

**Cienega Watershed Partnership
Oral History Interview
with**

**Dan Robinett
June 29, 2019**

**Interview conducted by Robert McMiken, Alison Bunting, and Shela
McFarlin**

**Transcribed by Jardee Transcriptions, 2019
Edited by Shela McFarlin & Alison Bunting, 2019**

Interview Summary:

Dan Robinett (b. 1950) is a range management expert who retired from the National Resources Conservation Service (NRCS), and now operates a consulting firm. He is on the Cienega Watershed Partnership's Wall of Honor and has been instrumental in the vegetation monitoring of the Cienega Valley and the Sonoita Valley.

In his narrative offered on June 29, 2019, Mr. Robinett discussed the appeal of range management as a discipline for him. He detailed his academic influences at the University of Arizona and his beginnings with the NRCS – then the Soil Conservation Service (SCS). Mr. Robinett described the dynamics and challenges of range management over his career and how the growth of Pima and Santa Cruz counties threatens the riparian areas due to groundwater pumping. He analyzed the climate trends of different decades over his career. Further, Mr. Robinett reflected upon how these climate trends have facilitated the proliferation of invasive species and changes to the landscape. Mr. Robinett then proceeded to discuss the intricacies of soil monitoring, the role of recreation in altering the landscape, and his thoughts for future range conservationists.



Linda Kennedy and Dan Robinett, 2018. Photo by T. Robertson

Dan Robinett
June 29, 2019
Empire Ranch Oral History Project
Interviewed by Robert McMicken, Alison Bunting, and Shela McFarlin
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ROBERT McMICKEN (RM): It's Saturday, June 29, 2019. We are at the home of Dan Robinett and Linda Kennedy to conduct an oral history of Dan Robinett. Interviewers are Robert McMicken, Alison Bunting, and Shela McFarlin. Also present for the interview is Linda Kennedy. So, first question, for the record, do you consent to give this narration to be used in advocacy for the Cienega Watershed Partnership?

DAN ROBINETTE (DR): Yes.

RM: O.K. When were you born?

DR: In 1950.

RM: O.K. Where were you born?

DR: Illinois.

RM: O.K. What brought you or your family out to Southern Arizona?

DR: My dad came out here in the early 1950s, after World War II. He worked in Northern Illinois. My mother, as a young girl had lost a lung to, pneumonia or something like that, and did not fare well in that cold climate, so the doctors told him, "You need to get your wife to a warmer, drier climate or she would not do well." So, I was just a little boy when we moved to Tucson. Dad came out looking for work. He knew the copper mines were going, but his first job was at the Pinal Air Field at Red Rock, Arizona. He was in World War II in a bomber squadron in Europe, and they were fitting planes there at Red Rock for the Korean War, the South Korean military. When Duval opened the Esperanza Mine in the Santa Cruz Valley—which I believe was '56 or '57—he got a job as they opened the copper mine, and he worked there until he retired in the mid '80s. Both he and my mother were great people. I'm really happy they came out here. (laughter) Never went back either!

RM: Do you remember anything from Illinois?

DR: I don't.

RM: So Arizona's sort of....

DR: Arizona is my home.

RM: Home state. So how did a career in range management start to appeal to you then?

DR: Well, as a kid I was always outside—all of us kids were—Tucson was that kind of a town. I'm not sure quite how, but I wanted to be a forest ranger. That was my goal. (chuckles) My mother actually referred to me as "her little forest ranger." (laughter) So after elementary school and high school there in Tucson, I started UA in 1968. You know, I thought about forestry, but I looked around Tucson, and there's not a lot of trees. And I loved hunting and fishing and stuff, so wildlife management was what I started in. Of course your freshman year you don't have to declare anything. But I talked to Dr. Hungerford, who was a wildlife professor at the time, and he encouraged me, so I thought that would be it. But in my sophomore year, he counselled me—because he got to know me a little better—and he counselled me to go talk to Dr. Phil Ogden in Range Management. And the reason was he knew I was a poor kid and I was working part-time, putting myself through school, and he knew I needed a job when I got out. And Wildlife Management was graduating about fifteen or twenty students a year, and there were one or two jobs available for them. Range Management was graduating one or two or three students each year, and all of them were finding jobs. So I went and talked to Phil Ogden—I didn't even know what range management was. He was a great guy. He told me what I needed to know, so my sophomore year I switched over to Range.

SM: Have we done an oral history of Phil Ogden?

AB: No, I don't think so.

DR: Well, you've got a short time left.

SM: Yes.

DR: He's not here anymore, by the way. He moved to Colorado to kind of full care home, but we could get you in touch with him, and it would be really good to capture ...

AB: There might be one at the UA, though.

DR: There could be. And the Society for Range Management may have done one with him too. But he was just a great guy. So that's what I did. My last two years of school I worked for the Forest Service in the Santa Catalina Mountains north of Tucson, part-time during the school year, every weekend and mostly building fence and working on trails. In summer I'd move up to Palisades Ranger Station, working the fire camp there on fire suppression. And I loved that job, but after two years, I kind of decided the Forest Service maybe was not where I wanted to be. (chuckles) I didn't have military experience at that time, but it seemed kind of military to me in its focus, and I was a little more rebellious than that.... But range management seemed like a nice fit. I sure had a lot to learn about ranching and range management, because I was raised in town and not on a ranch.

RM: So would you say that the UA then, and sort of a few professors, really helped shape what your interest was?

