana.

Santucci: Perfect. And then growing up, before you went to college, was there anything that you experienced either personally with your family or with teachers that got you interested in geology?

Lillie: Wow. Okay. Well, I grew up in Louisiana. It's a beautiful place. It's got beautiful cypress trees growing out of the swamps. Just wonderful landscape. But it's very, very flat. So I remember a few times like driving to the north, my dad had grown up in Iowa. So we'd drive north and we'd drive across these crazy things that I saw sticking up out of the ground like when we got to Missouri. They were called the Ozark Mountains. (Santucci laughs) I found out they were mountains. And I'd never seen mountains before until I was like in high school, you know. Or driving out to California, we had an uncle in Bakersfield. You get to west Texas and there's these crazy things sticking up out of the ground that I'd never seen before. So yeah, I got interested in mountains. So, I just really wanted to study mountains and to be in mountains ever since then. So that's how I got interested in geology.

Santucci: Excellent. And so when you went on to apply for college, where did you go to school and did you know you wanted to study geology your first year?

Lillie: Yeah. Well actually, I went to college, at the time it was called University of Southwestern Louisiana. It's now called University of Louisiana at Lafayette. And I actually started in math. My first year, I was a math major. And then my sophomore year, first term, I took this geology course and just fell in love with it. I just couldn't get over it. I'd read the

textbook over and over. It was just so fascinating. I wanted to learn more about these wonderful things and see all these great places in the world.

Santucci: And so you started off as a math major. At some point did you move into the geology program as an undergraduate?

Lillie: Yeah, I did. So, yeah, that's right. I changed my major my sophomore year. I changed to geology. But I kept minors in math and physics. I knew I wanted to go into geophysics. Like plate tectonics was just starting. And that was just so fascinating to me. So, then I ended up getting a master's and PhD is geophysics after getting an undergraduate degree in geology.

Santucci: As an undergraduate, were you required to do a field school?

Lillie: I was. And my university didn't have a field school. So I went to Indiana University's field camp after my junior year. And that was just amazing. It started in the Black Hills in South Dakota. Went through Wyoming. And the field camp was in the Tobacco Root Mountains in southwestern Montana. And that's where I fell in love with National Parks, too. Because in South Dakota, we went to Badlands National Park. We went to Devils Tower in Wyoming. And then to Grand Teton and Yellowstone. And then later we did a side trip to Glacier National Park. So, that was all part of Indiana's geology field camp.

Santucci: Great experiences, for sure.

Lillie: Yeah.

Santucci: So, for your master's degree, what school did you attend?

Lillie: I went to Oregon State University and I studied geophysics, which was in the College of Oceanography. And then later, I went to Cornell University and got involved in what's called a – yeah, go ahead.

Santucci: Did you – did you complete a master's thesis?

Lillie: Yeah, I did. In Oregon, it was actually on a place called Vale, Oregon Geothermal Area. It was actually in southeastern Oregon. Even though I was in the College of Oceanography, a lot of the theses in geophysics were actually on land. So, it was in a geothermal area, which was in a basin and range province of southeastern Oregon.

Santucci: Great.

Kenworthy: Hey, everybody. This is Jason. I've been on for a couple of minutes.

Lillie: Hey, Jason.

Santucci: Hey, Jason. How are you?

Lillie: I'm doing really well. Nice to hear from you, Jason. It's been a few years.

Kenworthy: Yeah. It has been. So, good. I'm so glad I can listen in.

Lillie: Fantastic.

Kenworthy: And honestly, I didn't know any of this early stuff.

Lillie: There we go.

Santucci: Thanks so much for joining us, Jason. And we introduced you at the beginning of part of our opening statement. So we anticipated you joining us.

Kenworthy: Okay. Excellent. Well, thank you. Sorry, I had [unclear] difficulty, but we're good now.

Santucci: Great. Thank you so much. So your PhD—

Lillie: I just want to mention, Jason – yeah, go ahead.

Santucci: No, go ahead. You can go ahead.

06:34

Lillie: My PhD was at Cornell University. So I worked on a project called a COCORP. That means Consortium for Continental Reflection Profiling. So that was an NSF, National Science Foundation, funded project. And it was looking all over the United States with seismic reflection profiling. So seismic reflection is something that was developed by the oil and gas industry to look in sedimentary basins around the world to explore for oil and gas. But COCORP, we used it to look even deeper. To look entirely through the earth's crust into the upper mantle. And it was to look at things on a large scale. Plate tectonics scale features. So I worked mostly in the Ouachita Mountains, which are in the southern United States. They're an extension of the Appalachian Mountains farther west. And so we looked at the crustal structure of this mountain range, which is similar to the Appalachians. It was formed by closing an ocean and continents crashing together. Only a difference with the Ouachitas and the Appalachians is the Appalachians is where there was a wholesale closing of the ocean, collision of the continents, much like India smashing into Asia today, making the Himalayas. Big mountains. Well, the Ouachitas were much smaller because the ocean didn't quite close all the way. It was sort of a soft collision. The continents just sort of did a little kiss and then they stopped. They stopped there. So, the mountains weren't nearly as high, but they're very beautiful mountains. And in fact, that's where Hot Springs National Park is now in the Ouachita Mountains in southern Arkansas.

Santucci: And just for the record, do you remember what year you defended your master's thesis?

Lillie: My master's was in 1977.

Santucci: And what year—go ahead.

Lillie: My PhD was in 1984.

Santucci: Okay. Perfect. After you defended your dissertation then, did you do a postdoc or did you find a job then?

Lillie: No, I went straight to the faculty at Oregon State University as an assistant professor.

Santucci: And did you teach courses?

Lillie: Oh, yeah. I taught Intro Geology. I taught geophysics. I taught a lot about plate tectonics and oceanography. I started doing those kinds of courses. Structural geology. Later I transitioned

into doing courses on geology of national parks. And then when I got involved with the National Park Service, teaching geoscience interpretation. That is, interpretation in the sense of presenting natural and cultural history to the public.

Santucci: And so as a professor in Oregon, do you feel that you attracted a certain type of student that were seeking something by virtue of your mentoring?

Lillie: Yeah. I think so. Initially, for the first ten, fifteen years, I was working on mountain ranges around the world. Especially the Himalayas. I worked in the Himalaya Mountains in northern Pakistan and India. Which is another one of these collisional mountain ranges, like the Appalachians and Ouachitas. So we're looking at the crustal structure there and tectonic evolution. So at that time, I was attracting students interested in geology, especially in geophysics. A lot of American students. We also had a lot of students from Pakistan. Some of my graduate students worked for government and other organizations in the country of Pakistan.

And then later, as I got involved more in science communication, interpretation, then I started attracting students who were really more interested in—they were certainly interested in geology, they all had geology degrees—but they were interested in communicating geology to broader audiences.

And in fact, one of my students is on the phone with us today. It's Jason Kenworthy. So he was a – he was very young and starting out with the National Park Service. A paleontologist. But we did a workshop together in DC. And he expressed a real interest in doing that sort of work. So, I had several students working in national parks. They would work two seasons as a GS5 level interpretive ranger. In other words, a regular seasonal interpreter. But they would use that experience to then write and illustrate a geology interpretive training manual for their park. And that was their master's thesis. So, yeah. Then I was attracting students that yeah, they're interested in geology, but also they wanted to be teachers, to be communicators. Especially the kind that you find working in the national parks, relating to the public as park rangers.

Santucci: Do you know of any other programs in the country that offer that same opportunity for graduate students?

