

**Oral History Interview of
Ernest Fish**

**Interviewed by: David Marshall
July 6, 2017
Lubbock, Texas**

**Part of the:
*University Archives***

© Southwest Collection/
Special Collections Library



TEXAS TECH UNIVERSITY

**Southwest Collection/
Special Collections Library**

15th and Detroit | 806.742.3749 | <http://swco.ttu.edu>

Copyright and Usage Information:

An oral history release form was signed by Ernest Fish on June 29, 2017. This transfers all rights of this interview to the Southwest Collection/Special Collections Library, Texas Tech University.

This oral history transcript is protected by U.S. copyright law. By viewing this document, the researcher agrees to abide by the fair use standards of U.S. Copyright Law (1976) and its amendments. This interview may be used for educational and other non-commercial purposes only. Any reproduction or transmission of this protected item beyond fair use requires the written and explicit permission of the Southwest Collection. Please contact Southwest Collection Reference staff for further information.

Preferred Citation for this Document:

Fish, Ernest Oral History Interview, July 6, 2017. Interview by David Marshall, Online Transcription, Southwest Collection/Special Collections Library. URL of PDF, date accessed.

The Southwest Collection/Special Collections Library houses over 6,300 oral history interviews dating back to the late 1940s. The historians who conduct these interviews seek to uncover the personal narratives of individuals living on the South Plains and beyond. These interviews should be considered a primary source document that does not implicate the final verified narrative of any event. These are recollections dependent upon an individual's memory and experiences. The views expressed in these interviews are those only of the people speaking and do not reflect the views of the Southwest Collection or Texas Tech University.

The transcribers and editors of this document strove to create an accurate and faithful transcription of this oral history interview. However, this document may still contain mistakes. Spellings of proper nouns and places were researched thoroughly, but readers may still find inaccuracies, inaudible passages, homophones, and possible malapropisms. Any words followed by "[?]" notates our staff's best faith efforts. We encourage researchers to compare the transcript to the original recording if there are any questions. Please contact the SWC/SCL Reference department for access information. Any corrections or further clarifications may be sent to the A/V Unit Manager.

Technical Processing Information:

The Audio/Visual Department of the Southwest Collection is the curator of this ever-growing oral history collection and is in the process of digitizing all interviews. While all of our interviews will have an abbreviated abstract available online, we are continually transcribing and adding information for each interview. Audio recordings of these interviews can be listened to in the Reading Room of the Southwest Collection. Please contact our Reference Staff for policies and procedures. Family members may request digitized copies directly from Reference Staff.

Consult the Southwest Collection website for more information.

<http://swco.ttu.edu/Reference/policies.php>

Recording Notes:

Original Format: Born Digital Audio

Digitization Details: N/A

Audio Metadata: 96kHz/24bit WAV file

Further Access Restrictions: N/A

Related Interviews: This is part two of an interview started on June 29, 2017.

Transcription Notes:

Interviewer: David Marshall

Audio Editor: N/A

Transcription: AV Dept Student Staff

Editor(s): Kayci Rush

Transcript Overview:

This interview features Ernest Fish as he discuss how he came to Texas Tech and some of the projects that he worked on during his tenure at Tech.

Length of Interview: 01:57:01

Subject	Transcript Page	Time Stamp
Receiving a PhD at the university of Arizona; his research	05	00:00:00
Lubbock Tornado aerial photos	09	00:10:10
Getting a job at Texas Tech	12	00:18:22
Working at the Guadalupe Mountains	17	00:33:25
Other areas that he was mapping	20	00:39:23
Involvement with radioactive waste; aquifer depletion	25	00:53:28
Climax grass community; grasses in the area	29	01:03:53
Invasive plant species that cause trouble	32	01:13:40
Lake Alan Henry; White River Lake	37	01:25:44
Silt and capacity in lakes; sewage project	40	01:36:16
People he had worked with, teaching; retirement	44	01:46:28

Keywords

Agriculture, Teaching, Texas Tech University

David Marshall (DM):

The date is July 6, 2017. This is David Marshall interviewing Ernie Fish at his office at Texas Tech, Lubbock, Texas. We're picking up from last time when we talked about your family background, your early education, and your national park service work as well, some of that. I want to talk a little bit more about that today. We also touched on your military career last time. I want to talk a little bit about your career here at Texas Tech and your research. To do that, why don't we back up just a little bit to the Arizona days where you received your PhD. That was University of Arizona, right.

Ernest Fish (EF):

That's right, University of Arizona, Tucson.

DM:

Okay. What I saw here is that you got your PhD in 1973.

EF:

That's correct.

DM:

Okay—in watershed management and statistics, does that sound right?

EF:

That's right, yeah.

DM:

Can you tell me a little bit about your research there more specifically?

EF:

Well, I came there right off active duty in the military, and I was there simply as an employee. I was looking for a job. A fellow that I had known from Colorado State days was there, his name was Chuck Bonham. So I went to work for Chuck as a technician on a—and this sounds more sophisticated than it was—an atomic energy commission project. It was basically, ecology—looking at community structures—different vegetation communities. Our main research area was a little bit South and East of Tucson in what's known as the "Empire Valley" of Arizona, near Elgin, Arizona. There was a ranch there at that time, I think it was called the "Elgin Hereford Ranch." It's now the "Elgin Research Ranch," more sophisticated. Basically, we were doing ecology, vegetation, sampling, looking at that sort of stuff. That wound up eventually being my PhD project. The long story to how I became a PhD student was one afternoon—the dean was prone to coming around and just looking at people—on Friday, I think, be sure you're there. So he opens the door, sticks his head in and says—looks at me funny and he says, "Do you have a

PhD,” and I said, “No sir.”, “Get one,” slammed the door and walked off down the hall. I thought, Well, sound like I better see if I can get a PhD. [laughter]

DM:

There you were anyhow.

EF:

Yeah. “Well, I might as well do that.” So anyway, I talked to Chuck and he agreed. I started—as a full-time employee it was a long process. I’d take one or two classes a semester and just plug away, plug away, plug away at it. Somewhere along that line Chuck left, he went back to Colorado State University. In order to support myself, I began doing some early satellite imagery stuff with NASA and that was—as we wound up—there was also, about that time, I think all the International Biological Program, or IBP—and there were two sites at Tucson: one was at the Santa Rita Experimental Range, the other was out at a place called Silver Bell. I worked on both of those doing the, again, vegetation inventory, image analysis, trying to correlate what we could—what we knew on the ground, what we could see from low-level aerals, and now could we still see that on satellite images.

DM:

Could you?

EF:

Yeah, more or less. Again, at that time, the resolution of the satellite imagery was about seventy-nine meters. You’re almost looking at a football field in one pixel, and now we’re down to sub-meter, almost centimeter, accuracy. It’s all a whole ‘nother ball game today.

DM:

So what were you—and how did that compare to the aerial, how much resolution did you have?

EF:

Well, with aerial we could fly—and we did fly some stuff, where we’re about a hundred, hundred and fifty feet off the ground. You could—one of our sites was very sandy, and if you walked across it then flew it, you could see the footprints no problem. Even on one occasion, there was a string, just kite twine, that we’d tie it between a couple of poles to mark a line, and you could see that line on the aerial photos.

DM:

And that’s flying low?

EF:

Yeah, that was flying extremely low.

DM:

You would think that flying low would cause blur though, because you'd be going fast.

EF:

High-speed camera, high-speed camera. That was interesting.

DM:

Well, when you're looking at, especially these early satellite images, are you seeing different soil types or are you actually seeing different plant types? What can—what could you distinguish?

EF:

On the early stuff I want to say—you were pretty certain that you were looking at what we could call a “ecological site,” a particular soil with a particular kind of vegetation on it. Again, when you stop to think, seventy-nine meters is about two-hundred and forty feet on a side, so just about the size of a football field. With any imagery, when you're looking at pixels then, whatever is the dominant reflective item—so in other words, we could see a road—you weren't seeing the twenty-foot roadway but that bare soil surface so dominated the signal from that pixel that you saw it. That's what gave people sort of a false impression. “Oh, well, we can see the roadway there for the resolution.” “No, you saw it because it just dominated the pixel that—it overwhelmed it.”

DM:

Is it color that you're seeing or is it some other—

EF:

Well, initially the very early satellite stuff—there was an infrared view or an infrared layer and then the three color bands. The way you put those together mattered in what you thought you were able to see. Heavy succulent vegetation tended then, in an infrared picture, to show up reddish, pinkish. So you could tell crops from rangeland.

DM:

This is the importance of correlating what you see on the ground with what you're seeing the air.

EF:

You bet.

DM:

You can say, "That's what succulents look like."

EF:

Yeah.

DM:

That's really interesting. That's pioneering.

EF:

It was. At that time it was—it was real high-level stuff.

DM:

It must be gratifying to see the enhancement of that over the years.

EF:

Oh yeah. It is so cool today to deal with satellite imagery that's got sub-meter resolution, and then try to be careful what you think you're seeing. It's pretty interesting stuff.