DR: The program, at that time was under the College of Agriculture. There was no School of Natural Resources yet.. But they were really great. Range, Wildlife, Forestry—they were all small programs, not a lot of people, and they were really, really good. Phil Ogden was my major professor, and he was great. I loved Dr. Hungerford, and I took a lot of wildlife classes. From Don Post, I took soils classes. I loved him, he was the soils professor. Ervin Schmutz was another range professor who really took a shine to me and helped me get my first job, and stuff like that.

SM: [Tumamoc] Hill, was that pulled in at this point, to that department?

DR: I think UA owned part of the property, but I'm not sure.

AB: You mentioned you were working at some ranches. Were those ranches in the Tucson area?

DR: Yeah, out on the east side of town, and I was just working part-time. A guy had one leased and was running steers on it. I was building fence mostly. But it was a good job.

RM: So you used to work with the Soil Conservation Service, and then that became the Natural Resources Conservation Service, right?

DR: Uh-huh.

RM: Could you describe your role and some of your experiences while you were there?

DR: Yeah. Sure. So when I got out of school, of course the Vietnam War was still going on, I had a low lottery number and was drafted immediately. So I went in the army and did my time. When I came back out, I was hired pretty quickly by Soil Conservation Service. First in Willcox and then Chandler from 1975 until 1979. In 1979 I got the job here in Tucson as the Area Range Conservationist. That job involved managing the range program for Southern Arizona. SCS had the state broken into a north half with an area office in Flagstaff and the south half with the area office in Tucson. That was the job I wanted, and I knew my predecessor there was my tutor in Willcox, and a great old range conservationist. So I stayed there for the rest of my career, thirty years, retired in 2007.

SM: Did you have to take those PACE exams and everything, in order to get that job?

DR: No. You know, it was really a neat system then. The civil service system for new employment had a job classification for every job series: wildlife biologist, range conservationist, whatever it was. They had a requirement for coursework from a university, but then they had a panel of volunteers, and these were mostly people in the field who were senior, and they would agree to volunteer and review applicants, and they would score you based upon your scholastic record, your work record, your job skills and job experience. You received extra points for military service. And you came up with a score from 1 to 100; I had a score of 97 which was high. So when an agency had a job for a range conservationist open, in my area of interest—Arizona, California, and New Mexico—they had to go to that civil service list for the job series, take the top three candidates and send them letters of availability. They had no other choice. And I think that was kind of neat. I kind of wish they still did that. So yeah, as soon as I threw my hat in the ring, I got notices. When I got one from SCS here, and it was close, I said, "Yep!" So that's how that worked.

RM: You said that Arizona was split into two halves at the time. Clearly, Northern Arizona and Southern Arizona are different. Is it because it was closer to home that you wanted to come back to Tucson?

DR: Yeah, I think so. I just loved this area, didn't really want to go anywhere else. The job in Flagstaff wasn't open, and I really liked my predecessor in Tucson, Harvey Nessmith, who really had the foundation of a really good range program." So it was an easy decision to make. Anyway, back to that, I did have a couple of things I wanted to add. These things that happened during my career I think really

helped me grow into become a seasoned ranged conservationist and helped me and the people I worked with shape an effective range program across Southern Arizona. And we had some really good range conservationists working out there.

So the first thing was, in the 1960s and '70s, a variety of environmental laws and policies came into being, as you all well know, that really caused land management agencies to reevaluate programs in renewable natural resources. Livestock grazing came under increased scrutiny during this period, especially on public lands in the West, as agencies had to make some hard decisions relating to the numbers of animals and how they were grazed on the range. So this put ranchers in a defensive posture. UA and ARS range scientists at this time were conducting research into grazing management at places like the Santa Rita Experimental Range. And some of those outcomes offered the possibility of grazing management that met the needs of plants and animals on the landscape, doing better than what the standard was at the time. Agricultural Extension stepped up at the same time and helped mediate disputes between ranchers and the agencies, and they developed monitoring techniques we could use to look at the impacts of grazing on plant communities and soils. So those of us in the SCS down here found a role—and I shouldn't limit it to Southern Arizona—in the state—we found a role in helping ranchers develop ranch plans by conducting a basic inventory of ecological sites and conditions, providing an assessment of alternatives to deal with problems. And we offered a yearly service, which included rangeland monitoring, assessment of forage and water resources, and development of annual grazing plans. This really put us in an active role in management, and made us more technical.

SM: Were those monitoring systems already developed, or was that something that you guys had to develop?

DR: UA developed the protocol that we used, and we're still using it. They really gave us a good tool there, the Pace frequency monitoring, that we all still use. This put us in an active role in management and monitoring, and the result of that was the ability to learn pretty quickly how rangeland responds to grazing, climate, fire, and drought. For me it was an incredible experience, and I think for the other people that worked with us down here—and it was popular with ranchers.

SM: Do you remember the sign, Blazing.... What's it say?

AB: Grazing Prevents Blazing.

SM: Grazing Prevents Blazing. Entrance to Sonoita--well, on both sides. Do you remember the origins of that, and how that came about?

DR: If it's the one you're talking about. It's on the Vera Earl Ranch. It might have been before Ian's time—I don't really know.

AB: I think it was before Ian.

DR: Before he took over management of the ranch, yeah. But you know, I saw another one of those somewhere, and I can't remember where, but a fire burned it down! (laughter)

RM: Irony!

DR: I love irony! Yeah. But I think, to my way of thinking—and Ian’s a good example—any properly grazed rangeland can still carry a fire. If you take half and leave half, which is a good rule of thumb, the fire may not be as big a conflagration, but it’s still going to burn your sign down! (laughter)

RM: Talking about monitoring, it sort of dovetails with another question that I had: Why is monitoring important, and how do you do it right?