Lillie: No, not really. There are programs; there are some excellent programs, for example, at Humboldt State University in northern California where they offer degrees in interpretation. In natural and cultural interpretation in a general sense. But no, none aimed at geology interpretation. There are some science communication kinds of degrees in various places. But this is a unique program aimed at people interested in geology at national parks and communicating that sort of passion to the public.

Santucci: As a young professor at Oregon State University, how did you wind up beginning to do work related to national parks? Was it mostly an academic venture for teaching? Or did you actually do research?

Lillie: Well, the research I was doing when I started out the first several years was the classical research. And especially as I mentioned the Himalayas and other mountain ranges around the world. You know, getting grants from the National Science Foundation and other places. So, more traditional kinds of thesis work and research and research publications and academic journals.

But then I was always interested in teaching, especially in finding ways to communicate in ways that were exciting and that would get students excited. And I remember being on a field trip in Oregon. And this one student, she mentioned to me, her name was Marianne Mayday and she had worked at Redwood National and State Parks. And she was telling me about it. And I was just so fascinated by that. I said, "God, how do you get involved in something like that?"

She says, "Well, what park do you like?"

I said, "Well, like Crater Lake would be nice."

She says, "Well, just call them and tell them you're interested in volunteering."

So I did. That was in the early 1990s. I called the chief of interpretation and she said, "Oh, yeah. Send us a resume." So I did. And that summer, I was working as a volunteer there, with a volunteer uniform. And I just fell in love with national parks and the idea of communicating geology to the public. What a great place to do it. Especially inside of an active volcano like Crater Lake.

Santucci: Excellent. So, do you recall what year you worked at Crater Lake? Was it 1995?

Lillie: Yeah. Crater Lake. I worked the summers of 1994, '95 and '96.

Santucci: Okay. So, the three years.

15:17

Lillie: And that was as a volunteer. As a VIP. Volunteer in Park. So wearing a volunteer uniform.

Santucci: Excellent. So that's the first park that you actually worked in some capacity.

Lillie: Exactly. Yeah. And later, like after that first season, I said, you know, I noticed it's certainly a very exciting place for geology. But the materials they had, I said, "Well, you know, why don't we write up some stuff and make some illustrations that other volunteers, other park rangers can use?" So, that's the first time I did a geology interpretive training manual was for Crater Lake in 1995. Something that the rest of the volunteers and the staff could use so they could convey geology to the public more effectively.

Santucci: So, if I'm counting correctly, you actually worked as an interpretive ranger or a volunteer in at least ten national parks. Is that correct?

Lillie: Yeah. Yeah. Yeah, definitely. As an actual volunteer, or I did some paid positions, too, as GS5 position seasonal rangers. I did that at Yellowstone National Park and John Day Fossil Beds National Monument.

Santucci: So, I consider them both the same, whether you worked as an interpretive ranger or as a volunteer. They're both contributions where you're working in the park. Just for the record, I'm going to just list the parks. And I'll try to do so in chronological order. Let me know if I'm missing anything or I make a mistake. So your first assignment was at Crater Lake National Park in 1994, '95 and '96. Then in 1998, you worked at Sunset Crater Volcano National Monument. In '98, you worked at Blue Ridge Parkway. In 1999, you worked at Gulf Islands National Seashore. In 1999, Haleakala National Park as well. In 2000, you worked at Mount Rainier

National Park. In 2000, you also worked at Olympic National Park. During 2006 and 2007, you worked at John Day Fossil Beds National Monument. In 2014, you worked at Petrified Forest National Park. And then most recently—well, maybe it's not most recently. It looks like you had two opportunities to work at Yellowstone National Park, first in 1999, and again in 2016. Does that sound correct?

Lillie: Yeah, that's correct. Yeah, it is. And let me just mention that those parks, starting in '98, you know Sunset Crater Volcano National Monument up through Olympic National Park, 2000, that was actually part of a sabbatical in the parks.

Santucci: Nice

Lillie: And that was something actually started by Judy Geniac from the Geologic Resources Division of the National Park Service in Denver. I'd talked to her and expressed that I had a sabbatical coming up for 1998-1999, a sabbatical year. And I said, "Well, I'd love to just work in parks." And so we looked into that and decided that well, why don't you go to a whole bunch of parks? We communicated with several parks. So, you just listed like six of them that I went to during that sabbatical. I'd spend two to three months at each park and work as a volunteer interpretive ranger. But also work on writing and illustrating a geology interpretive manual for that National Park Service site. And that was interesting.

Because after that, after that sabbatical year, Judy says, "Well, Bob, this is something kind of interesting. There might be other professors interested in this." So she wrote up something she wanted me to fill out. And I wrote a document just summing up what I did, how it all went. And she said, "Well, this looks like a good idea." So that's when the Sabbatical in the Parks actually started. Not just for geologists, but for other people. So this started the NPS Sabbatical in the Parks program. Which I don't know if it's still going on today.

I did it again in 2005 and 2006, where we did a series of geology interpretive training for ten different NPS sites around the country. So again, that was facilitated by the NPS Geological Resources Division. But it started up this thing called Sabbatical in the Parks for college professors.

Santucci: Well, that's really interesting that you helped to pilot that whole program. I guess I'm not surprised. You would be a good candidate to be the poster child for that program.

20:35

Lillie: Well, it was fun. It was the idea there's a lot of professors who love parks, you know. Not just for geology, for many other disciplines. So it was an opportunity where there was some structure and at times some funding available to help them live and work in parks during their sabbatical years.

Santucci: So Bob, I'm going to dig into each of those parks just a little bit deeper. But before I do that, I just wanted to ask Jason; Jason do you have any questions you wanted to ask Bob at the moment?

Kenworthy: One of the things that I think is really interesting is that the transition from you doing the work and going out to actually recruiting grad students to help work with that, and Stacy Wagner being the first. And if I remember correctly, I think she actually came on to do a geophysics quote unquote your "standard" master's program. And then both you and her I guess

pivoted to [unclear] at the Grand Canyon. So, I think that's an interesting story because it shows that transition to having your grad students work. And maybe that's where we're headed. But that's one of, I think a really interesting part of the story here kind of a career transition and a type of student transition.

Lillie: Exactly. And Jason, I know you came to Oregon State specifically to do that kind of thesis. But most of the students at first, they came to work on master's degrees in geology. And then, after a few months or whatever, once they found out that there was this possibility, they switched over. Because I think a lot of students are interested in communicating geology to broader audiences than just to other scientists. People who might want to be teachers. But not just that. They might have a special interest in this special kind of teaching that we call interpretation. A kind of a teaching that's done in parks. Park rangers relating to the public.

Santucci: Thanks, Jason. So, Bob, we're going to go through these parks. And just briefly, for each park, could you tell us what your role was, what you did, whether it was a volunteer or seasonal. And then the second thing is, one memory of something that you gained from that experience, whether it's new knowledge about geology or something about that park. So if we started with Crater Lake, what was your job, what did you do, and then what did you take from that experience?

Lillie: Well, Crater Lake is a very special place to me. It's right here in Oregon. It's Oregon's premier national park. It's Oregon's only national park, only one that's actually called a national park. We have national monuments and the historical sites as well. But Crater Lake, I wore the volunteer uniform. I went through the seasonal training in all aspects of working in the park. Learning content on natural and cultural history, but also methods of presenting that content to the public. What we call interpretation. And a lot of what I did there was boat tours, which is a lot of what park rangers do there. So it's two-hour boat tours around Crater Lake. You make a stop at Wizard Island. And it's just spectacular. You're inside this ancient volcano that was known as Mount Mazama that collapsed in on itself eight thousand years ago and made this spectacular crater that's now filled with this beautiful blue water. So I worked there doing, as a ranger on the two-hour boat tours. We also did talks from the rim of Crater Lake. A place called the Sinnott Memorial Overlook near the visitor center up at the rim of Crater Lake. And other guided hikes in various places. So, I was doing essentially the work that a paid park ranger does, only as a volunteer.