DM:

My brother called not long ago and said, "I'm looking at the top of your house right now on satellite." Of course, it was a picture taken way back when. I said, "You know, I was going to climb up there, check on it, make sure it's okay. Can you just tell me?"

EF:

[laughs] Yeah. Well, you can go on your computer today at home, and google—and it's probably a year old picture, but it is a satellite image picture.

DM:

It's really amazing.

EF:

At least in my house, I can go out, look in the backyard and see the sidewalk so it's a meter wide, give or take, but it does show up.

DM:

I see the little trails that I've walked, and I can see the furrows even under—even on CRP [**Conservation Reserve Program**], I can see down through the grass to where the furrows were.

EF:

Where those plants were drilled, probably. A lot of that grass seeding was done with a drill, and so the predominant pattern is a row pattern. If it'd been—if it was broadcast seeded it wouldn't be that way, but so much of it was drilled that it—and that still helps tell it from the CRP from native. There's a pattern. [laughs] Mother nature doesn't do patterns.

DM:

So you can look at the satellite and go, "CRP, CRP, native." That's interesting.

EF:

Some of it, yeah. Some was broadcast, there was some broadcast but it's—

DM:

Now, while you were at Arizona, Lubbock was hit by the tornado. Somebody took images—that was aerial.

EF:

Yeah, and that was NASA. You guys have that imagery here now.

DM:

Yes. How did you—did this come to you when you were at Arizona or later?

EF:

No. I get over here, and I'm going through the stuff that was mine, sort of inherited stuff—this light table that's out here, and this roll of film. I'm thinking, What the heck is this, holy smokes. Because the day they flew that, the NASA plane was to have flown a site for us in Arizona—study site—and we assumed they did. We did our part and were ready for it, then get this information a few days later that says, "Gee guys, we're sorry we were unable to fly your research site because there was this tornado in Lubbock." We flew it and you'd go, "Oh okay, well, cool." Never expected to see the imagery—get over here and see it.

DM:

Never thought of Lubbock at that time, I guess.

EF:

Well, not really. My in-laws lived here, and so we knew about Lubbock, and we knew they had survived and they were okay. Father-in-law was a heavy equipment guy, and so he helped bulldoze and do all sorts of stuff during that aftermath, the cleanup. To see that imagery was just too cool, just too cool.

DM:

Could you describe it? Tell me about seeing that.

EF:

I guess from a flight pattern's standpoint, they just lollygagged Lubbock. They flew over it at one altitude, flew over it at another altitude, flew back and forth, back and forth, back and forth up and down. So there was no real consistent pattern, but it was good enough quality, good enough scale, that all of that area that was hit so hard basically from about where the Civic Center is now out to the airport—you could see the pieces of sheet metal that had been ripped off those big storage buildings and scattered out across the country. So you're looking at ten feet by two feet and you could see all of the airplanes flipped upside down at the airport.

DM:

Could you pick out a path of destruction?

EF:

Oh yeah, easily. Really the most interesting thing, I thought, was, you figure this is the morning after, so people are trying to go places and so there's a—sort of a traffic pattern congestion thing, and you get to look at it. The reason for it was that the places that were still underwater and where the damage had been done. So people were trying to go out University but they were having to turn on Erskine, and go out and come back around because that whole area was underwater. You could see that and reason it out. There wasn't a whole lot of traffic in the downtown area because if you tried to go down there, you had flat tires, there was so much glass and stuff. It was fascinating imagery.

DM:

Did you happen to see any more than just the one primary path because some people say there were multiple tornadoes.

EF:

I'm not a tornado guy but you could see all the damage done to the stadium here, the lights twisted, and that looks like it was a different path.

DM:

You know, a tornado expert—if they haven't already—they need to look at this, because it might resolve some riddles.

EF:

I don't know but at that time—I'm trying to think of—Richard—atmospheric science professor that was here—Peterson, Richard Peterson—he might have seen that stuff. When I came here—

and I can't remember if he was here then or not—the only person that had any real interest in imagery other than the guy replaced Paul Nurup [?] [00:14:50] who left. I'm having one of those senior moments. The geology prof at that time—oh shoot—

DM:

Maybe it'll come to you later.

EF:

—I can't recall his name. Anyway, he may have been a—[inaudible] A real character. I went over to kind of introduce myself to him, and he told me that the one guy doing imagery was plenty for Texas Tech, go do something else. [laughter] Reeves, Reeves, Tex Reeves. Yeah, Tex Reeves. We got to be good friends.

DM:

What a start.

EF:

Well, yeah. I thought, Okay. That was Tex Reeves; he was that kind of guy. I've come to learn, you know, don't take offence. [Laughter]

DM:

Anyway, thanks for the photographs. It's all photos, right? It's not film?

EF:

No it's film. This is film

DM:

Oh it's film?

EF:

You bet. Nine-inch film, a whole roll of it.

DM:

Okay. I look forward to hopefully seeing that one day.

EF:

Lots of overlap and stuff like that. I think—now, I could be terribly mistaken, but I think you guys have the small film-like tape that I had when we had to move out of Plant Science because of the renovations and stuff. I think that went with a lot of the imagery and most of the stuff you got at that time was hard copy. Somebody should have that somewhere. Whether or not you have

the stuff to make it handle roll film—it was designed to handle—I don't know—I can't remember if the rollers and things were with it. If not, holler and you can borrow these. [laughs]

DM:

I'll ask around about that. I know that we have a lot of old equipment so we can look at these old things.

EF:

It sets up about that high and would be shaped like that. Green, green base. [laughter]

DM:

Well, maybe if I do locate it I'll see if you can come over and identify it for sure then we'll know. They may have labeled it. They do try to hold on to a lot of old equipment because we look at old media. Let's look at a little bit more about while you're at Arizona. Did GIS [**Geographic Information System**] come in at that time? Did that play into your research at all?

EF:

Not really. It was—well, at that point in time computers were still the mainframe stuff, there wasn't any desktops. While we were thinking of stuff that would eventually be GIS, there wasn't any GIS software per say. That was pretty much after we got over here.

DM:

Okay. Well, let's talk about coming here to Tech. Nineteen seventy-three, right? Right when you got your PhD.

EF:

Yeah.

DM:

How'd that come about?

EF:

Again, that's one of those long stories. We had recently changed department chairman at Arizona, and I knew I was about to finish my degree and concerned about, "So what's going on here?" So I tried to go visit with the chairman and he was busy. About that time, a friend of mine was over in the arid lands studies group there at Arizona, a guy named Ken Foster. Turns out Ken's parents lived at Lamesa and he had come through Lubbock and come back. He calls me over there—we're good buddies—and he says, "Ernie, there's this really cool job that's just you at Texas Tech. You ought to check into it," and I'm thinking, No I don't think I want to do that but blah, blah, blah. Anyway, I called over, talked with Elo Urbanovsky who was the chairman

of the department at that time. We had an interesting conversation. I won't relay too much of it on tape.

DM:

You should, we have some Urbanovsky stories. [laughter]

EF:

May he rest in peace. But anyway, long story short he wanted me to send him a resume and I did. He wanted me to come over and I did. It was just an absolutely interesting three days at the—I couldn't get an answer to any questions that I had. It was just—I would go around with people, he had me set up with everybody. I even interviewed with President Murray—but I couldn't get an answer to any question, and I thought, This isn't going to work. I, in fact, called my wife Monday night. I came in Sunday, and all day Monday I was just frustrated. I said, "If I can find a way out of here in the morning, get a plane ticket, I'll be home tomorrow rather than coming home Wednesday." She said, "Well, okay." So the next morning I got—Prof to pick me up, and he had an answer to every one of my questions.

DM:

Who picked you up?

EF:

Elo.

DM:

Oh, he did?

EF:

So what apparently had been going on, everybody that I interviewed with and had a question had fed the questions to Prof. That's how he did it. That was Elo. He was in charge.

DM:

They could've told you what was going on.

EF:

Well, it would've been nice. Also, one of the guys that I interviewed with was Ed Jacaques [?] [00:21:32] and I just nearly got angry with Ed because he kept working on me with a groundwater hydrology issue. "Well, if I was a hydrologist I should be able to answer it." It was like doing my PhD orals again. Turns out, had nothing to do with that. Ed owned a hundred and sixty acres over in Dickens and he was having a problem with his well. He thought this was free

advice. [David laughs] We got to be good friends, but at that time I just did not like Ed Jacaques [?] [0:22:12] at all.

DM:

He didn't explain why?

EF:

No, he said—well, he got out his paper and pencil—"Now if you have an [inaudible] water— [0:22:20] of water and depth to water is a hundred and twenty feet here, this well is so many feet over here, this—and what's going on here?"

DM:

It was a very personal issue with him.

EF:

I'm thinking, Dude, I'm a surface water hydrologist not a groundwater. "I don't know," but I didn't want to say that. So anyway, long story short—I then interviewed with the dean and his question was something about, "What would it take to get you here?" I was on a twelve-month appointment at Arizona. Never even dawned on me that they were talking nine-month salaries here. I knew that to move would be expensive and so very candidly I shot them a number that was about thirty percent higher than what I was making at Arizona. I could tell that it just didn't go well with the dean. It was like—"what kind of—", choked and sputtered a little bit. I thought, Well I guess that's the end of that. Elo had a comment with his usual several words, "We'll see what we can do, boy," and they did. I got fifteen-five for nine months and I had later learned that—

DM:

And this was in '73?