DR: Let’s get into that down the list. Another thing that happened during my career, that I think was really fortunate for me personally—but Soil Conservation Service began doing soil surveys on rangeland in Arizona in the 1960s. The start of that kind of coincided with the start of my career. There’d been a couple of soil surveys done before I started, but from the beginning of my career I was assigned a certain amount of my time to assist with soil survey. And that job entailed working with the soil scientists as they mapped soils across the landscape and correlating plant communities to soils. Within that time I had allotted, which was about a quarter of my time each year, I identified areas where I would go in and sample plant communities to help build information that could go into ecological site descriptions and build the technical guides that range people are using nowadays. So as Area Range Conservationist from ’79 to 2007, I worked on nearly all of the soils surveys in southern Arizona. And that’s from Yuma County, across Cochise County and up to the Mogollon Rim. And that’s an incredible experience, and something I really value, and not a lot of people had access to that kind of experience. Our individual range conservationists and field offices, we’d always get them working with me on a soil survey that might be going on in their local area. As a result of that, I developed a pretty extensive background in soils and their associated plant communities, and I helped develop the technical guides that we use today across Arizona as land managers. So those were two very fortunate things in my career. I kind of think what if I was starting now, what is there going to be? And I really think about these young range specialists that are starting. What’s going to be something they can really sink their teeth into, and something that will give them a lot of job satisfaction, plus a lot of good experience? And I don’t see a lot of things coming out, so I don’t know. It’s something I was very fortunate to experience, plus the fact that I stayed here for my whole career. I think I learned something about this area that helped me a lot, and I think it really helped me after I retired, in the consulting business we’ve begun. And that’s been a lot of fun.

RM: You were talking about, basically, you spending your entire life in Southern Arizona, right? So since 1980.... I found some statistics that Tucson’s grown 63%; Pima County’s grown 93%; and Santa Cruz County has grown 155%. So what reflections of this have you sort of observed during your work?

DR: When I was a little kid, I think Tucson was about 55,000 people, and that’s still a big city to me, but it’s nothing like today. And I can remember when the city limits was Swan Road, and we lived out between Craycroft and Wilmot, and you could ride your bike to Swan Road and drop it in the dirt and get on a bus and go downtown with a quarter on the bus and see a movie at the Fox Theater or the Paramount, and come back and your bike would still be there. (laughter) I think that’s changed a little bit.

But anyway, in thinking about that and all the impacts of growth, I mean there’s so many of them that it was inevitable. But probably the biggest impact, I think, has been in use of ground water and how that’s affected the environment. So groundwater pumping increased with that population growth after World War II, when people like my dad came out here looking for work and a better future. And, as it did, streams like the Santa Cruz and its tributaries in Tucson slowly died. We just dropped the water out

from underneath them. I think that growth and development at that time in history was inevitable. I don't think anybody knew what was going to happen, or maybe there wasn't a lot of concern about what was going to happen to those streams. I'm sure that's not true of everybody, but I know our family had no clue. We were about surviving, and not about worrying about riparian areas and stuff.

So I think here's a lesson. Growth and development in the future, how are we going to manage it? It's up to us. And I believe that what Pima County is doing there in Tucson now through the Sonoran Desert Conservation Plan is really a positive thing. And I had the privilege to be involved in that in a small way on the Ranch Conservation Committee. But I just saw the way that worked, and I think it went really well. And I know there's always going to be tradeoffs, but at least in that process we can mitigate damage in a lot of different ways, and protect stuff into the future that I think people are going to look back on and say, "Hey, I'm glad they did that." And you know, when I look at other situations in Southern Arizona that resemble what happened around Tucson, it kind of makes me sad that we can't learn from our mistakes, because we know so much more now than we did back then. And I'm kind of referring to the San Pedro River now, and the situation there. Is that river going to survive or not? You know? And politics seems to be right now that maybe it won't. That's pretty sad to me.

SM: Let me follow up with that. With regard to your input on the ranching side, I think what impressed me one of the first times I read that plan was people considered continuation of ranching as a lifestyle. So I'm wondering, did you interact with other ranchers on that committee, were you recruited because of your technical expertise, how did that come about?

DR: I think I was recruited because of technical expertise. But Mac Donaldson was on the committee with me, and I was working with the Altar Valley Conservation Alliance at the time, and that was one of the focal areas for Pima County. I think when the idea of the Sonoran Desert Conservation Plan first came up, people out there in the hinterlands where all this conservation was going to happen, thought, "Oh God, they're going to zone us to where we can't sell our private land, and realize the economic value that we have here!" And I think they were right. And I think by getting involved in the process, instead of just fighting and getting lawyers and going to court, but by getting involved, they turned that whole thing over on the County. So that initial head-butting kind of led to creation of this Ranch Conservation Committee. And then from there we had—I say "we"—the people on the committee—Tom Sheridan led it—historian there at UA—we had an in to say, "Hey, this is what you have to respect out there, if ranchers are going to work with you on this." And it worked out. I was really delighted with the way that worked out.

SM: We're sitting in Santa Cruz County at this moment—what about Santa Cruz County?

DR: I don't know about these other counties, and I don't know what.... When I look at the pressures that pushed Pima County that direction, we don't have that in Santa Cruz County right now. We may be getting that pressure in Cochise County, you know, with situations like the San Pedro River. But we don't really have it in Santa Cruz County right now, so I don't know. And there's a lot of things I'd like to see change in this county relating to how we do development, and especially how to use water, groundwater supplies. You know, I think irrigated agriculture up here in this dry grassland is not really appropriate, but that's not my decision. But the way the water laws are right now, if you want to do it, you can do it.