Santucci: Thank you. Same two questions—

Lillie: And you wanted.

Santucci: —oh, go ahead. Please continue.

Lillie: And you want a special moment.

25:24

Santucci: Yes.

Lillie: I don't know. There were so many special moments at Crater Lake. I don't have one in particular. But go ahead. Let's try the next place.

Santucci: Okay. Sunset Crater Volcano National Monument. Same two questions.

Lillie: Yeah. Well, there I was there for two months. And what a beautiful place. It's just north of Flagstaff, Arizona. It's within a group of three national monuments. There's Sunset Crater, Wupatki and Walnut Canyon National Monument. And so they relate a lot of not just geological but also cultural history. So at Sunset Crater, most of the work I did there was the standard visitor center work behind the desk. But also, there's a one-mile loop trail that goes to the base of the volcano that's just spectacular. It was in the fall so it involved a lot of school groups coming to the park. And there, that's when I started that yearlong sabbatical in the parks. So I started the work on writing and illustrating a geology interpretive manual. I think it's still there. Like my wife and I, we just dropped by there three years ago and we started talking about geology. And I started asking some questions about geology. So, the guy looks behind the desk, he says, "Well, let me look that up." And he pulls out the training manual I developed all those years ago. So that was kind of gratifying to see that. So that's kind of my special story about Sunset Crater.

Santucci: Great. Moving on to Blue Ridge Parkway.

Lillie: Yeah. Blue Ridge Parkway. So that's another part of the country. But it was one I was familiar with somewhat, having gone to Cornell University and working on mountain ranges. I didn't work just in the Ouachita Mountains for my PhD dissertation. I worked on looking at mountain rangers around the world, and looking at seismic reflection profiles which gives you a view into the earth. You can see beneath the mountains. It's the story beneath the scenery is what you get with geophysics.

So what I looked at is evidence for ocean basins opening and closing. When the oceans close and the continents smash into each other, that's how you get big mountains like the Alps and Himalayas today and the Appalachians in the past. So, I had a clue to what was there geologically from that experience. And I knew that I was on the ancient continental margin of North America. That's what the Appalachian Mountains are. That's what the Blue Ridge is above what used to be the coastline of North America. But now it's beneath five miles of rock that have been thrust over the edge of the continent. And that's what the Appalachians are.

So, it was fun to be up there on this long, 500-mile long road that actually follows the ancient continental margin of North America. But getting people to realize well, these mountains, they used to be the Himalayas. They used to be that big. There's Mount Mitchell now is the highest mountain in the eastern United States. But if you use your imagination, you can see Mount Everest and K2, you know, the two highest mountains in the world. If you go back 300 million years, you would have seen mountains that high in the Appalachians. They're just worn down a bit now after 300 million years.

29:28

Santucci: Thank you. Gulf Islands National Seashore.

Lillie: Gulf Islands. Well, that was closer to home because I grew up near the gulf coast. So that was fun to work there in what's called a passive continental margin. Unlike the US east coast, I'm sorry, unlike the west coast, which is at the boundary of tectonic plates crashing into each other, sliding by one another, and making earthquakes and volcanoes and dramatic landscapes. The east coast, including the Atlantic coast and the Gulf coast, they're where the continents ripped apart a couple hundred million years ago and opened the Atlantic Ocean and Gulf of Mexico. So there aren't volcanoes and earthquakes, at least not any big ones there nowadays, and

it's called a passive continental margin. But what develops on that is these beautiful barrier islands and just incredible sand beaches. That's what you have at Gulf Islands National Seashore. So I grew up not too far from there. Gulf Islands is in both Florida and Mississippi Gulf coast. As a kid we would actually go to, we would go to the Florida panhandle. We'd go to Biloxi and Gulfport, Mississippi on vacations. So it was wonderful being there then as a volunteer and teaching people about that as a park ranger. But also, again, developing a geology interpretive manual.

Santucci: That's one of the few parks you worked in that didn't have any mountains, per se.

Lillie: It didn't have mountains. But you know, it gave me the idea as I was developing these manuals that you know, there's something here that systematically, just like we looked at glaciers in national parks, we look at fossils in not just one park but whole groups of parks. If we look at the Civil War, people don't go, I assume when people go to Gettysburg, they don't talk about just Gettysburg. They talk about it in the context of the whole Civil War. So, other NPS sites that are telling parts of that same story. So that's where I started to get the idea of saying, well, you know, this idea of plate tectonics, it's a way to look at the whole picture so you can compare and contrast how landscapes are similar at some parks because they develop in the same ways by the same tectonic forces. And how they're different, like I mentioned in the west coast compared to the east coast, because they developed in drastically different tectonic settings.

Santucci: Thank you. Haleakala National Park?

32:23

Lillie: Well, that was exciting because that's at the top of the island of Maui on a huge volcano that rises out of the sea over ten thousand feet out of the Pacific Ocean. So, living up there near the top of the mountain for a couple of months, again, that was pretty exciting. And again, this is where I was getting the ideas of plate tectonics in national parks. Because now we're at something called a hotspot. Tectonic plate, the Pacific plate moving over a stationary hotspot and making these enormous volcanoes out of the Pacific Ocean. So and then later, working at Yellowstone, it's a hotspot, too. But it's where it's coming out underneath a continent instead of underneath the ocean. So we get different kinds of volcanoes developed.

Santucci: Mount Rainier National Park?

Lillie: Okay. So, Mount Rainier, okay. Mount Rainier, it's a volcano too. It's closer to my backyard now here in the Pacific Northwest. So part of the Cascade volcanic mountain range. And it was interesting living there, because they actually put me up at what was, it was at the Nisqually Gate, which is at the west entrance to the park. And it's what used to be the superintendent's residence in the early days of the park. In the late, in the late 1800s, the park was actually the fifth or sixth National Park Service site. So in the early days, the superintendent would sit on his porch looking over the entrance gate to the park so he could see the comings and goings of the park. So, I learned a little bit about the history and politics of parks while being in them, besides the geology. So it was interesting living there right at the gate to Mount Rainier National Park.

Santucci: Thank you. Olympic National Park?

Lillie: And a side note there, wait, one thing now, in recent years I've started working for Road Scholar, I don't know if you know about Road Scholar. It used to be called Elder Hostel.

Santucci: Yes.

Lillie: So, my wife and I have done a lot of trips around the world with Road Scholar. But I started working with them in the past couple of summers. And last summer my work was at Olympic and Mount Rainier through Road Scholar. So, I'm coming back again in places I'd worked in the past. So, you mention Olympic now. So, that was part of, I spent the summer of 2000, half of it at Mount Rainier and half of it at Olympic as a completion of this, my sabbatical year also actually extended to that following summer.

So, Olympic was, again, what a special place. Go ahead. I'm kind of getting lost for words here, Vince.

Santucci: That's okay. So, your responsibilities at Olympic, and was there a memory from Olympic that stands out?