EF:

That was '73. That almost made me the highest paid person in the department. [laughter] Prof was making a little better than that, but not much.

DM:

But you didn't realize it was a nine-month appointment.

EF:

No, I had no clue. No clue. So it was—and anyway, we got the deal and as he took me out to the airport he basically made me an offer and said, "It'll be in the mail." I still have the letters from Kennedy and some of the people that were in the provost office at that time. So we came. Now

again, Halley had grown up in this area. Her parents had lived at Sudan and she'd been here through the Dust Bowl, the fifties and things. So the deal was, "Okay, we'll take that job but only for a couple years then we get to go back to Colorado or some good place, right?", "You bet.", "Okay." So here we are forty—whatever it—forty-four years later and we're still here.

DM:

And retired here?

EF:

Yeah. I couldn't have got a better deal or had a better career. We hadn't been here very long when I got an offer to go to the University of Hawaii as an associate dean. Got to checking on their cost of living and thought, Oh no this would be a bad thing. Prof was so mad about that. Apparently, somebody had called-- and that I had accepted the job and blah, blah, blah, blah, blah when I hadn't even applied for it. They had—so I—boy he was mad.

DM:

Who was that?

EF:

Elo. He called me in and, I mean, ripped me one side and down the other. I said, "Wait a minute, what's this all about?", "A blankety-blank job at Hawaii." I said, "Prof, I'm not going to Hawaii.", "Well they said you were.", "No sir, no sir. They called me and asked me if I'd be interested and I asked them to send me some information but probably I was not." Apparently they had called a kid who was the president of the club and asked him about me. They were really doing a lot of checking.

DM:

That's how word got out then.

EF:

But oh my stars. So anyway—

DM:

What made you decide to stay here? Cost of living was one thing.

EF:

Well, yeah. I didn't want to go to Hawaii. [laughs] At that time, we were just getting some things started. This—it was a good place, Prof was a good guy to work for. For whatever reason—and he was an interesting individual in many ways. At the heart, he was a good man. He was a lot of bluster and a lot of language that'd just make a sailor blush, but at least I never—now, I won't

speak for what other people ran into—I never had a problem with Prof. If he chewed on me it was because he wanted to make me better. He wasn't cruel and I'd been around language before so I went, "Okay, you're mad at me.", "Being dumber than a sophomore" was as nice—and he meant that. Usually you had done something wrong. "You're dumber than a blankety-blank blank sophomore." [laughter] "Okay, what did I do wrong, Prof?"

DM:

I just suspect that a lot of people didn't see through the—didn't see through it enough to see that he was trying to help. They probably just reacted to it.

EF:

It's harsh at times. Even when I was interviewing, that first night we went to his house and he was just [imitates Elo] and his wife just jumped on him, "Elo!", "Oh, blankety-blank blank. I'm sorry." That was—and that was Prof—and she was happy. [David laughs] I'm thinking, Okay this guy is something else. He was a important influential guy on campus too. The design, the buildings look and things was because Elo insisted that it be that way.

DM:

What about allowing you to develop your career. Did he want you to follow this specific path or were you able to grow into your career individually? How did that work out? Are you happy with how it went?

EF:

Yeah. There was never—and part of this is—okay, I was only one of three people in the department that had a PhD at that time. Texas Tech was—Knox Jones was the graduate dean guy and Texas Tech was starting to become a research institution. There really weren't many PhDs, there wasn't a lot of research going on. I brought some stuff with me. I don't recall Prof ever making a suggestion one way or another. Now, one of the big things at that time that he was involve with was state parks park planning and things. So that was an avenue to do some work, and one of these rolls of films is a state park roll of film where we did some work for them, usually aerial imagery. He, I think, was interested in my image background and the watershed background so those were the two courses—my two courses were the aerial photo interpretation and a watershed course, both of which probably would fit where it is now today in what then was range and wildlife—but it was part of the administration of Landscape Architecture, Horticulture and Entomology was the name of the department at that time, and Prof was in charge. That was where those courses were. I did ask him about it once but I never asked again. [laughs] He explained real clearly. Well, I think he was proud to have that, if you want to call it "technology"—but that kind of thing—in his department. Of course, it's a tremendous planning tool; allows you to see the land in a way that you can't see it any other way. He understood that.

DM:

What state parks did you work with?

EF:

Washington-on-the-Brazos, Varner-Hogg, Mission de las Cabras.

DM:

So really not these around here as much as other parts of Texas.

EF:

Yeah, down there.

DM:

I wonder if it was the Texas Parks and Wildlife saying, "We need this at this park."

EF:

So much of that was brand new, that was developing at those times. So these were plans. "Here's what you should do with this park," and the department was providing that information and expertise. Elo was, if anything, a planner, and he understood that. Anyway, going back to kind of your earlier question: there was a thing called the "Southwest Park and Recreation Training Institute". It was a professional organization, met once a year and this was Elo's thing, he had started it. Everybody participated in that. That just wasn't even an option, which didn't bother me at all. It was a good deal, there were lots of people. What it did, it met at the same time, early February, that the Range Society would meet and all of these other things that I had been a part of. So, I went to Southwest Park and Recreation Training Institute. I didn't go back to the range meetings and things like that. I do now, but that was the only thing that I ever felt—and it didn't bother me, that was what this department did so I did it too. About that time, is when I got the, at that time, 'big' research grant from the Office of Water Research Technology, OWRT, to work at Guadalupe Mountains. It was a brand new national park, brand new.

DM:

You worked there quite a bit it looks like.

EF:

For a long time, yeah. We did a lot. We did the overview stuff with the imagery, we did a lot of erosion—trail erosion work, and a lot of water quality work.

DM:

Looking at tourist impact on—

EF:

Tried to get—first of all, get baseline data so that as the park developed and things happened, could you see an impact, what was happening.

DM:

Gosh, that's a great advantage over what the earlier parks had, they didn't have that kind of—

EF:

So to have that database was real important. We put in—of course, the nearest weather station was El Paso so we instrumented five or six weather stations in the park, took that data all the time. Again, it was one of those deals that I'm still, as I look back, "Who in the world would've put that much money up for a young guy and let him go do it." [Laughs] Our dean was Anson Bertrand, a guy that was a well known internationally respected soil scientist and he was on the project. Guys like that would let credibility—I'm sure he never left the dean's office. I would go by and I'd say, "Dr. Bertrand.", "It's okay, go do it." [Laughter]

DM:

Again, this sounds kind of pioneering to me. How many other national parks have had this kind of—

EF:

None that I know of, because we were there at the start. And again—

DM:

You did manual surveys too, didn't you, as a part of that? Did you—someone did manual surveys.

EF:

Yeah, the guys over in biology did that. There was—it was a huge undertaking. A lot of that, initially, Bill Kitchen was sort of in charge of. He was the, sort of the—after Elo—he was the most senior guy in the department. Park Administration oriented, did a PhD on spinach. [laughter]

DM:

That's interesting.

EF:

Bill was—that was his thing, was to be—we had a lot of meetings with the park service in Santa Fe and places like that. That's where, of course, our [Inaudible 0:36:30] was during that time period. Bill would do a lot of work at Big Bend, and a lot of these rolls of inventory are of the

Big Bend area too. Yeah, we were—a lot of our graduate students were doing park planning, tourist, interpretation, trails. That was a big emphasis in the department at that time.

DM:

Where is this information now? These rolls that you're talking about, did they go to the Southwest Collection?

EF:

Yeah. They—I'm trying to remember the day—just real recently your folks came over—I say guys but there was a girl too.

DM:

Yeah, about a week ago.

EF:

Yeah.

DM:

I think it was the same day that I called you the first time.

EF:

That's what I'm thinking too.

DM:

I mentioned it. They said, "We're going over there today.", "Oh okay." [Laughs]

EF:

I was surprised and pleased. I kept telling them, [Laughs] "This is not thirty-five millimeter stuff. This are nine-inch rolls. You've got to be able to carry this stuff. They came, took a look at it and said, "Let's go get the boxes," so they did. Of course, there's no elevator, so you got to go up the bloody stairs with those things.

DM:

I'm glad to hear there's national park material in here because we try to collect—we've tried to collect on national parks for a long time.

EF:

Yeah, well that stuff's there. It just led to a whole bunch of stuff. One of the guys who was a big-gun professor here is now down at Texas A&I—was David Wester. David came here as a young man, I can say that. [Laughs] Bill Doll was his major professor and David mapped the vegetation

at the Guadalupe. One of my projects on my big deal was to map that, and so through Bill and David, David mapped that. Then he was young enough to hike up, down, around, in and out and that's how he did his PhD. Then he stayed here to teach ecology and statistics.

DM:

Were y'all using aerial or satellite?

EF:

Aerial, aerial imagery. There was satellite but the level of detail—it was just aerial stuff. Again, that film is over there.