RM: So what sort of makes the Cienega Valley unusual, unique, or special—what, in your experience?

DR: O.K. Well, that's a good question, and again, I wasn't sure of the scope when you said Cienega Valley, so I included some other areas that are adjacent. I think this high elevation grassland here is really unique. In Arizona it's very similar to the Great Plains grasslands we see in Western Kansas, when Linda and I go back a couple of times a year. So to me it's kind of a relic of that plant community. As you go north, and lower elevations in the Cienega Valley, you transition to desert grasslands, and a lot of them now have a shrubby aspect. And then the watershed is bounded by these wonderful Sky Island mountain ranges like the Santa Ritas, Whetstones, Huachucas and Rincons. So it's just an incredible place, the diversity of country and the diversity of habitats.

I think another thing special about it was the Sonoita Valley Planning Partnership when it formed and had a major role in framing how public lands in the area should be managed, resulting in a lot of real positive things: bringing the public in with the land managers and the land users on the ground, mostly ranchers. And I was part of that process and pleased to have been able to play a part in it. And the spinoff of that was this biannual biological planning on Las Cienegas, which continues to this day very successfully. And I've always thought that was a really excellent way to do business, and just avoid the confrontations that otherwise take place. I included in here major stream systems like Cienega, Sonoita, and Babacomari River. Their associated riparian areas and riparian grasslands up here are still largely intact. There are not many places you can say that [about], left in the Southwest. They're all threatened by growth, groundwater depletion, and increasing temperatures. And I think they're all worth fighting for.

RM: Yeah. And I mean you've written extensively. I've read some of your articles. So grazing management, the role of fire, and invasive species—how have they sort of altered the landscape of the watershed area? And let's call that the greater watershed area.

DR: O.K. I think the upper grasslands in this watershed—these around the Sonoita Valley here have been very resilient, and they've held up to some pretty abusive grazing in the past, especially in droughts like the 1930s and the 1950s. And I wasn't around to witness that, but the pictures you see from that era show not a lot of cover on the land—mostly bare ground. My career itself spanned some different climatic eras. When I started with SCS the '70s were very dry, and ranchers were complaining there was not much rain, not much forage production. There was a lot of conflict with, I think, wildlife and livestock. 1976 had severe winter drought like we've experienced a lot of in the past twenty years. That was a range research project Phil Ogden did, and he did it on the Research Ranch. That was after the livestock was removed. But that resulted in grass mortality there on the Research Ranch and reduced forage production for about three years afterward, even though summer rainfall was average. That was our first inkling how powerful winter drought could be. The next decade, the 1980s, were the wettest decade in our climatic history here. (laughter) We went from really dry to really wet, and everybody in range management and ranching thought we were geniuses because the range responded.

AB: You created the rain!

DR: The first transects I put out were in 1979 and '80, with ranchers, monitoring transects. And through the '80s we just watched everything improve in condition.

SM: Did ranchers talk to you or realize the importance of the winter rains at that time?

DR: I don't think anybody really knew, and you know, that research that Phil did was never published. It's captured in a dissertation a Ph.D. student did there at UA, but never published. And I'm not even sure they knew what happened. It's just here was rainfall, and here's what happened, we lost two-thirds of our blue grama, and here was forage production for the next three years, with ten inches summer rain each year. But that was the first sign how powerful that could be. And we'll get into that in a little bit, about what's happened since '96 here, in terms of climatic change and how that's been impacted. Now it's been documented and researched and published.

SM: I ask that because one of the things that comes out of our oral history interviews, I think, is how much local knowledge there is of climate, weather....

DR: Oh, absolutely.

SM: People who are on the land, people who depend on the land, have a tremendous body of knowledge there, and I just was curious about that one topic.

DR: Yeah. And I think if you add research findings to that, that then that helps you take what you see, you know, and say, "Yeah, that makes sense," or maybe, "No, it doesn't. I wonder why?" But you're right, it's.... Anyway, so let's see, where were we?

The '80s were the wettest decade in the climate history, and grasslands recovered quickly. One offshoot of that was these African lovegrass species really took off in that period, because we a plant community thinned by drought in the '70s. We had openings, the seed source was here, and they African lovegrasses kind of blossomed. In fact, on the Santa Rita Experimental Range, Clark Martin told me that they really swept across the range in the '80s.

So the last period during my career, from 1996 to present day, has been one of continuous drought. From the end of the '80s to '95 we were kind of up and down, but from '96 to present day, nearly continuous drought. And these severe winter droughts—winter is the cool season, October through March—occurred in '96, then again in 2002, 2006, 2011 and finally in 2017. So they've just been hammer blows. And we didn't have drought like that prior. We had severe droughts in the '50s, and in the '70s, we had some dry years, but we didn't have this just continuous thing for over twenty years that we have now. And that's really had some negative effects. And through that period, summer moisture has not changed. Linda [Kennedy] and I did an analysis on moisture from the Research Ranch and Canelo, the NOAA coop weather stations, and through that period summer moisture and the variability of summer moisture has stayed about the same. But winter moisture has declined significantly, and the variability increased to 80%, so it's really gone crazy. And you know plant communities live within a range of climate extremes, and when climate goes beyond those extremes, then things start to fall apart.