Lillie: A memory from Olympic. I remember doing lots of great bicycle rides there. Especially riding up Hurricane Ridge Road was always just spectacular. You're looking at the ocean crust actually lifted out of the sea and pushed up a mile above sea level. Olympic was, you know, the variety of the park really impressed me. You get the high mountains with the glacial scenery up in the core of the Olympic Mountains. And then you get the coastline that's just out of this world, the Pacific coastline, where sedimentary layers are thrust up out of the ocean.

Santucci: It's a beautiful park. So in 2006 and 2007, you worked at John Day Fossil Beds National Monument. Did Jason have anything to do with that?

37:10

Lillie: I mean, Jason also worked there at that time. So, yeah. I mean, Jason was incredibly helpful because he actually has the background in paleontology, which I don't have. John Day Fossil Beds was, it's a place I'd been to quite a bit in the past. But I never really appreciated what was there until actually working there. And I guess I just want to stress that all the work I do at parks, I don't think I could do it nearly as well if I hadn't actually worked as a park ranger in a uniform. You get such a different perspective there. So even though I don't know much about fossils, I learned a bit. And I learned to be more thorough in integrating what happens on the landscape in a biological sense. To tie that to the tectonic sense of building the landscape. The idea that other aspects of natural and cultural history, that they're playing out on that geological stage.

So seeing the fossil record develop over time was very enlightening to me. Especially things like the evolution of the horse, and how that was so tied to changing climate. Going from a tropical rainforest to an oak savannah type of landscape. And seeing how horse fossils changed in response to that. So I learned a lot from Jason and others at the park about that and how to try to tie that ecology and biology and the fossil record, how to tie it to the work I was doing on more geological structure and tectonics.

Kenworthy: Can I just jump in for a second?

Santucci: Please. Go ahead.

Lillie: Go ahead, Jason.

Kenworthy: So, you were there in ’06 and ’07. And then I was there in ’07, because I started at Oregon State in January of ’07. And I think what really helped solidify what my project was going to look like was that summer that you spent there in ’06 and discussions with Ted Fremd.

Lillie: Yeah.

Kenworthy: Because when we went to the Fossil Resource Conference, which was in Albuquerque in ’06, Bob, I don't think if you were there. But Ted was definitely there. And one of the side discussions that I had with Ted while at that meeting in Albuquerque, by then I had already, you know accepted the position at Oregon State. But we didn’t really have a project in mind. So, I think it was after your summer there. Ted was like, man, it would be really cool if we not just focus on John Day and build on what you had done the previous summer, that summer of ’06, but let’s look at where all of the fossil parks have fit in to that story. And John Day, of course, connects all of them. So your first summer there really laid the foundation for what my project became the next summer in ’07 when we were both there. We overlapped for, I don't know, what, a month or so, or a couple of weeks. I can’t remember if you were there the whole summer. I was there for a month.

Lillie: Yeah. We were both there for, I was there about a month and a half both of those summers. Yeah. That’s correct. Yeah, and so Jason’s thesis, it’s unique in that it’s not just one park; it’s tying six different National Park Service sites together. The ones that tell the story about Cenozoic fossils in national parks. And again, I like to bring back the analogy with Civil War, or Revolutionary War at NPS sites. You don’t tell the story of just that one park. You need to tell it in the context of other NPS sites. Because you know, so many people are national park junkies. They just love parks. And if they’re fossil enthusiasts, you can bet that they’re going to go to a whole bunch of parks. So the idea of Jason’s thesis was to, it was for those people, so they could see the context of fossils they see in one park and how it fits into a much broader story. And unless you understand all those parks together, you really don’t understand the complete story.

Santucci: Yeah. It’s a tremendous master’s project for sure.

Lillie: Yeah. Oh, yeah. Very ambitious. But Jason was able to take

Kenworthy: A lot. It was. (laughs) I’m not sure I’ve recovered yet. But somehow it worked.

Santucci: And Jason, since we have you on the phone, can you tell us, can you tell us just a little bit of background about that project? You were able to actually physically work in a number of national parks. Can you tell us about that?

42:39

Kenworthy: Yeah, sure. And actually, if I could take the liberty of jumping back one step that might show a little bit about how students kind of came to know Bob and get involved in his program. If I could spend a minute or two doing that. Is that okay?

Santucci: Please.

Kenworthy: You know, Bob had created this unique program. And I had learned about it in 2003. So Vince, I’d already spent, what, that was at least two and a half years at Fossil Butte by

then in ’03. And I can’t remember if it was called the Geology Interpretation Workshop. But I think it was in Philly. And Judy Geniac pulled that together. And there were a whole bunch of presentations by folks that were working on geology interpretation. And frankly, I don't remember any of them other than Bob’s presentation. (laughter) I was like, you can get a degree doing what?! And that kind of started our conversation. Between you and me, Bob, we checked in every year to see if there was like a TA position available.

Lillie: Yeah.

Kenworthy: And in ’06, you were like, “Apply, apply, apply! Go, go, go!” I put everything in in ’06. But I specifically was like; this is the only program that I was even remotely interested in because of the type of work that you were doing and the unique aspects of the program. It just pushed all my, checked all the boxes for me—

Lillie: Fantastic.

44:17

Kenworthy: —you know, to do geology and in the Park Service. You did such a great job of mentoring me early on in what it means to be part of the Park Service.

Lillie: Well, thank you. Yeah.

Kenworthy: And then Bob brought in this other piece. So, I really sought out that. And I was almost like, I don’t really care where I work or what park I do. As long as Bob and Oregon State are involved, let’s do this.

Lillie: Yeah.

Kenworthy: And the fact that it worked out in such a way that it actually did revolve around paleontology and connections to Fossil Butte, which is my favorite park. And so that was kind of the seed that really got this going.

And then to have the opportunity to work at, I worked at, at the time, all six of the Cenozoic fossil parks. Although as part of my master’s, I only went to five, because I spent two and a half years at Fossil Butte. And so summer of ’07 it was a month at John Day and then a month at Badlands. And in the summer of ’08 it was a month at Agate, two weeks at Florissant and two weeks at Hagerman. So that was the kind of order of operations there.

Lillie: Yeah. That was a master’s thesis. Can you imagine?

Santucci: Yeah. What a well-planned, what a well-planned education that was.

Kenworthy: Yeah. And I think it just, being able to see all those different parks and all the different programs that they offered. I think Bob hit the nail on the head that the parks are so busy telling their story. And dealing with geology and paleontology. There’s not that natural hook to connect other parks, like there is the Civil War parks or the civil rights parks or things like that where you kind of know where you fit in the other Park Service units. And I think this is a really great way to see that. And one of the cool things that Bob has always done in this program, and you can see it in *Parks and Plates* book is connect, you know, whatever park you’re at, connecting it to that big picture. Either what’s the context as far as plate tectonics go, what’s the past tectonics, where can you see that today in national parks? And then what other

parks tell the other parts of that story and linking those together. And that really, both Park Service employees that move around a lot and have experienced a lot of different places. And then also, like you're saying, kind of the Park Service junkies that will go and visit all of the Civil War parks. Or all of the fossil parks. Or all of the parks. And so that perspective really came through, obviously, in a project like mine where it was designed to move around and look at the six different parks.

47:39

Lillie: Yeah, that's great. Yeah, you bring up a good point about the NPS employees, how important it is to them to get a feel for perspective and not just their site, but NPS sites in general. Which you know, a lot of their visitors have been to so many NPS sites. It's a good thing for park interpreters to have that perspective.