DM:

So Guadalupe National Park, some in Big Bend—some work in Big Bend—some work in state parks. What else? What other areas were you mapping or classifying? Classifying land use, right?

EF:

There were just different projects. I ran across some stuff today. There was a project that we, being Texas Tech, we got involved with, with Amex, a mining company, down in the Del Rio area at one point. I can—Jim Ernest, myself, Tex Reeves—I'm sure there's one or two other people—were flown down there in the university plane at that time, and we looked at a bunch of stuff. Basically, I did image analysis for—Bill Allen, I guess, was the one who did that.

DM:

Was this the strip mining?

EF:

Yes. That was that mining stuff that was done down there.

DM:

What were they mining?

EF:

Coal.

DM:

Coal, okay. Down in Del Rio area, okay. Well, yeah, it looks like—looking at your CV [**curriculum vitae**] it looked like constant changes in projects.

EF:

Opportunists. You've got money, I'm for hire. [laughter]

DM:

Lots of different projects.

EF:

Yeah we did a lot.

DM:

Reservoirs.

EF

Um-hm.

DM:

Okay. So surface water.

EF:

Yeah, I'm a surface water guy. Ken Rainwater has been the guy that I—if it's a groundwater issue we marry up and work together. He is a top-notch groundwater—before him, Lloyd Urban. Lloyd was sort of his mentor. But yeah, back in the seventies it would've been myself, and Lloyd Urban, and Bill Allen and Jim Ernest, probably, as a group—Tex Reeves for the geology. Even on the Guadalupe—see, Tex had a student who did the geologic mapping down there.

DM:

So who's the aquifer expert during that time period?

EF:

Lloyd Urban.

DM:

Urban? Okay. I also have here that you were looking at flood zone—development in flood zones. There was a—

EF:

Yeah, Waxahachie. Again, that's one of those deals—a student of ours, mine, could take an aerial, watershed and all of that stuff, graduated with a park administration degree, became the park planner. At that time, every city in Texas had a Texas Tech graduate in their parks department. Again, that was Elo. He knew—and he would call, "David, you're going El Paso

and you better say ‘Yes sir. Thank you. When do I start,’” because if you said anything else he was on your case. He had decided that that’s where you needed to start your career. Then in two or three years he would call up and say, “David, there’s a position opening at Greenville, Texas and you—“

DM:

“We don’t have a Tech person at Greenville.”

EF:

That’s right. “And you should be up there at such and such a time. You can do that, can’t you?” [laughter] So anyway, this boy had gone to Waxahachie and so he calls me, and this was at the time that HUD [**Housing and Urban Development**], I guess—FEMA [**Federal Emergency Management Agency**]
—one of the agencies had mapped [clears throat] flood zones. The way they did it was they got out the topog [**topographic**] maps and said, “Well, look. If this is a creek then three hundred feet either side of this creek must be a flood zone. You can’t build here or if you do build here this, this, this and this.” “Well, that’s cool except that if this is the creek and here’s a four hundred foot cliff the water’s going that way, it’s not going this way.” To get around that, you had to have somebody come in and map it and submit your—you had to contest it, basically, is what it amounted to.

DM:

Is this aerial mapping again or is this on the ground or both?

EF:

Both. That’s basically what we did. At that time, also—the Waxahachie deal was interesting. There were some earth-filled dams, structures—Lake Waxahachie was one. We’re over there looking at it, and there’s this really nice, lush green spot on the downstream side of an earth-filled dam. I looked at Craig and I said, “Craig, what did I tell you in class about earth-filled structures?” He said, “Is that one in trouble, sir,” and I said, “You’re absolutely right. Man, you’ve got a problem.”

DM:

Don’t build that high.

EF:

“Well, get this thing fixed.” Earth structures—when there’s bright-green on the downstream side, they’re leaking, and it’s only so long till they bust. Well, this one was about a hundred and fifty foot tall structure so everything downstream could get washed away. He said, “Yeah when the guys have been mowing they try to avoid that because they get stuck in it.” I said, “Yeah because it’s muddy.” [laughs]

DM:

Was there already development on the down—

EF:

Oh yeah. There was—the town—this was just outside of town, so it was going to come down and gut that town if that dam failed. I said, “You really need to get serious about this,” so he did—and they did. I guess they solved it. Another earth-filled structure—we went across—we were walking across the top of it—there was a badger hole and I thought, This is not good either. You don’t know how deep that badger’s gone or exactly what they’ve done. “Yeah, we have trouble with badgers around.”, “Well, fix the hole.” So it was—

DM:

What is the fix, concrete?

EF:

Depending on how bad it is, the fact that it’s an earth-filled structure—a lot of people don’t understand, there are designed things to make the core of that dam almost non-permeable. You can’t quite do it but what it does is, there’s a—if you want to think of—a soaking in curve. The water’s up here and it doesn’t go straight across but it soaks in and if it hits this then it’ll deflect and come out below the dam. If this is not done properly then it may deflect a little bit and comes out over here so you’ve got to go in and usually the solution is: put a little water down, drain the dam and rebuild the core but that’s an expensive process. [phone rings 00:47:03] Let me check—

[pause in recording]

DM:

So I’m seeing development in these high development like around Fort Worth, Dallas—just a glance looked like right in the flood zone. In fact, there’s place I’ve seen flood before. I don’t know if there’s been any kind of preventative measures, but I don’t see it. Is that—I mean, this is a real issue that you were—

EF:

[speaking at once] Oh it is. It is absolutely real. There are—one of my favorites is the places here in Lubbock where they’ve got houses right down against these playa lakes and then the mayor gets all upset because there’s a duck in her living room. “Well, duh, you bought a house in a flood zone.”

DM:

Sometimes you can’t see that in this area though. It’s a shallow depression and—

EF:

Again, then hire your local soil scientist because if it's a Randall clay it's going to get wet. It is a nationwide, real problem. Why this feeds on itself—and the area around the mall is probably a great example, okay? The playas here that—that Randall clay soil—is probably the hundred-year flood plain. It'll fill up, okay? But that was when the other one-thousand acres around it were open range land. The four-inch rained: three of it soaked in, one ran off to the playa, okay? Take a look now at the area there from Slide Road, out to the Loop, back over to about 56th Street is absolutely, one-hundred percent impervious surface; it's paved. So guess what, all four inches go into the playa lake and, "Oops," it's way above the area that was intended. That's exactly—most of the playas in town here were not excavated, they're shallow. You go up to basically 82nd and Memphis—Henry Huneke—and that one was excavated. It's twenty, thirty feet deep in the deep part which does two things: it holds a lot more water for a small area, that's cool. You can build houses right up close to it, just don't have a basement in your house because they broke through the clay layer and all that water is flowing out and you have basically a perched water table. If you have a basement or you have the BA building, you have water in the basement.

DM:

What about shifting on foundation? With that water under your house you—

EF:

[speaking at once] Oh that too. There were a lot of houses in Lake Ridge—see, they dug out those lakes but they used that [inaudible] [0:50:33] clay to level up the lots. Well, it doesn't flood but you water the front yard, the front of the house moves up because the clay swells. You water the backyard, the back moves up. The front dries out, it cracks. They went into some of those houses and had to drill piers in the concrete slab and pour piers pilings, whatever you want to call them, to stabilize those houses. These were, at that time, two-hundred thousand dollar houses. They're probably million dollars houses today.

DM:

Someone needs to design a floating foundation that just kind of—

EF:

[laughter] Sorry, we don't do that.

DM:

What a problem though. In these high development areas of the Metroplex, for example, it's just—I don't know how they get by with that kind of construction. Maybe someone's looking the other way.

EF:

People just don't know. I can vividly recall when Lake Ridge was being built and I went over and fussed at some people where I saw what they were doing. Basically the guy told me on no uncertain terms to mind my own business and get off the property or he'd have me arrested. I said, "But dude, that clay soil is going to do this, this and damage the house." Well, he didn't know, didn't care. He had been told to do it and he was doing what he was told to do.

DM:

I think most people buy a house thinking, "They wouldn't build it here if they—"

EF:

Sure, absolutely. We owned a house on Chicago—right at Chicago and 82nd, second house in off that intersection. It's when we moved to town, that's where we moved to. There was a place in the front yard that just never was quite right. It was one of those deals. Finally, I went, "I'm tired of fussing with, I got to see what's there," so I dig down and—oh, eighteen inches down. It was where they had buried a whole bunch of tar paper, and sheet rock and stuff like that. Of course, the roots would go down, hit that and everything you planted would curl up and die so we excavated that, and everything there's fine now. Right in a residential—just dig a hole, throw it in, cover it up, nobody'll know, I guess. It had to be done during the construction of that house, just had to be.

DM:

Anyway, this is one of the fun issues you've got to deal with in your career, at least with the Waxahachie thing. I don't know if you were directly involved in that study.

EF:

I did the study for the city down there.

DM:

Oh you did? Well, some other things—radioactive waste. Looks like you were involved in some kind of assessment there. What was the story on that?

EF:

Well, again, just looking at the land and trying to evaluate, you know, "Would this be a suitable site? Is it going to leak or leech," those kinds of things.

DM:

Where was this?