Also during that period, this last period, we've had a lot of fire, and the fires often coincide with drought, so 2002, severe winter drought, we had the Ryan fire. In 2009 we had the Canelo fire. In 2011, severe winter drought, we had the Monument fire. In 2017, severe winter drought, we had the Sawmill fire. And so you have fire on top of drought impacts, and you can really open up plant communities, and that happened. Lehmann lovegrass responded aggressively to that on both grazed ranches and un-grazed properties like the Research Ranch, and it now dominates the landscape in a lot of areas—still moving. Also I think increasing temperatures globally are affecting our local climate, and

it looks like the big impact here is the loss of winter moisture in this area. In years where we get less than two inches in the October - March period, we can kind of expect to see grass mortality. So if this continues I think we're going to witness a decline in the resiliency of this grassland, I think it's going to open up to invasive species and I think we're going to see a change in composition that more resembles desert grassland than what we have had in the past.

RM: Following up on that. What sort of economic impacts do you see coming from that directly?

DR: Well, productivity. If things stay the same, increasing temperature obviously increases evaporation. And even if rainfall amounts stay the same, we're going to have less production here, so the number of animals that can be safely carried on the range I think is going to decline. Another economic factor is loss of water supplies. I can't tell you how many springs in this country that people that were ranching here in the '60s, called reliable springs, are really dry now. That's forced ranchers to drill a well somewhere and run a pipeline down to that location because there's no other way to get water there. You know, it used to bubble out of the ground, and now you've got to spend \$40,000-\$50,000 to replace it. So those are big things. I think as temperatures continue to increase, that's just going to be a larger magnitude of impact, both production and water supplies.

RM: So what events do you think were most significant in affecting the resources in the history of the valley?

DR: Well, I mentioned this before, but I think the combination of heavy grazing and severe drought in the '30s and '50s resulted in a pretty significant loss of topsoil from the watersheds—not everywhere—some slopes are pretty well protected with rock, but I think a lot of areas that happened. In the lower elevations to the north, the desert grasslands, shrub invasion occurred, and that's been widespread. And also down there in the northern areas, down-cutting of the major stream, Pantano Wash, which is a tributary to the Santa Cruz, began to down-cut shortly after the turn of the century and has changed the base level in the system and caused accelerated erosion in the upland areas adjacent to the creek. That hasn't happened in most places up here, and that's a blessing.

SM: Would you say it happened south of Gardner Canyon? Is Gardner Canyon a threshold....

DR: I don't know if Gardner is the breakpoint there, or if there's some bedrock control there below the Cienega, but it did, that headward erosion came back up through the narrows, onto the Empire, onto Las Cienegas. And I'm not sure, it seems to be right about, just below the concrete road crossing there on the main road to Cienega Ranch. You know, that's pretty gutted-out below there, but up there it's.... And so that road crossing is probably a pretty important feature to have in there, but it'll need protection in the future I think.

SM: Well, interesting. You know, we are receiving some funding for erosion control, arroyo control, and we have done some prioritization of where things should occur, what makes sense, what doesn't. And we have to take a deeper look, because you don't want to put money and efforts if it's already a lost cause, or takes a bigger multi-million-dollar effort, instead of the small amounts we do have.

DR: There's a lot of discussion about Mattie Canyon, as you well know.

SM: I was thinking Mattie.

DR: Because it had cut back up through and was threatening the sacaton in the lower reaches there. But you know, when you're fighting a geomorphic process like that, you can do it, you can spend the money on concrete and steel and do it, but it's very expensive, and sooner or later it's going to fail. It might have a hundred-year lifespan, but sooner or later it's going to fail. I don't know, those are tough decisions.

SM: Yeah.

RM: So what sort of efforts have ranchers and range scientists made to combat the invasive species?

RM: I'll just make a comment here, ranchers are pretty good about combatting invasive species that are not good for forage, so plants like mesquite and juniper, yeah, we'll go out and get those. But they're not so good about these invasive [i.e., non-native] grasses. And the reason is, they're forage species, and even though they're not as useable as native grasses, they still have utility. So I think that's a fair statement to make. Rangeland scientists and other environmental scientists have studied plants like Lehmann lovegrass extensively, and it has been successfully controlled in a few places on a small scale like Linda's program on the Research Ranch. But it was all she could do, every year, to go out there and spray that 500-600-acre area between the two ranch headquarters there, and keep it free of Lehmann lovegrass. And the rest of the 8,000-acre area on the Research Ranch, Lehmann's is still moving across the land. You know, there's only so much people can do, and you have to do it every year. But for ranchers, you know, it's a foreign species, and you'd have to ask an individual rancher what they think about it. I've heard every opinion in the world. I just think that's something we're going to be living with. And I think we're kind on the tip of the iceberg when it comes to invasive species. You know, we're still largely still native species here especially on National Forest. But boy, every year we're seeing other plants pop up. Linda and I found a patch of Malta starthistle on a nearby road with the wet winter this year.

SM: Which plant was that?

DR: Malta starthistle, which is a plant nobody would like to see in this grassland.

SM: Malta starthistle.

DR: Yes. I think with the more people coming up here and more growth and disturbance that's going to continue.

AB: This spring I've seen plants that I've never seen before, because of the wet winter, it's been interesting.

DR: Absolutely.

RM: Now, how does that sort of diversity between native and invasive grass species, how does that affect the sort of maintenance of the current ecology of the system?

DR: You know, there's been a lot of research done on species like birds that use these grasslands. The monitoring Linda did on the Research Ranch, had several transects on the same soil type—loamy upland ecological site. On sites that were dominated by native grasses, and still are to this day, after fifteen years of monitoring, she would have a list of over 150 native species of plants. That's on an area of less than a

quarter acre. That's pretty incredible diversity. One of those transects is dominated by Boer's lovegrass, and I think the total count is fifty species. And when you go out there and read that transect, 90% of the time you're setting a frame down on just Boer's, and you just encounter these other species maybe one plant of blue grama, maybe two plants of spruce-top, maybe a forb here and a forb there. The number of species is fifty, but they're not abundant.