And let me mention about Jason. When I met Jason in 2003, I was really impressed at the meeting, at the conference, he was talking about, you know, here's this young guy straight out of undergraduate, giving this amazing presentation with all these much, much older professionals. I was really impressed. So Vince, if you remember then, a couple of years later we were planning to do these series of workshops on our park staff, on geology and geology interpretation. So yeah, we did one at Great Falls Park in DC area.

Santucci: Yeah. You're perfect timing for that.

Lillie: [unclear] Jason there. So, I know Vince helped facilitate there. He even let us go in a helicopter. That was amazing. NPS sites in the DC area by helicopter was just wonderful. I still use a lot of the slides I took from that helicopter, one helicopter ride, was amazing. So Jason then, we were co-teachers. Jason and I were co-teachers at that workshop. So, yeah, that really worked well. And then Jason started his master's degree at Oregon State shortly after that.

Santucci: Perfect timing. I was going to segue into that. Jason, that was perfect. Thanks for bringing that up. That was a wonderful interaction between the both of you that brought some real good context to this discussion. So let's talk a little bit more about that Great Falls workshop that you put together. So, can you share a little bit more details on the genesis of how that came to be, and then Jason's involvement in that?

Lillie: Sure. So, again, this is working with the NPS Geologic Resources Division. Judy Geniac and also especially Jim Wood, who's still there in Denver with Geologic Resources Division. So, I had another sabbatical coming up. So this time I wanted to work on helping to train NPS staff, especially interpretive rangers, on ways to learn more about the geology of their park. Not just the park, but of the surrounding setting. What we call the tectonic setting. Like it could be the Cascadia Subduction Zone in the Pacific Northwest or the Appalachian Mountain Region back east. So, they could learn about the regional, broader geology and then zoom in on their own park.

So, what we did for each of these ten NPS sites where we did this, we got together some experts. That is, other geologists who were experts on the local and regional geology of that park site. And then we would present that as content along with interpretive methods, ways to communicate that stuff to the public. So, for each workshop we had, it was me as well as two or three or four other geologists. And we would hold these two-day workshops in a park. For example, the first one was at Arches National Park. So, we did it for Arches. And Canyonlands

National Park in Moab, Utah. But we had other, we had, Tamsin McCormack was the local geologist there. And I forget the names of the other two geologists. So, the four of us were the geological experts. So, we would present geology for each workshop. But then we would have the participants work together in teams. And so by the end of the workshop, they would actually design and present a geology interpretive program, sort of an interpretive skit where one of the people would pretend to be the park ranger. The other people in their group would pretend to be their designated audience. And they would present some aspect of the geology of their park and their park region, pretend they're presenting it to the public. So, that was kind of like the structure of these workshops. So we did it for ten different NPS sites around the country over a yearlong period. So, the one Jason was involved in, and again, you also greatly facilitated that, Vince, was held in Great Falls Park.

Each of these also involved a field trip. So, a half-day field trip was part of it. And I remember Great Falls; we had a very renowned older geologist. E-an Zen was a presenter there. Yeah. He was amazing in the field.

53:17

Santucci: That was a great workshop. And thank you so much for that, both of you. That's a fond memory. Can you share with me again—

Lillie: Wait, I want to bring up one other thing. That was an interesting thing because my brother, Tom Lillie, he actually worked for the Senate at that time. He was a Senate staffer on the National Park Subcommittee, amazingly. So he actually presented stuff from a political standpoint. So that was kind of interesting. It was nice having my brother there as part of a workshop. It's the only time we've had the opportunity to work together professionally.

Santucci: Very good. So tell me again in a little more detail about the opportunity to fly in the US Park Police helicopter to see Potomac Gorge. And you can both share your reactions to that.

Kenworthy: Well, I mean, I couldn't believe it, you know? What an amazing opportunity. And seeing an opportunity to take photos of these iconic NPS sites. I mean, obviously there's some areas we couldn't fly over directly because of the air restrictions, even for the NPS police. But I think we could fly over a lot of places that the general public normally wouldn't have access to from the air. So, we got amazing photos of Great Falls Park as well as many national monuments all over the place. And we could look at them from a geological perspective having aerial photos of them. I think that's what was interesting and what really, the time of year, it was early March when we hosted the workshop and got to fly. So, it was leaf off conditions. So, flying up the Potomac Gorge, coming up from Teddy Roosevelt Island up towards Great Falls, you really get a sense of what the gorge actually looks like. You know, you can't see it from the road in most places.

One of the things that really stood out to me on that trip was just the sheer number of little mass movement and flies that were just all up and down the gorge there. I think most people look at that part of the gorge as that's the bedrock portion, so it's this permanent thing. And you could see, because the leaves were off, the active processes still continuing. So, I think that was a pretty cool thing to see. And like Bob said, this is an iconic National Capitol Region feature that's of regional and national significance, the Piedmont fall line.

Lillie: Exactly. Exactly.

Kenworthy: You can see that from Teddy Roosevelt which is the boundary line all the way up to Great Falls. So that was just an incredible experience. And so much of geology makes so much more sense when you can see it—

Lillie: That's right.

Kenworthy: Or see that big picture. And I think that's something that Bob has always stressed in his classes. There's the two interesting scales of geology. There's the big picture, so that's why plate tectonics is such a good, we're talking about geology in context for parks, and that's the aerial scale of things. And then also like the really cool details, like how we come up with how old something is, or the particular information about a fossil or something like that. So, it's like the big picture and then the stuff that you can like hold in your hands. And the really cool, cutting edge stuff. All of the quote unquote "stuff in between" where the academic folks typically work is less engaging to the public, at least in the quick interpretive study. So, anyway, that trip really pulled all that together.

Lillie: Mm hmm. Yeah.

57:39

Santucci: Thank you. So, we're going to go back to your chronology of parks that you worked in. So John Day must have had a great influence on you because you went to another fossil park after that at Petrified Forest National Park. Do you have some recollections about that experience?

Lillie: Well, yeah. Petrified. Yeah. That's because Matt Smith and Sarah Herve were working at John Day Fossil Beds at the time Jason and I were there. But then they both had moved on to Petrified Forest. Matt is a paleontologist and Sarah is now actually the chief of interpretation at Petrified Forest. She was assistant chief. So they'd invited me to come there in 2014. Not just to volunteer to help develop geology interpretive materials for the park. But again, also to work as a frontline volunteer interpreter. And what a gorgeous place. I was there in the winter. Which just the Petrified Forest, the Painted Desert is just beautiful at that time.

And I'd learned to incorporate more of continental drift into my work on plate tectonics. Because plate tectonics, you're generally talking about the things that go on at the edges of tectonic plates: earthquakes, volcanoes, development of mountain ranges. But another important aspect is the drift of the continents just slowly over time, especially when they move to different latitudes. So Petrified Forest, all those logs that are now petrified, they were in an Amazon type of setting. They're on the passive edge of the continent, the western edge, which was open at that time. There was no California or Oregon or Washington at that time. That was the Pacific coast. But it was also on the equator. It's when North America was drifting across the equator. So, you can imagine an Amazon type forest. That's why you have these petrified logs there. So, being able to incorporate that continental drift part of the story was very important.

So, I was fascinated by the details of the petrified logs because they have rings. But when you look at them closely, they're not these normal annual growth rings. Because you don't get that in the tropical regions where you don't have distinct summer and winter to make annual rings. But rather these are decade-long type of indicators within the petrified logs. So, it's very coarse rings that reflect decades-long changes in the climate that naturally occur within this tropical setting.