EF:

We looked a little bit at that site—the waste site, there at Carlsbad, but more recently down near Sierra Blanca. There was a low level site—there is a low level site down there, and we did—David Wester was probably the lead guy on that— we did the work there. What they were real interested in—they were going to put the material in there. This is the stuff like the gloves so it's not bad but yes, it's radioactive so you've got to do something with it. So there they were burying it and then putting a earth cap on it. What you want to do is stabilize the cap so it doesn't erode, so water doesn't penetrate into this thing and leech it. So, the work there was how to revegetate those caps and what will grow there and what won't grow there. Again, you don't want to have to irrigate it and fertilize it but you're down there in an exceedingly—you know, six inches of rainfall a year is wet—so what's going to grow under those dry conditions and stabilize those caps. That's what we were looking at.

DM:

I'd like to know what thrives with radioactivity and the emissions. [?] [0:55:29] It's interesting. But when you're looking at a site like this I guess you're considering the water table and the—

EF:

[speaking at once] Yeah, and runoff.

DM:

—land use in that area.

EF:

All of those sorts of things. The interesting thing about stuff like that is, we're talking forever. This isn't, "Will it last ten years?" It's like—and we're guessing, "So five-hundred, a thousand years from now will this be okay?" I don't know. We hope it is.

DM:

I wonder why those things aren't just buried with the toxic waste itself. I wonder why they don't throw the gloves and the other equipment, whatever's become radioactive, in—

EF:

Because of what you have to do with the hot stuff. You probably can't afford to—this mass of stuff—to treat it the same way you would a pellet from a reactor core.

DM:

Right, right, I got you. Well, another thing, you have—something indicated to me that you have looked at aquifer decline instead of your research or maybe you were teamed up with somebody else.

EF:

Yeah, with Ken Rainwater. There was a big project on the Ogallala.

DM:

You were looking at surface water?

EF:

Well, and surface land use as well. In other words—pretty obvious, at least to me—if you’ve got a bunch of center pivots, there’s a lot of draw on the aquifer and you can—one of my graduate students did a “Rate of Decline versus Surface Land Use.” It doesn’t take a rocket scientist to figure out that if the surface land use is pasture land, the rate of decline wasn’t near what it was under center pivots. Then, what Charlie did was look at over time—and you see the center pivots disappear because they finally pumped out so much water they couldn’t run them anymore. I don’t know the exact dates on things like this, but by and large, when we moved here most wells were six and eight inch wells. They just had had a V8 engine on them and they’d throw a stream of water as big as you wanted it to throw. Most of those today are two or four inch wells, and they don’t pump them real regularly or they’ll run dry. They’ve declined the water table that much.

DM:

Charlie who?

EF:

Charlie Alback. Charles Alback. He did his PhD with me in the early part of the nineties.

DM:

That’d be interesting to see where pivots have come and gone over time. It’s amazing to fly over at night sometimes and see all of the blinking lights of pivots everywhere.

EF:

Blinking lights and then the wind chargers now all have navigation lights on them so you don’t run into them at night.

DM:

Right, right. Well, what is your—I mean, you have an expert opinion I’m sure on this. What is the—what’s going on with the water table as we speak? It’s different in different areas of the South Plains but do you have a take on where we’re going?

EF:

Well, largely the Ogallala is a depletable resource; we’re mining it. Now, from an economic

standpoint it pays to do that as long as you can run a crop on it. When you can't irrigate the crop, then you get off and fortunately at that point there's usually enough water for livestock or for a house well, but the agricultural production, irrigated ag economy, is destined to go out. That just—

DM:

Do you think it'll be replaced by dry land farming or will it go completely out?

EF:

In some cases—dry land, yeah. What you see is you go from row irrigation, basically, to center pivots or to drip, and then to dry land. Then, of course, back in the late seventies, early eighties, so much of it went into CRP that—that was wonderful. That extended our life, so to speak.

DM:

Well, is that where we're headed eventually, back to grasslands?

EF:

Yeah, at some point. That's the only thing that really makes sense. At one time they were talking about importing Mississippi water to restore the aquifer and all this good stuff. That was going to cost them a billion dollars and nobody wanted to pay that much money. [laughs] Chump change now. So, yeah, the drip systems are way more efficient so they've extended that kind—

DM:

Drip systems and CRP. Any other factors that have extended it?

EF:

Well, the technology—and of course, some improvement in the types of plants, the genetics of the plants, make more water; it's efficient. Ernie Fish's gripe is that corn is not one of those. [laughter] You can't—I can do the math for you. You cannot afford corn as a biofuel in this area where you have to irrigate it. It just doesn't make sense but it's happening.

DM:

I know and everybody I talk to says that very thing but you still see it.

EF:

You bet.

DM:

Well, if it goes back to grassland will there be—is there any long term damage that's been done

from depletion of the aquifer that would affect even grassland? I mean, grassland is dependent on surface water.

EF:

Well, it's a yes and no thing I think. Some areas it really depleted to where the windmill water for the livestock will be an issue. As a result then, that will limit—the other thing that you see a lot of is surface erosion—wind erosion. There'd been a lot of it so while we can reestablish grasses—we're reestablishing—and then in the soil it was twenty-four inches below the surface a hundred years ago. It's not as productive, just face it. "Is it productive? Does it grow grass?", "Yeah, but not as much as it would have." It is difficult, just difficult, to get native grasses reestablished. We talk about restoration and—I think probably the better word would be reclamation. We can get a grass community established. It is not the climax grass community that was there a hundred, hundred-fifty years ago, and probably never will be.

DM:

And you're talking about climax grass community. What kind of grasses are you talking about around here?

EF:

In this area it was—it would've been buffalo grass, blue grama, sideoats grama, big bluestem, little bluestem. Those are—they're great, but they're a booger to get reestablished. You can over to the Ranching Heritage Center where we've done some demonstrations, lots of people can see it, and you look at it and say, "Wow, isn't that cool. Look, those guys did that." I don't want to tell you how much irrigation and fertilizer [laughs] and everything else went into that so that it looks—it looks wonderful but it was—you couldn't afford to do that over a million acres, you can afford to do it on an area twice the size of this office. I've got some buffalo grass at the house and it uses less water, it's cool, makes a nice grass—it doesn't stand up to the wear and tear of foot traffic like Bermuda grass does. It was established with plugs and that's okay when you're doing an area twenty feet by five feet or something like that. You wouldn't want to have to plug—the closest I've seen an interesting establishment of buffalo grass was out at the TI [Texas Instruments] plant when it was a brand new plant. That was Elo project and it was seeded—now, it was seeded at a very high rate. Again, you could afford to do that on a hundred-twenty acres. I'm not sure you could afford it on tens of thousands.

DM:

And TI could afford it.

EF:

TI could afford it and it rained just right. They were going to have to irrigate it and stuff like that and, it just one of those deals: they got the seed out—this was late summer, middle of August,

hotter than blazes. It rained a half inch, two days later another half inch, two days later another half inch. As I told Prof, he said—he was giving me a hard time because I had told him it would not come up without irrigation. They had all the irrigation pipes and things but never had to use them. So, he was giving me a pretty hard time and I said, “Prof, be sure you tithe this week. You had nothing to do with this, I had nothing to do with this.” [David laughs] “Be sure you go to church,” and he understood what I was saying. It was one of those deals, it happened.

DM:

Is it still a good stand of buffalo grass out there?

EF:

Well, what’s left of it—parking lots. The original TI was a small plant with a lot of grassland around it to landscape it.

DM:

I was just hope that they put it into use somewhere when they were putting in a parking lot.

EF:

Yeah, they probably just pulled those dead out. But anyway, it was interesting. It was fun.

DM:

What about house water, will that ever really be affected by the dropping of the water table? I guess it depends on how close you are to the irrigation.

EF:

Yeah. Most irrigation ceases when you just can’t pump enough to do it. So if you’re looking at house water, there’s probably going to always—I say that carefully—but there will be that kind of water there for a long time. Now, there’s some folks that have been fussing out here somewhere kind of near the Lubbock Lake site, in that area, where their house well was near a six inch irrigation well and it got pulled down. Again, how much water they’re trying to use for house water.

DM:

So many factors.

EF:

Yeah.

DM:

Well, and the type of soil it seems like. You could have a six inch irrigation pipe over here and your house is here but the type of soil that you're in seems like it would affect—

EF:

Will affect that lateral movement of the water and stuff.

DM:

Typically around here, how far does a big irrigation pipe draw? Will it affect a place a half a mile away?

EF:

Oh yeah. If you—if it really—it's being pumped hard, that drawdown cone can extend that far. Over time, that's what happens. Maybe a guy fires up his well and you're a half a mile away, you don't notice it this year, but next year you notice it, and the next year.

DM:

Really interesting. Another of those great areas you've been able to delve into. Let's see what else we might have here. Invasive species, you did some work on salt cedar, maybe imaging.