So what does that mean for species like birds? The grassland birds that live here eat seeds and bugs. Lehmann seed is not food for birds, it's too small for them to get. There's 5 to 6 million seeds in a pound of Lehmann lovegrass. It's tiny, almost microscopic. So there's no seed, and when you get completely dominated by lovegrass, there's very few insects, because there's only a few that will feed on that stuff—a couple species of grasshopper. So you've lost the food for that whole niche of wildlife there. And we're in a period right now of transition to where you still have Lehmann's mixed with natives, and the ratios vary, depending on where you are. So you still have habitat for birds. Janet Ruth, USGS bird research scientist on the Empire, had one of her study plots being invaded by Lehmann's. And she said, "You know, the Lehmann's is really good nesting habitat, because the cows don't eat it much, so there's big clumps, and the sparrows get in there and make their nests and have really good cover from predators, and you still have the natives grasses and forbs producing seed and providing food for bugs, which is what they feed their babies in the summer when they're born. And so they were doing well." And I said, "What's going to happen when it's all Lehmann's?" And she said, "I don't know."

SM: Is that Baird's sparrow?

DR: Well, there's Bairds, Grasshopper, Botteris and Vespers sparrows and other species. There's a whole suite of grasslands birds. But anyway, so that kind of thing worries me. Pronghorn eat primarily forbs and low shrubs and there's not many of those plant species left in solid stands of Lehmann lovegrass, so what's going to be there for pronghorn to eat in the future?

SM: Can we ensure diversity by managing small plots of diversity, keeping them going, while larger plots are in fact going to go the Lehmann's lovegrass way?

DR: Well, when you say diversity, if you're just inclusive of plants, maybe, a little bit. But if you include animals, what do you think you're going to have in a small plot of diverse plants?

SM: Exactly.

DR: You're not going to have the species that need big areas, and even these birds need big areas. So I don't think so. And you know, I don't know if there's any hope of controlling Lehmann's. It's everywhere. We brought the seed over from Southern Africa in the '30s, and we left all its natural enemies behind.

RM: So over time, what sorts of changes have you seen between conservation activists and ranching interests?

DR: I think the label "conservation activism" includes a real variety of actions. I think there's been a lot of constructive work done with middle-ground groups like TNC [The Nature Conservancy], Cienega Watershed Partnership, Sonoita Valley Partnership and ranching interests like the Canelo Hills Coalition, Malpai Borderlands Group, and Altar Valley Conservation Alliance. In Pima County I think,

as I mentioned before, the Sonoran Desert Conservation Plan was a successful process because it was inclusive of all sides and respectful of the importance that private and state rangelands played in the conservation of plants and animal resources.

But here's the downside: I think that fringe groups on either side of the spectrum are still fighting, and I think the situation is getting worse. I think with actions like the Bundy–BLM standoff in Nevada in 2014, and the armed takeover of Malheur National Wildlife Refuge in 2017, are really a negative thing. And I think the worst part of these actions was that it emboldens other public land users, and not just ranchers, to do what they want, rather than what's required by law or what's right for the land. And I don't see that getting any better. And I'll just leave it at that.

RM: So in your [October 2002] article "Grazing Management: An Art and A Science," you wrote that "improper grazing management can aid the spread of some non-native plant species and some noxious plant species by removing forage species, creating soil disturbance and opening the plant community to invasion." So in your experience, have you observed ranchers pivot to embrace a more sustainable model?

DR: I would say by and large, yes. Most ranchers I've worked with utilize grazing systems, they participate in monitoring efforts and they make adjustments during drought and after fire to accommodate the needs of rangeland. There are still some that practice year-long grazing with fixed numbers of livestock. I think under year-long grazing areas on the rangeland preferred by livestock are overgrazed and never have the opportunity to rest and recover. These include riparian areas, swales, washes, areas around water sources, and bedding grounds.

SM: And that's in this watershed?

DR: Well, Cienega Watershed? I think the majority are practicing grazing systems and doing a good job in this areas.

RM: So we touched on this a little bit earlier too, when we were discussing monitoring earlier, but why is it important, and how do you do it right?

DR: I think it's very important. You know, how else can you learn what is causing changes if you don't monitor the vegetation and the variables that impact it? When you monitor grazed areas and un-grazed areas you can actually separate climate impacts from grazing impacts, and I think that's real important, and we don't do as good a job on that as we could. I don't know how many ranchers have called Linda over the years, in a certain season when they see a forb, like annual goldeneye or purple aster everywhere on the range, they would ask, "Is that on the Research Ranch too?" And she would say, "Yes, we had a dry summer last year and a wet winter this year, and you're going to have it under those circumstances." And they would go, "Thank goodness, because I thought I was doing something wrong out here, and somebody was going to point a finger at me." So I think that these reference areas, like the Research Ranch, are really important, because they give you a place to look at an un-grazed setting, and see what things are going on there. Monitoring is hard work. Transects have to be placed in areas that are representative of the bigger landscape, so that takes some skill, because one agency range person can only read so many transects each year. In a perfect world, you'd have a heck of a lot more than we do, but we do a pretty good job with what we have. The techniques need to be repeatable and require as little decision-making as possible, to have consistent data, because you are going to have different

people over time, reading those things. Monitoring, I think, needs to be done yearly. That doesn't mean that you need to read every transect yearly, but you need to read some of them yearly, so you can see what's happened that year and how it's going to impact the vegetation. Monitoring needs to include things like vegetation composition and cover, precipitation by either month or season. A lot of people just monitor precipitation by "cool season-warm season." I think that's fine. Actual grazing use, keeping track of animal numbers and the dates they're in an area, pasture; and grazing utilization by plant species, how much has been removed by weight, on average, across that key area are important things to document. And if you do this on a landscape over a long period of time, fifteen or twenty years, you're going to learn a heck of a lot about the dynamics of that rangeland ecosystem. And in this country, you need to do it over a long period of time. Consider my career: dry in the '70s, wet in the '80s, dry again in the 2000s. So we saw plant communities come back from the '70s, peak, crash in the 2000s, and go back down to some other equilibrium there. And if you don't do it for the long time, you never learn that those things are out there and important. So it's been a good learning experience for me, and I think a lot of ranchers that I've worked with as well.