1:00:42

Santucci: Thanks. I do want to take the opportunity to ask you one paleontology-specific question. And that is, having the opportunity to talk with the public at a fossil park, did you have any experiences where visitors saw fossils in a natural state for the first time? And was that meaningful for them?

Lillie: Yeah, I think so. I mean, we used to, at John Day Fossil Beds we started this thing called Fossils and a Flick. So, we would show a film, the park film, which is really wonderful, narrated by Ted Fremd, about John Day Fossil Beds National Monument, and especially about a lot of the paleontological research done there. But then we would follow that up with a cart of actual fossils. And you know, a lot of them were replicas, but you can't really, they're so well done you can't tell the difference between that and the real fossils, other than that their weight is much lighter. But some of them were real fossils. But yeah, you could see, especially kids, could see their eyes light up when they got to hold these actual real fossils. And some adults, too.

Santucci: We've finally gotten to Yellowstone National Park, which in 2022 will celebrate its 150th anniversary. So, you were there in 1999, and then again in 2016. Are you able to share your experiences for each of those time periods? And were they different? So starting in 1999.

Lillie: Yeah. Well, they were different in that 1999 was the Canyon District, and 2016 was Old Faithful. And they're both iconic. You see pictures of the Lower Falls of the Yellowstone when you think about Yellowstone National Park, and you also see pictures of Old Faithful. So those are the two iconic features of Yellowstone National Park. And of course they're both geological. And for different reasons. Down cutting canyon—

1:03:00

[END OF RECORDING 1]

[BEGINNING OF RECORDING 2]

00:00

Santucci: We're good. Okay. I'm going to just give the brief introduction again.

Lillie: Go ahead.

Santucci: All right. Thank you. Today is Monday, August 3, 2020. My name is Vincent Santucci, senior paleontologist for the National Park Service Paleontology Program. Today we are conducting an interview with geologist Bob Lillie, retired professor at Oregon State University. Bob's career has involved a wide range of projects involving National Park Service geology. The interview is being conducted by telephone from Bob's home in Oregon. And I am at my home in Gettysburg. We are joined by geologist Jason Kenworthy from the National Park Service Geologic Resources Division. This is the second tape of two and we're continuing on with Bob's discussion about his work at Yellowstone National Park. So, Bob, can we start again with your work at Yellowstone, starting in 1999?

Lillie: Sure. Yeah. In 1999, I worked at the Canyon District in Yellowstone. Which is, you know, geologically, it's a wonderful place to be. It's where the Yellowstone River is cutting down, making a deep gorge called the Grand Canyon of the Yellowstone River. And one of the iconic features there is the Lower Falls of the Yellowstone. When you look at pictures of

Yellowstone, you commonly see either the Lower Falls of the Yellowstone or Old Faithful. So I worked in both places. In 1999, it was at Canyon District. So one of the places we would give presentations is called Artist's Point. And that was just a fantastic place to be doing that, because there were so many painters, photographers have been there doing just beautiful landscape portraits and photos. And they often took them from this place called Artist's Point. So giving talks to the public there was just wonderful.

And of course we would do things with the wildlife, like have spotting scopes set up. So, just looking at birds in the nest. Yeah. I'm sorry. Are you still there?

02:37

Santucci: Yes. Mm hmm.

Lillie: Hello? Okay. Okay. So, yeah, so, that was at the Canyon District. And then in 2016, I was at Old Faithful. And Old Faithful is another, of course, another iconic feature of Yellowstone. And I always wanted to work at Old Faithful. I worked at Canyon in '99. I loved Canyon, but I'd go to Old Faithful and I'd say wouldn't it be neat to actually be walking along the boardwalk there, showing people these geysers and hot springs and mud pots and all these other wonderful things. It was great being there in 2016, because it was the hundredth anniversary of the National Park Service. I believe August 21, 1916 was when the NPS, was when the Park Service was established. And I had the privilege on that day, August 21, 2016, of actually doing a walk where we started at Old Faithful and walked with visitors from Old Faithful Geyser to Old Faithful Inn. So it was very special on that morning to be reading from the Act of Congress, the Organic Act that established the National Park Service. Yellowstone started in 1872 as the first national park. But it wasn't until much later, in 1916, when the Park Service started. So, it was quite a privilege to be there in the ranger uniform and starting at Old Faithful Geyser, walking to Old Faithful Inn. Two just beautiful features that people think about when they think about national parks.

And then reading the Organic Act. To be able to talk about two reasons for national parks is, one is to preserve these wonderful natural and historic features. But also to preserve them for the future. And in fact, the word "preserve" wasn't used in the Organic Act. The word is "conserve." So, to be able to talk to people about the difference between preservation and conservation as a geologist, I think, is very important. Because you preserve things like an antique desk, for example. You put preservative on it. But you conserve natural systems. And geology is about natural systems. All these geysers in Yellowstone are natural systems. And you don't preserve them. But rather, you conserve the system so it continues to do what it does and to change over time. When you look at national seashores and barrier islands and spits and beaches, those are things that constantly change over time. So, you don't want to preserve them, you want to conserve the natural system so that they continue to function within that system. So, to be able to talk to people on the hundredth anniversary of national parks about the conservation as part of the mission of the National Park Service, to be able to do that at a place like Yellowstone National Park at Old Faithful was very special.

Santucci: Very good. Thank you for that.

06:06

Lillie: By the way, I just thought of the name of the birds there. Ospreys.

Santucci: Ospreys. Okay.

Lillie: There are many ospreys in the canyon. And putting the zoom scope on their nests in the Canyon District was really cool. People got so excited. But it's an opening to talk about the geology. Because the reason you have osprey there is because you have a deep canyon with water down there with fish in it in the Yellowstone River. But also these spires, erosional features sticking up through the eroding volcanic tuff rocks that make these incredibly sharp spires that the osprey can build their nest on.

Santucci: Excellent. Thank you, Bob, for that. Jason, do you have a few more minutes to stay on with us?

Kenworthy: Oh, yeah. Sure.

Santucci: Oh, perfect. Thank you. I wanted to ask a couple of more general questions to get your perspective, Bob. So, Bob, what do you think about the idea of professors using the national parks to teach introductory level geology classes? Since you've done that, do you have any thoughts about that and the value of that educational experience?

Lillie: Well, I mean, it's what in teaching we call a hook, right? It's a hook. I mean, why should students care about geology? It's "just an elective," in their minds. But to put it in context, to relate to something they really care about. Not just intellectually, but also emotionally. Because so many of those kids, now grownups who are college students, so many of them have had special experiences with their families visiting different national parks around the country. So I think it's a hook then if you can get them to see the landscapes of parks and try to appreciate the deeper meanings. But also how it relates more generally to other things they're interested in, like ecology and human history and how the geological landscape is such an important part of that, I think, is important. And that fits right into the idea of national parks is that that's what parks are all about. It's not just about that one park. It's to talk about how a lot of heritage, including the physical landscape, how it fits into a broader perspective. So geology in national parks, I think, is that natural hook. To get students, either some who may become geology majors because of that. But also others who may be majoring in history or ecology or political science. They can see how the physical, the geological landscape fits into whatever they're interested in. That it's all part of a broader package.

Santucci: Thank you. Had you ever networked with other geologists, professors in academia, who were also developing courses to teach the geology of the national parks? Have you had any networking that went on regarding that?