EF:

Yeah, again, mapping where it was using the imagery. It was one of those mixed blessings with CRP. The area that was being cropped all the time, plowed up, there wasn't a salt cedar problem because it can't get established when it's being plowed up. Down in the Brownfield area, that area called Lost Draw once—a lot of that went to CRP. Salt Cedar got into that CRP land and established, and it uses a lot of water. Now, it's nowhere near—there's some piece in a literature somewhere of salt cedar tree using two-hundred gallons per tree, per day. No, that doesn't happen. Somebody really missed some decimal points on that— [David laughs] Does salt cedar use a lot of water, yes, compared to other things—and it is a phreatophytic plant; it just uses a lot of water particularly if it's available. The interesting thing is where you see salt cedar trees in town, part of the landscaping and things like that. Right now—well, I haven't messed with it at least since I retired, so three or four years—but there's a good bit of salt cedar beginning to occupy the drainage down at Lake Alan Henry. So it's one of those things you've got to do something about or it becomes a real issue.

DM:

How deep is it drawing?

EF:

Oh it'll root down two-hundred feet over time, yeah. Wherever the water table is it can follow it

down and deplete it. What happened with the CRP in this area of Lost Draw was, "Okay, so we're not farming it anymore, we're not pulling that down." It is a drainage area and the water table came right up and was very close to the surface so the salt cedar gets in there, sticks down a root, grows it down eight, ten feet and now it's hooked up. Whatever the water level does, it can stay with it, and it's a bummer.

DM:

What about where there's a water problem like around the BA or around the stadium? Maybe they need some salt cedar over there. [laughs]

EF:

I did not see that. [laughter]

DM:

How about compared to mesquite? Is mesquite a water hog?

EF:

Not nearly what salt cedar is, not nearly. Again, it's kind of, "Where is it located?" The mesquite that you see out, let's say, on the Texas Tech rangeland this area out by Erskine—it's not tapping the groundwater, it's just not.

DM:

So mesquite is hated because it's taking up land that can be used for grazing?

EF:

And if it's in—if you have mesquite along the drainage way, yes, it can use a fair bit of water but when it's in an upland situation—now, again, it's using the water that otherwise might grow some grass but it is probably not tapping the groundwater in those locations. So, yeah, let's get rid of it because it's not feeding the cattle, or the sheep or whatever. It's making it hard to work them, it's impeding. Yes, it does provide a little bit of shade [laughter] but not much.

DM:

Are there other—I mean, these are the big invasive species that I know about. Are there others that are a concern on the same level?

EF:

Well, yeah: broomweed, snakeweed, shinnery oak. Depending on what you're trying to do, these are plants that are probably more abundant today than they were a hundred years ago. They are not a source of nutrition for cattle. Maybe they're a source of cover for quail. So again, it's that—a lot of the shinnery oak, particularly over West of here, is bird chicken habitat. People

that are interested—prairie chickens like it. People that are interested in cattle maybe don't like it. Where's the compromise? How much do you need?

DM:

For that amount—there are fan clubs for mesquite. People who like to make furniture out of it, or barbeque or whatever. It's interesting.

EF:

As we manipulate the system—[laughs] what are your management objectives? What is it you're trying to do? In Arizona now on the campus, there were some huge, beautiful ole mesquite trees, of course, near water and irrigated. This big around—

DM:

[speaking at once] There's some in town.

EF:

—and forty feet tall.

DM:

Some pretty sizeable mesquites in town, pretty trees.

EF:

Yeah, pretty nice trees. Depends on where you're at.

DM:

Let's talk about reservoirs just a minute. Have you done any work with—you mentioned Alan Henry a little while—oh, I'm sorry. Before we get on to that, imaging these invasive plants—I call them invasive, I don't know, that might not be the proper—but I'm talking mesquite and salt cedar in particular. Are you imaging these with aerial photography, or satellite or both?

EF:

Well, you can do both.

DM:

Does it work pretty well?

EF:

Yeah, oh yeah. Usually each kind of plant, even sometimes each species, will have a slightly different signature. As you look at it you can say, "Aha, this"—let's do an example that I can be really clear on. You got juniper and you got mesquite, okay? Juniper's an evergreen so if we fly

this area that's mixed juniper and mesquite in the winter time, the ones that look like they're a tree are probably going to be the junipers and not the mesquites. Even if you fly them this time a year when both are leafed-out, they look different. Junipers look dark, mesquite doesn't look so dark. If you've got infrared—and like this week and the next week, the next two weeks after all that rain the mesquite is going to look really nice, bright pinky, and the juniper's, not so much. They just—they're not responding to that moisture the same way nor do they—they always look different but they'll separate even further when there's plenty of moisture around. Now of course, for the next month or so everything's going to look pinky, so it depended on what you're trying to do. It gets really hard to tell things apart if there's too much water.

DM:

This really sounds like it's an acquired observational skill to read these things. I'm sure you have students that said, "Nah, I don't see the difference here."

EF:

There's a lot of talk about it all being automated and that always worries me, that scares me. We do a lot of digital image analysis, let the machine do the math but—and I'll just give this as an example: let's suppose we take an image—I don't care whether it's aerial or satellite—and let the computer categorize thirty-six classes. In other words, here's almost dark black, here's almost pure white, here's all these other varieties of colors, and we'll chop that image up in thirty-six pieces, okay. Which of those thirty-six pieces are woody vegetation, which are agricultural crops, which are water, which are bare soil, which are blah, blah, you name it, you've got to come in and do it. You can't just say, "Oh, well, let's see: asphalt is black therefore all the black are roadways." It turns out that might not be quite right. What's white—what about paved, fresh concrete roadways? They're going to look really white-ish. Caliche looks really white-ish. You'd be surprised at how dark water can look depending on what the sun angle is, is it muddy water or clear water. Going back then and saying, "Okay, this looks like that, that looks like that, that looks like something else," and as you can imagine—if you have an area where you know what it is, "I know this is an alfalfa crop." One thing you could do is go ahead and say, "All right, build a digital 'signature,'" we call it, "of this. We'll call it alfalfa. Now go find all the rest of the alfalfa."

DM:

But surely alfalfa over here doesn't look perfectly, exactly alike.

EF:

Not quite but within an area, again, it's how far away do you get. For corn or cotton—again, how do you know? Well, the reason I know it's a cotton crop is the time of year, the way it's laid out and that cotton grows around here. We're not growing bananas. [laughs]

DM:

Growing all bananas [laughs]

EF:

And that's where you get into a lot of—I call it 'skill', experience. After you've done it for twenty or thirty or forty years, you try not to make the same mistakes you made when you started.

DM:

That's got to be a learning process.

EF:

It was a lot easier thirty years ago. It really was.

DM:

It seems like it would be not just color differences but maybe texture differences.

EF:

Texture differences, pattern differences. Well, stop and think about it. What—and you know this area fairly well—what all is planted skip-row?

DM:

What all is planted skip-row? Like, cotton, things?

EF:

Like cotton.

DM:

I don't know—sorghum is sort of planted skip-row.

EF:

Usually not. Corn isn't.

DM:

There you go.

EF:

It—that helps because that's a very distinct pattern. At this time of year, okay, we're July—what does a cotton field look like, even if they're forty inch rows? There's a lot of bare soil. This time of year, what does a corn crop look like?

DM:

It's very thick.

EF:

It's very thick, very dense, almost a solid canvas. That kind of thing—when was the picture taken? What was the sun angle? On, and, on, and on it'd make a difference.

DM:

If you took the best tech—automated technology now and it was analyzed that way, and you using your own observational skills analyzed the same thing, is there any comparison between what you can do and what is the best automated solution right now?

EF:

Yeah. What you get into is, "How much time do you have?" I can run that computer and in an hour I can come back with classes on sixty-thousand acres. That's a lot of country. I can't do that in an hour by hand, so to speak. That's where—one of the things that we're doing now is more similar to that, largely mapping areas of heavy, woody vegetation cover. So, you kind of know where it's going to be. You can kind of see it like you were saying: color, texture, pattern, those sorts of things. We go ahead and do the automated then come in and verify it, check it, kind of do one of these deals back and forth, back and forth.

DM:

So it's both, it's automated and it's your observation as well. Is there still moments where you say, "Someone's going to have to go out and take a look at this."

EF:

Oh yeah. "Boy, do I want to go see what this is." I ran into that last week on some stuff down in Nolan County. I'm almost sure it's prickly pear but I'd love to go there.

DM:

[speaking at once] Maybe it's alien evidence. [laughter]

EF:

It sure—it's something a little different. It's not casting much of a shadow so it's low-stature, close to the ground and yet it just doesn't look right to be grass, if you will.

DM:

And you haven't gone and looked at this you say?

EF:

Well, I know the area well enough to make a guess but yeah, I would—and I will, one of these days, get down there and verify myself. It's wild, some of the stuff that you see and don't see. Let me pull up something on google here.

DM:

Okay, sure.

EF:

I don't know if you want to leave that running or not.

DM:

No, I'll pause it here.

[pause in recording]

DM:

I want to catch this—

EF:

[speaking at once] You want to hear my griping.

DM:

—your thoughts on this.