SM: What kind of formats do (coughs) the ranchers had to get this information? I know that there's some consulting, individual contracts, but are they sharing this information at rangeland meetings, or just amongst themselves, co-ops? How does that information get there?

DR: A big venue for sharing that information is the Society of Range Management, and they have meetings twice a year in the state. Anybody can present at these meetings, so if they have monitoring records, a rancher, a technician, or a technician with the permission of a rancher, that they want to share, that's fertile ground for presentation at those meetings. It's a good way to talk about—and I've done that throughout my career. The last one that I gave was at an SRM meeting in Tucson a few years ago, and it was on drought impacts up here in the Sonoita area, and we talked about loss of grass cover and movement of invasive grasses, and the loss of oak trees here at the lower elevation limits due to this lack of winter moisture. And those were all things that we could measure and present on. So I think that's an important venue. As far as how ranchers actually get this done, most agencies are actively doing monitoring now, so NRCS is a big one on nonfederal land. BLM, of course, on BLM land, and now they're moving to a new system that's going to be interesting for them to see how that plays out. On Forest Service, monitoring has been a little more sporadic, but most of these southern districts of the Coronado have, I think, done a pretty good job, and they're actually getting some help now from the NRCDs in the area. The NRCDs get money from NRCS, to hire a consultant to go out and help ranchers monitor on some of the forest allotments, where NRCS doesn't have the license to do that. I think a reasonable level is getting done. It's something that can really slip in the future, especially if agencies have real tough budget times, because that's maybe not viewed as an essential thing. And it's not the field people, you know, it's the managers up above who don't seem to realize the importance of monitoring.

SM: It's the managers, yeah.

SM: What is not being monitored? Are we talking about suburbia here? You know, ranchettes, the kind of place where the Bocks [Carl & Jane] have done some work?

DR: Well, their study gave us a lot of insight, I think. I think it's pretty much just the working lands, and some of the bigger protected areas, of course, have quite a bit of monitoring going on.

SM: Would it be possible to do a citizen stewardship monitoring program aimed at ranchettes?

DR: I don't know.

SM: You'd have to know a lot about plants, wouldn't you, to monitor?

DR: Yeah, you do. Who's going to pay for it? You know, who's going to view that as a necessary thing and pool some money to hire somebody that does know plants and knows how to do it. It's not going to be me.

SM: Dang! I thought you would train us all. (laughter)

DR: I'm almost done with it! (laughter)

RM: Well, I think that links in with another question: You've observed a lot of collaborative efforts over the years, right? So, what sort of qualities differentiate the ones that are successful versus the ones that are either unsuccessful or dysfunctional in Southeastern Arizona?

DR: I don't know too many dysfunctional ones, so I'm just kind of guessing at this, but the successful ones attempt to bring parties together in a respectful manner. So they're inclusive, they allow some kind of democratic process to unfold. And then they have a system of providing feedback to where that keeps going. And how long that is going to be in place is anybody's guess. So the longest-standing one is Malpai Borderlands, and they seem to be pretty effective in keeping it going. I think Altar Valley, thanks to some really good leadership, is moving in that direction, to where they've got a pretty good endowment now, and if they can get more I think they'll be there for a long time, as long as those families are there on the ranches. The Canelo Hills Coalition here locally was a very effective group that worked kind of for a specific purpose with the Forest Service over endangered species issues. I don't think they're active anymore, but maybe they accomplished what they set out to do, and got a monitoring system in place out there on the four ranches that were involved. And as far as I know, that's still being carried on. The unsuccessful one's, I assume they're not inclusive, or somebody tries to dominate. But like I said, I haven't been involved in any, so I don't have firsthand experience with any. Do you, Shela?

SM: Not so far. What we worry about is—you put your finger on it—continued long-term success and participation, so that, like, the Sonoita Valley Planning Partnership, that history, what we agreed to, the directions, the guidelines, does not get lost in a hole, and people began to start all over again. So that continuity of effort (DR: That's really important.) is something that we worry about, not just in the archival sense of preserving records, but preserving the dialog and that respect, as you said, where you've already gained trust of people. And that is the most important thing. You sure don't want to do anything to make it drop.

DR: Yeah.

RM: So, we've talked about a lot of the sort of environmental effects, and climate change is an omnipresent topic in the national dialogue today. So, have you observed any sort of broader climate change trends affect the landscape or the Cienega Watershed, the greater area?