09:20

Lillie: Not, well, you know, I know there are many professors at different colleges and universities around the United States who teach courses on geology in national parks. They're actually quite popular courses. And so I had the idea of doing a textbook on it. Because the books that are out there, they're good. They present park-by-park perspectives, for the most part. They might have a loose framework about landscapes that are more glacial, that are more mountainous, etcetera. But I wanted to develop something that was more systematic. So that's why I did that book called *Parks and Plates: The Geology of our National Parks, Monuments and Seashores.* I wanted to present a framework where people could look at parks and sort of make sense out of the varying landscapes and varying geological features. But in fact it's the

same framework that's commonly used in introductory geology courses. They very often start with plate tectonics because it's a unifying theory that puts all of these landscapes into patterns, into perspectives.

Santucci: Can you briefly give us an example of how you've used national parks to tell the story of plate tectonics?

Lillie: Give an example of, okay, of how you use plate tectonics to help tell the story?

Santucci: No. More specifically, how do you use the national parks to help teach the concept of plate tectonics? Are there a couple of parks that maybe provide good examples to illustrate some of the concepts?

Lillie: Okay. Sure. Well, I'll give an example. Let's look at three parks. Let's look at Mount Rainier National Park, Hawaii Volcanoes National Park, and let's go for Cape Cod National Seashore, right?

Santucci: Okay.

Lillie: So, how are those similar and how are they different? I mean, Mount Rainier and Hawaii Volcanoes are similar because they showcase active volcanoes. But they're different because the kinds of volcanoes in the Cascade Mountains making Mount Rainier are these steep-sided composite volcanoes. Whereas in Hawaii, it's these very broad shield volcanoes. So, why are they different? They're similar due to volcanic processes. But they're different because Mount Rainier was formed at the Cascade Range because of one plate diving beneath the other. The Juan de Fuca plate's subducting beneath the North American plate. And diving downward so that the heat and pressure generate fluids that rise and melt rock and make magma in the Cascades. Whereas Haleakala, Haleakala is Haleakala National Park. But volcanoes like Mauna Loa, Kilauea in Hawaii Volcanoes National Park, they form because the Pacific plate is riding over a stationary hotspot in Earth's mantle. So it makes basalt that's more fluid. It's called basaltic lava. It's more fluid. It's rich in iron, low in silica. It flows very long distances and makes a very broad volcano instead of a steep one, like with pastier lavas like at Mount Rainier. So you can contrast the different landscapes because you see these are in different tectonic settings. One a hot spot and one a subduction zone.

And then look at Cape Cod National Seashore. You don't see volcanoes. You don't have earthquakes. You don't have mountains. And that's because it's not an active plate boundary. It's what was a plate boundary in the distant past as the super continent of Pangea was ripping apart and the Atlantic Ocean built them up, making what's called a passive continental margin along the Atlantic coast of the United States. So, it's a completely different landscape.

So, plate tectonics, then, helps us to appreciate why landscapes are similar or why they're different. If we then go to Katmai National Park in Alaska we see volcanoes very similar to Mount Rainier. And it's because it's in the very similar tectonic setting. It's another subduction zone where the Pacific plate dives beneath southern Alaska. So, it's not surprising we get similar volcanoes to what we see at Mount Rainier.

So, plate tectonics, I mentioned four parks there. It enables us to compare and contrast the landscape. So, by systematically looking at different tectonic settings, we can appreciate why park landscapes are similar and why they're different.

14:36

Santucci: Nice examples. Thank you. So, you've talked geology to undergraduate and graduate students at the university level. And you've talked to families and visitors in parks about geology as a ranger. Can you share some thoughts about those two experiences? How they're different, how they're the same, and how you find those rewarding?

Lillie: (laughs) Well, the main difference is that in a classroom, that's, the students are there for a lot of different reasons. But one of the main reasons they're there is because they have to be there. It's required. They're in a compulsory learning setting, a more formal learning setting. Whereas when you go to a national park and there's families, kids, adults, other people, they're there because they choose to be there. So in education, we call that a free choice learning environment. Instead of a compulsory environment. So the difference is that these people have different motivations. Students in a classroom, they're motivated primarily because it's part of the requirement for their degree. They want to get a good grade in the course. They want to get a job. So it's more compulsory and leads to different motivation. They're motivated, so you have to teach them a little differently than the way you relate to people in the parks. In the parks, there's no grades, there's no degrees. People choose to be there. They see an advertisement for a ranger program or they pass an exhibit that looks interesting and they might want to read on further, look on further. So they're motivated differently, so you have to relate to them differently in that free choice or interpretation kind of setting. So they're different audiences. But I think they both can be engaged in ways that are effective.

So writing the *Parks and Plates* book, that's aimed mostly at that compulsory learning audience. That's a textbook. So while it may not be as technical as most textbooks, it is a bit more technical than what people would want in that free choice learning setting of national parks.

So actually, one of the things I wanted to do when I retired was to make things more accessible to the public in national parks in terms of the items they see at the visitor centers. So I've done some books now. I did one recently called *Beauty from the Beast: Plate Tectonics and the Landscapes of the Pacific Northwest.* So I've always thought well that *Parks and Plates* book, it could be useful but it's too technical and it's too expensive for visitor centers. People don't want to pay more than about thirty bucks when they're in a visitor center and see an item, a book for sale.

And I recently just completed another book. It's called *The Story Beneath The Scenery: Plate Tectonics and the Landscapes of Our National Parks.* Probably have it available within about a month or so. It's something I've always wanted to do in retirement. So it's somewhat like the *Parks and Plates* textbook. But this one is much more readable. Much more vividly illustrated and written in language that's more meaningful to, that both intellectually and emotionally it's more meaningful to people in parks, which is what you need to do to reach that voluntary type of audience. So it's something I've always wanted to do in retirement. I'm finally finishing that last book, *The Story Beneath the Scenery.*

Santucci: Thank you. I just have a couple more questions and I want to turn over to Jason if Jason has any more questions. And then I'll have one final question. So, I just wanted to bring up the name Bob Higgins. Did you ever associate with Bob?

18:46

Lillie: Oh, yeah. Oh my God, absolutely. Bob was incredible. Used to be essentially the chief geologist for the National Park Service with the Geologic Resources Division. So yeah, Bob was an amazing guy.

Santucci: Why was Bob amazing? Why was Bob amazing?

Lillie: He was so relatable. He was a down to earth guy. I mean, here's a guy, he's the chief geologist of the Park Service, but he could just talk to anybody, you know? I could talk to him anytime. And he was incredibly helpful. He even came along, a couple of the first workshops we did, like one in the Bay Area. Point Reyes National Seashore, Golden Gate National Recreation Area. He showed up in person for that and was just so delightful. So, I don't know, I can't say enough good things about Bob Higgins.

And he was extremely instrumental in the two sabbaticals I did. Certainly working directly through Judy Geniac. But indirectly with Bob and just being able to talk to him anytime I wanted to. And he would always help to facilitate things, to get things done. He and Judy were both incredible at that.

Santucci: Excellent. Jason? Do you have anything?

Kenworthy: I guess, Bob, I'm curious. Is *The Story Beneath the Scenery* book, are you publishing that through the Wells Creek publishing family?

Lillie: Yeah, Wells Creek Publishers. Yeah. I am. And what I might say is that I've been working with Jim Wood from the Geologic Resources Division of NPS. And this past fall and winter we've worked together to redo the NPS websites on plate tectonics and national parks. So, did a lot of work in redoing illustrations, texts. So it would be for national park type audiences. Once we started doing that, I realized well heck, I can keep working on this and just make a book out of it, too. And I talked to Jim about this. I told him I'd probably be doing a book. Yeah. So that is just about ready. I have a proof copy in front of me right now. So it's getting close to being finished. And I call it a Covid book, you know? I was just reading that Mary Shelley wrote *Frankenstein* after the, it wasn't Krakatoa. What's the other volcano in Indonesia? Not Krakatoa. But the other one that went off in like 1817, 1816? Anyway, she was holed up in Switzerland at the time and wrote *Frankenstein.* Because there was no summer then in Europe after this volcanic eruption.