EF:

It's—the reason that it was fun to teach the same thing to a group of kids year, after year, after year, is that every year I was learning something. They would probably not buy into that always but—ok let me get

[pause in recording]

DM:

Well, let me also ask you about—you mentioned something about Alan Henry, can you tell me about the situation at Alan Henry and also at White River Lake? If you've done any work out there as far as the water supply, invasive species and the other—

EF:

We did a lot of work at White River a few years ago. The issue at that time there came up and everybody—the board got mad at the lake manager because he's doing something wrong, the

water level's going down. It's not like it was twenty years ago. So, as we told them I'm not sure they were happy. "Yeah, you're right. It's not and here's why." When the lake was first built, and designed, and all of that in the sixties, range condition, if you will, in that watershed was fair to poor. In other words, we're coming out of the drought through fifties. It had been heavily grazed. If you got a precipitation event, a lot of it ran off. It didn't infiltrate, it didn't soak in, it ran off, and it ran off to this new place called White River Reservoir—the dam and stuff. So, fast-forward forty years, range condition is good most places. So it has come up, really, two condition classes. There's a lot of research work showing—and matter of fact, there's a poster that I saw this morning as I came in over what used to be the dairy wing of this Food Technology building that talks about this. The more grass cover you have, the more likely it is that that precipitation is going to infiltrate, soak in. Even that that is trying to run off now has a torturous path, it's got to go around this plant and around this plant instead of, "Whoosh," straight off. So, improved range condition, less runoff—and we're talking a lot less. There's research where under poor condition, eighty percent runoff. Under good condition, twenty percent runoff. It doesn't take a rocket scientist to figure out that if you improve the entire watershed—and this—we did the evaluations all over the watershed where there had been transects running in the late fifties, sixties, run today. By large, instead of fair and poor, we're looking at good. Some still fair but that was poor to fair, fairly good. So that explains some of it, there is simply less runoff. Now then, the other mind boggling deal was, "Let's take the first twenty years"—because the range was improving during that time period but the lake was still filling up—"versus the last twenty years." Annual average rainfall was about twenty-four inches a year versus about twenty-two inches a year. So, two inches, give or take, out of twenty—Aggie math, not quite ten percent but eight percent—let's say, eight percent less total rainfall. It is the high end of rainfall that does the runoff so it's—this part that's no longer there. Not only that, but what storms cause runoff. Since we've just had four or five days that we can test against, if it hasn't rained for thirty days and I get a half inch rainfall event, very little's going to run off; it's soaked in. But if I get an inch today, and another inch tomorrow, then inch today may have mostly soaked in. The inch tomorrow is mostly going to want to run off. I have wet up the soil surface, I've filled that part of the bucket, if you will. So, this was Ernie Fish science, "Why don't we look at saying: in five days you've got to have two inches of rain—I don't care how it comes—but anything over that will be a runoff producing event and how many of them are there?" In the first twenty years, there were about six or seven a year, runoff producing events. In the next twenty years there were three or four. There was less total rainfall, but there were fewer events to cause runoff. Yeah, you can get water in the reservoir from an inch rain nearby, but ten miles away where it has to go a half mile over a rangeland before it gets to the creek, not so much. Yeah, there are fewer runoff-producing events. That is not the fault of the lake manager. One of the—we made this big presentation to the board, the advisory board, and one of the guys I could tell he was just getting warmer, warmer, warmer the whole time. So finally, "Well Dr. Fish, what are you saying we need to do?", "Probably, to flip it, is pray more. This is—"

DM:

How do you—

EF:

“This is a phenomena. It is not the lake manager’s fault. “Well, but we need him to do this, and this, and this.”, “Yeah okay.” What they wanted to do was to dredge the channels, make it so that the water would run into the lake rather than spread out—and yes but, you’re spending a lot of money that might get a little more water—I’m going to admit, it’ll get a little more water into the lake, but did you really want to do that, need to do that, spend that money? When you dredge—and we’re talking dredging a channel about as wide as my desk and five feet deep or something so it’ll sloosh the water into the—“Well, it’s an erosion issue, dude.” You’re going to have a lot more sediment and silt. That was another thing that over time, particularly because way back here a lot of that runoff was sediment laden—the reservoir’s filling up so it doesn’t have the capacity. Now, White River’s doing that. The classic example of that is Elephant Butte Reservoir in New Mexico. It’s at less than ten percent of its designed capacity from sediment filling up over the years. It is—and I use this in class as an example—it’s on the river end. One of the tributaries just above it is the Rio Puerco. The Rio Puerco produces ten percent of the water that goes into the reservoir, ninety percent of the sediment. And it’s just the country that it’s coming out of is highly erodible, it’s not anybody’s fault. Now yes, it’s country that’s been overused, over abused, but in the best conditions, it would still produce a lot of silt. That’s that country.

DM:

Is this even in the calculations when the thing was designed, I wonder.

EF:

Probably not. There is a certain amount—the engineers design a certain estimate of sediment loading. It’s just like, again, the design for flooding. “Well, there’s no flooding here. The flood plain’s over there.”, “Yeah but if you pave all of this, ‘whoosh,’ now here’s the new flood plain.” You crowd houses in, you try to take that Mississippi river that used to—when it overflowed it went two, three miles wide and no big deal—or the Rio Grande through Albuquerque. “We’re going to confine it. We need this land over here for this, this and this.”

DM:

You’re displacing it.

EF:

Now then, “Sure, but it’s going to go twenty feet instead of five feet deep because you’ve got it in this channel.”, “Oh, really?” And it’ll erode like the Dickens. My father was a civil engineer and worked for the Corps, did a lot of the flood control work on the Rio Grande and stuff. He just would shake his head about what people wanted the Corps to do. “We need to narrow that

channel and raise those levees.” “Okay but do you know what happens when one of those levees breaks then?” “Well, but this is prime farmland. My farm’s been here for a hundred generations.” “Yeah but the city of Albuquerque didn’t grow out to the mountains.” So, yeah, we have done a lot. We do a lot of good things but we also change the way the system works, and we’ve got to realize that.

DM:

That’s an interesting thing about y’all trying to get more water channeled into White River Lake and then creating the silt problem. How much of it is silt problem now? How much silt do they have?

EF:

I’d have to look back at it, I can’t tell you off the top of my head.

DM:

But it would have to make it—

EF:

They lost probably twenty percent of the capacity over the years. Most—from a design standpoint—most of these things are designed with the idea, “It’ll take a hundred years to fill it up,” but with the other problems that people weren’t paying attention to, those design periods are usually less.

DM:

That’s really interesting. It’s a lot of factors that most of us don’t ever think about. The silver lining is, “Hey, the rangeland’s doing well.”

EF:

Oh yeah. So what do you—again, that was sort of my barb that I threw at some of these people. The NRCS [**National Resources Conservation Service**] has done it’s job. “What’s your problem with that?” [David laughs] Well, the guy basically marked it on the marina at that time was one of the—you know, honestly it’s killing him. He’s not selling gasoline and bait because the—

DM:

The rangelands are doing good.

EF:

The rangelands were doing fine.

DM:

People who want to buy cheap sailboat in White River, they can do pretty good too. [laughs] I say that because I remember when it got real low there were fixed keel sailboats sticking in the mud down there and they were selling pretty cheap. You just had to get them out somehow.

EF:

Go figure. The one that to me is pitiful is Lake Meredith. It's at—just right at twenty percent capacity. That's a huge lake. That son of a gun is huge. Will it ever fill up again? My educated guess is, no. If it does, you need to get your Ark out. [laughs] It's just not going to happen. Now again—

DM:

And if it did start to happen, the cities would drain it off again I'm sure.

EF:

Sure they would. It would take a ten-inch rain and when you get a ten-inch rain, "We don't want to be here."

DM:

Right. Well, we've talked about some of the issues that you've researched. Are there others that I've missed? Other big projects that you've been involved in besides imaging and—

EF:

I don't think so. Imaging is a tool and that's what I've used it for a lot of things just to—a way to look at the land, a way to look at the landscape, understand it, and then hopefully make better decisions in what you're going to do and how you're going to do it. From a water standpoint, we did a lot of water quality work on what was called the 'Merco Project'. That was the big thing at Sierra Blanca where they brought the New York City sewage sludge and spread it out over the rangelands and all of the concerns there. The key—I guess the take-home points there—and you know, when you start talking sewage everybody gets a little funny.

DM:

"New York sewage?"

EF:

Yeah. "New York?" As long as it is municipal sewage, okay, as opposed to industrial, there's not a whole lot—it's a fertilizer and that's basically what we saw there. Again, this is a semi-arid area. You're not going to get a lot of rainfall, you're not going to get a lot of runoff. It did increase grass production, it did affect soil-water chemistry in the top soil where the roots are. What it did was act like fertilizer. We did simultaneous trials with store-bought fertilizer and it

had about the same effect. So, there were no ill effects. There wasn't anything—it wasn't contaminating the groundwater because you didn't get enough rain to leech it to the groundwater. The plants took it up. They did better, they grew better where the stuff was applied. The only—and you can still today, you can see where those application areas are so the question is, “What are you seeing?” I think you're seeing two things: you're seeing a little change in the vegetative community—more production, maybe a few different species—but this is the—what do you suppose the one thing that doesn't biodegrade in sewage sludge, municipal sewage sludge? Well, maybe two things. If it came at Christmas time, we could tell because you could see the tinsel from the icicles in it. That's aluminum foil, it's not going to biodegrade so it sticks around. Hair, hair does not—stop to think about. Now, you're the historian. Think about these archeological digs where they dig up the old mummy and there's hair on the skeleton. Not a lot of fat, not a lot of guts and things but they'll still have their hair. Well, there's a lot of hair in sewage sludge.