Kenworthy: Tambora.

21:57

Lillie: Yeah. Tambora. Exactly. Tambora volcano went off huge. So, I think there's going to be a lot of Covid books out there, so this is going to be one of them. I just had the time, being home so much. Just had the time to do it.

Santucci: Congratulations for that.

Kenworthy: Well, that's great. And Bob, Jim actually gave me a presentation on the GRD website at one of our staff meetings just a few weeks ago. And really highlighted your contributions to that. And certainly we're integrating that information into our reports for the

programs I work on, the Geologic Resources Inventory. Because all of that information is so good and the resources are all there.

Lillie: Super.

Kenworthy: We'll leverage that rather than trying to recreate the wheel. Yeah, I think having those resources available online is just so super helpful to us internally and obviously to the greater public as well. Our website's outside of webcams, which are always the top hit for Park Service sites. You know, the geology subject sites, we call them, are pretty popular and right up there in visitation.

Lillie: Yeah, that's what Jim was saying even before we started to revise the webpages, that the plate tectonics ones are always very popular. Partly because when school kids have projects, they like the idea of parks, landscapes, geology. But they're also often, as I mentioned, in introductory geology it emphasizes plate tectonics. So it gives them a resource, literature they can directly go to and find resources for their own reports or whatever on geology of parks. Or on just basic plate tectonics in general.

Santucci: Good stuff. Any other questions, Jason?

Kenworthy: I guess just what's your next park or your next book, now that you've got *The Story Beneath the Scenery,* what's your next book?

Lillie: I don't know. Pardon?

Kenworthy: Where to next?

Lillie: Where to next? Well, Vince, as I mentioned to Jason, I've been working with Road Scholar. Started doing that recently, so I'm excited about that. That's a great audience to relate to because it's mostly retirees. And they're just the ultimate in this free choice learning audiences. They really want to learn some cool new stuff. So Road Scholar's a great way to do that.

Santucci: Excellent. Yeah, that was my last question. Jason, we're on the same—

Kenworthy: Oh, sorry.

Santucci: No, no. We're on the same wavelength. I'm glad we still share that. My question was worded just slightly different, but it was the same question. And that was, what remains on your bucket list that you still want to do as it relates to national parks?

25:27

Lillie: Wow. Okay. Well, I want to get this book out and see about if I can get it widely distributed, which is going to be a challenge. I have some ideas about that. Maybe you guys can help with that, I don't know. I can talk to you about that later, maybe. So I'm reevaluating bucket list with this whole Covid thing. I think it's given us some perspective. Many people. And I think parks fit into that, don't they? I think there's much wider interest now in national parks because of the whole Covid thing. Because people can't travel internationally so freely now. So I mean, what I'd like to do is continue working with parks, individual parks. I need to finish up some stuff for Petrified Forest. I've been talking with Sarah Herve about that. Exhibits and things like that for Petrified Forest. I don't have anything specifically now. With Covid, I just haven't made

plans. It's not helpful to make definite plans right now, I don't think. But yeah, I want to get this book all wrapped up and see about getting it distributed in parks.

Santucci: Well, I want to thank you on behalf of all of us, including Bob Higgins. First for doing such a great job with mentoring Jason. Jason's our future of the Geologic Resources Division. We hope to be working for him someday. (laughter)

Kenworthy: You're too kind.

Santucci: But that's certainly one of your best success stories. But thank you for—

Lillie: Did you say you're going to be working for Jason?

Santucci: Absolutely. I think we all are. We hope so. (laughter)

Lillie: Well, the GRD's in good hands.

Santucci: Oh, yeah.

Lillie: With both of you around there.

Santucci: Yeah, he's one of those rare people that not only is he a wonderful human being, but he's also a very knowledgeable, modest individual who contributes to a lot of things within our division that makes us successful. So, we're very proud of Jason. But we wanted to thank you for what you've done—oh, go ahead.

Kenworthy: I was just going to say, this is about Bob. I appreciate your [unclear] also. (laughter) I certainly wouldn't be where I am without both of you. And Bob, you really helped I guess give my career some focus and some direction. And I know that that's the case for many other folks, and sparked that curiosity with I don't know how many dozens of rangers and tens of thousands of visitors over your 25-year career with the Park Service. And more to come, I'm sure.

28:40

Lillie: Well, thank you, Jason. I just want to say that it goes both ways. I've learned so much from students. Especially students like you, you know, who are just so talented and enthusiastic and just really good at what you do and inspiring. I mean, I couldn't have done all this stuff without parks, without working with so many great students over the years.

Kenworthy: I think that's one thing, kind of a hallmark of you and your approach to the Park Service is that you, rather than kind of showing up with a canned thing, is that you are always tailoring and evolving and basing the discussion on the people that were there and their interest and their needs and where they wanted to go with things. And you were always adopting and implementing that and taking that and running with it, rather than kind of telling everybody okay, here's how it works. (laughs)

Lillie: Okay. Thank you, Jason. Appreciate it.

Kenworthy: I think that really speaks to a lot of the program and how it works so well.

Lillie: Thank you. Thank you, Vince.

Santucci: And you've been a friend to us for many decades. And we all recognize your contributions across the board. At the park level and at the agency level as well. And we're better

off for our experiences working with you. So thanks again for everything, and for spending time today in this interview.

Lillie: Well, thank you, Vince. Let me know what I can do in the future, too. I appreciate that opportunity to review that paper a couple of weeks ago. That was fun.

Santucci: Thank you for that. Well, I guess we—

Lillie: By the way, that's one person we didn't mention was Allyson Mathis. I can't tell you how incredible it was working with Allyson all these years. I mean, I met her; she was a TA in my intro geology course long before I started working in national parks. So the idea that when she got her master's she started working as a park interpreter, that was a big influence on a lot of the stuff I do, too. And we've continued to work together doing teaching workshops together and lots of other cool stuff. So I was happy to see that she's still involved in writing papers there for Grand Canyon.

Santucci: So, save a date about ten years from now, Bob, and we'll do another interview and try to pick up all the pieces of things you've done since this interview. (laughter)

Lillie: Wow. Okay, hopefully we'll be through this COVID stuff by then. But we'll see.

Santucci: Absolutely.

Kenworthy: Oh my gosh, yes. (laughs)

Lillie: Don't say that.

Santucci: Well thanks again to both of you. I sure appreciate it and we'll look forward to chatting again.

Lillie: Thanks so much, Vince.

Santucci: Thank you.

Lillie: Yeah. You guys stay safe. Say hello to your families for me.

Santucci: Likewise.

Kenworthy: Will do. Thanks, Bob. You take care, too. And hopefully we'll talk again more often than every handful of years.

Lillie: You bet. Okay.

Santucci: Have a great day.

Lillie: Yeah. Thank you.

Kenworthy: Take care. Be safe.

Santucci: Bye-bye.

Lillie: Bye.

32:06

[END OF RECORDING 2]

[END OF INTERVIEW]

Total time = 95 minutes

The Department of the Interior protects and manages the nation’s natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 2020/022, August 2020

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U.S. Department of the Interior

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