DM:

Does it have an adverse effect out there?

EF:

Not particularly but it's there. To this day you can walk around and it looks like there's a little bit of hair there, little bit of hair over here. “Where'd this hair come from?” [laughter] I've got a big ole dog, I know where that hair comes from, he sheds like crazy. There'll be—

DM:

Just out on the surface there. Was this laid out on the surface or was it buried at all?

EF:

No, this stuff was scattered. It was thrown out with the manure spreader.

DM:

How big an area, by the way?

EF:

Oh, huge, huge area. It's thousands of acres. They would spread it at three tons per acre per year. They did it every year. We did our studies at zero, three, six, nine and forty. At forty tons, it's a nice thick layer, but we wanted to see how just—what's it going to take to make this bad.

DM:

How did it do at forty?

EF:

Again, no real problem but it's just heavy. It's thick. You didn't need to do that. Too much, and it would go off the chart on almost everything we did. So, I guess, the take-home message was at three, six, nine—oh, fifteen—no problem. You want me to show you those areas?

DM:

Sure. Yeah.

EF:

We can still google them, at least we could last time I looked.

DM:

I'll pause this.

[pause in recording]

EF:

I was positive that I sent all the annual reports over there, that Monty got those.

DM:

What would it be called? What's the overall title of this project or how would we find it?

EF:

Well, Merco was the—M-e-r-c-o, all kind of an acronym—was the outfit that funded it. Sierra Blanca Project, Biosolids Project. [clears throat] Each year we put out a report, oh, half-inch thick—they're paperbound—and then a lot of other publications. I've got some journal article stuff that came out of it too. Yeah, the only reason I went to this deal—there was—still there—yeah, there's a hangar, and we took a lot of soil cores; meter tall, PVC [**Polyvinyl Chloride**], ten-inch diameter, forced it into the soil, dug it out, took those cores, and then put biosolids and forced it to leech. So we collected water out of the bottom of that core. We had those setup there in the hangar so we could control when it rained, when it didn't rain and all of that stuff. Then I had three or four graduate students over the course of the study that worked on that sort of stuff. Those are all gone now.

DM:

And your grad students said, "You want me to work on what?" [laughter]

EF:

Yeah. "My mother doesn't appreciate this." [David laughs] That was fun. Those were good kids.

DM:

The career has just—

EF:

It's been a hoot.

DM:

—been so amazing because it's so many different things.

EF:

And it's been fun. There were some ugly times a time or two, but by and large it was fun.

DM:

Well, it kept you here.

EF:

Sure, sure. Get up, come in and see what we can do today—and the people, with a few exceptions—I can name one or two—but most of the people were good, solid people that I would consider a friend today no matter where they're at.

DM:

Do you want to name some names? You may do so.

EF:

You don't always get that. Well, right here in town still today, Ron Sosebee. Ron was the head of this Merco Project; he ran that thing. At that time, he was our department chairman. I followed him as a—well, we had an interim between the two of us, but he was chairman for about nine years after Henry Wright, and then there was two year, three year period of a guy named Phil Zwank then I took over, Phil died. Dave Wester, who's now the guy at A&I, he was on that project. Another retired person here still in Lubbock is Russ Pettit. Russ was a plant guy. Of course, Bill Doll—Bill's deceased. Henry Wright—Henry's deceased. A lot of— [clears throat] a lot of these guys didn't make it as old as I am. Carlton Britton, who was a—he was, sort of, Henry's protégé as a fire person, and Carlton's retired now—lives down in Lampasas area. Over the years, I think Tech has had good leadership most of the time. I haven't always agreed with everybody, but it was a good place to be for people in Natural Resources and Agriculture. The oddity is that it's not land-grant, and we don't have that pipeline support that the land-grant does. That's partly why my career has been all over the board. "Where's the money? That's where we're going." When I was in Arizona, the land-grant stuff—the hatch money, the McIntire-Stennis money—it was just always there. You didn't have to think about, "What sort of a proposal can I write so I can buy a truck because I need a new truck, my pickup's worn out."

You just took your share of the money, which was maybe thirty, forty, fifty-thousand dollars that year and bought a new truck. You just had one less graduate student.

DM:

At Fort Collins, that was land-grant too right?

EF:

Yes, yeah.

DM:

This was a new arena for sure.

EF:

Oh, it's a whole new ballgame and it is a—

DM:

It worked out.

EF:

It's a cultural shock too because that was that nine-month contract. "Wait a minute, my wife eats during the summer. What do I tell her?", "Well, tell her to go on a diet. Tell her that, 'you should've saved your money.'" That was the motivation to get busy and get involved, find something. Now, the range department had line-item funding, the Park Administration and Landscape Architecture did not. Of course, that has gone away now, but when I moved over, one of the blessings of moving over was, "Whew, I have a summer salary. I don't have to keep looking my shoulder or—"

DM:

For a project.

EF:

You bet. Find something to pay my summer salary.

DM:

Well, another great thing it sounds like about your career is that you were in on the ground floor, pretty much, of imaging. It sounds like it's not done anything but become more important.

EF:

Yeah, I think that's right.

DM:

That's not the case in so many disciplines and so many research areas.

EF:

Well, just been fortunate to—again, that military stuff that I learned has been applicable and easily so. It wasn't a shock when GPS came along. It was like, "Yeah okay, I understand this."

DM:

This makes sense.

EF:

"We know how to do this," and everybody was going, "Uh, what do you do with this stuff," and so we had a way to do that, and use it, and could see what it was—

DM:

You had an immediate application but then so many other disciplines have found applications for GPS now. It's interesting. Well, here you have—you've done your research in many areas, you've done a lot of field work, but you've also been teaching all of these years and you've been an administrator for some of those years. So what is your forte? Which do you prefer?

EF:

Oh, the teaching. Working with the young people is just a hoot.

DM:

Over your research?

EF:

Oh yeah. To the extent that the research supports it—and there's some fun things in research but it—as I have told people, "If you just really want to do research,"—there are folks that I've run into, "Oh hell, I've got to go teach. I wish I could be—" well then you need to go with ARS [**Agricultural Research Services**] or somebody that's a pure research field, get away. Please don't mess with my students because they're here for a different reason. But no, it was—and part of the reason that I decided to retire when I did: it had just gotten to where it wasn't that much fun. For some reason—

DM:

How did it change for you?

EF:

I want to say administrative loads and, "You got to do this, you got to do that, you got to do

this.”

DM:

Right, right. It's not just grading papers anymore.

EF:

No, it's all that other stuff. I understand it, I understand some of the reasons, and the needs and things like that.

DM:

Is liability issues a part of it, liabilities around students?

EF:

We were—I think I was terribly fortunate. I will tell you that a long time ago I took out a million dollar liability policy because of field trips and things like that. I thought, Oh my goodness. We're up in Colorado, Fred gets drunk and falls off a cliff, and I'm going to go to jail or be sued because I didn't tell him not to. Well, duh, I told him, and told him, and told him—and I had some of those close calls. No, it was—I'm not sure how to explain it. The—no, that's okay. Part of it was an attitude deal. The good students were as good as ever, okay? The middle kind of dropped out. The first thirty years for a parent to have called me and griped about something, just almost never happened. For a student to say, “I'm entitled to a C, I paid tuition.”, “No you're not, you're not entitled—“

DM:

A change in attitude.

EF:

“—to anything. You're entitled to come to class.” And yet, I want to be careful because I had some wonderful students in the last couple of semesters, but it was two or three out of forty instead of nearly twenty or twenty-five. There's always been the slugs, the bottom-feeders, but even—shoot, even some of the kids who had trouble had a work ethic and they work at it. They wouldn't lie to you. I just got tired of being lied to. “I'm in the hospital. I'm in the ER.”, “No you're not; you're sitting out here in the hall. You wanted to be sure I was in before you made the call.” I don't know, that just got old and I thought, You don't want to mess up. It had always been fun, I think I always did a good job, and I didn't want to mess up, so it was time to hang it up. John Hunter had told me that four or five years earlier. I was fussing at him when he retired. I said, “John, why are you retiring?” He said, “Ernie, you'll know when it's time,” and I said, “Oh really?” He said, “You will.”

DM:

And you did.

EF:

And I did. "It's time. We need to find something else to do before we hurt somebody." [laughs]
And I haven't regretted it. I would still enjoy the thrill of going into a classroom and teaching but
I would want to teach in the eighties or the nineties, not the two-thousand-teens. So that's—I'm
at the right place at the right time.

DM:

I think I've about exhausted my questions. Are there big areas that we've missed?

EF:

I don't think so. I didn't know I could remember this much. [laughter]

DM:

I'll go ahead and stop this then.

[end of recording]

© Southwest Collection/
Special Collections Library