DR: Well, we kind of already talked about it, but the impact of temperature, how does that relate to this thing with cool-season moisture? I didn't explain that very well, so here we go. Cool-season moisture in the area has declined significantly in the last twenty years and the variability has increased, which makes it really difficult for plants to survive. But what increasing temperatures have done is they've lengthened the growing season here, almost a month in the spring, so now we're seeing plants greening up and starting to grow in March. Where it used to be April first, now it's March first. Whenever monthly air temperatures get above 50 degrees Fahrenheit, you're going to see these warm-season grasses starting to grow. We've also pushed the growing season back further in the fall. We used to think of October as a cold month, and if we got moisture in October, it would stay in the soil and be there for spring growth. Now October is so warm, plants are using it, and using it all up before it gets cold enough that plants go dormant. We're going into spring earlier, these warm season perennial grasses green up, they try to recover enough photosynthetic canopy to regrow root system that they lost in the winter dormancy. They still have to live in the winter, use water in respiration, burn energy to keep tissue alive, and they exhaust root system to do that. So they're greening up and growing, and instead of May and June to hold out before the summer rains come—now they've got April, May, and June, because we've pushed that growing season back a month. In addition, we've depleted moisture that came in October because it's so warm now in the fall. So those plants, especially in these dry winters, are running out of soil moisture in May or June—and they just die. They lose the moisture in the soil, and then they lose the moisture in their tissues, and then they die before the summer rains ever come. It may not be the whole plant that dies, there might be one or two tillers that survive to make another plant, but often it is the whole plant, It's a significant loss in basal cover every time this happens. In years where we've had just one inch of rain in that October-March period, we've lost over half of the basal cover in just that one drought event. And it doesn't matter what the summer rains are, they just come too late. So that's a combination of increasing temperatures and change in winter moisture patterns here. These things always act together, and things go awry. Increasing temperatures are always going to increase evaporation. And if you get the same amount of summer moisture and have more evaporation that means less water is available for plants. That means plants have to transpire more water to keep their tissues cool under those higher temperatures too. And that, I think, translates to less production—less water, less production.

RM: Now does that sort of temperature hike sort of facilitate the invasive species as well, or for grasses that might be more hardy?

DR: That's hard to say for grasses. You know, we have one waiting in the wings down around Tucson, which is buffelgrass, which has some sensitivity to cold temperatures in the winter. As winters become milder, I think we're going to see buffelgrass move up higher in elevation. But I think from a shrub standpoint, I'm already seeing it here. I think mesquite is moving pretty quickly up into these higher grasslands now with these increasing temperatures. Mesquite doesn't like it cold, it likes it hot and wet. And this is wet compared to the Sonoran Desert. (chuckles) So anyway, that's what I see—I don't have data on that, but that's what I see.

RM: So what effect has recreation, if any, had on the landscape of the Cienega Watershed and the Sonoita Valley?

DR: That's a good question, because recreation is really increasing. To me it's a double-edged sword, because on one hand I think the more people that come out and enjoy our public lands, the more of them are going to fight for it, to keep it. And I'm a huge fan of public lands, and I really don't want to see

them go into private ownership. I think it's the one thing in this country that makes sense for most of the population that will never own more than their house and the little plot of land it sits on. So I'm a huge fan I like it that people are coming out and enjoying public lands. But I also know that with more people, and with more toys like ATV's, there's going to be some negative impacts. We all know what those are. And the small minority of people that will break the law go off road on their vehicle, or disturb an arch[aeologic] site, it's going to be something we're going to have to deal with. And I think it's going to need an increased presence of law enforcement out here, and things like volunteer land stewards to really police the hinterlands and keep an eye on what's going on. Otherwise, it just gets away from you, and we've seen quite a bit of that on the Empire. It's kind of sad to see, but almost every new hunting season that goes by, there's some ATV tracks that go up a hillside, and somebody sees those and they follow it, and pretty soon you've got a road going straight up the hillside. Most of that's on State land. I think the BLM is a little more on top of it than the State Land Department, but it's really sad to see. It can get out of hand in a hurry.

RM: On the way over, we were talking about some of the fires—you know, somebody throwing a cigarette out the window of the car. Have you seen an escalation in the number of negligent fires started that way?

DR: Absolutely. I think the vast majority of the fires we have now are started by people, and not by natural starts. The Monument fire was obviously a lightning-caused fire, but the others I mentioned, the Ryan, the Canelo, the Sawmill, were all human caused. Many people that don't know what the ramifications of their actions could be—even shooting a gun and hitting a rock can start a fire in really hot years.

SM: Even scientists have done that, unfortunately.

DR: Have they? Oh!

SM: Yes.

DR: I didn't know that!

SM: Not this scientist, but others, yes.

RM: Following up on that, what role could education play in something like that? And have you seen any efforts beyond Smokey the Bear, of course, to educate people on responsible recreation?

DR: You know, I think Game and Fish tries to do a good job, and that's mostly related to hunting and fishing activities. And there's a lot of dispersed recreation out here that does not involve that, but this whole business of off-road vehicle recreation.... I don't enjoy it, I don't like the noise and all that stuff, but a lot of people do. And as far as I'm concerned, if they're on designated roads and trails, if they want to come out here and blow off steam, more power to 'em. But I don't know how you get to people recreating like that. You don't get it through the traditional programs that an agency like Game and Fish has, where they can mentor hunters and fishermen and have classes for kids that are starting out and stuff like that. I don't know how you do it. But it would really be helpful.

RM: Yeah, it'd be nice if had... especially those wildfires.

DR: Yeah, that's really disturbing.

RM: It just makes no sense, throwing a cigarette out the window into dry grass.

DR: ~~No~~. Also fires happen around here because people are mowing in June, when they should have mowed in December.

AB: In December, yeah.

DR: Or January.

AB: And they hit a rock.

DR: Hit a rock with your mower. You'd be flabbergasted, how easy it is to start a fire out here when the grass is dry and it's 100 degrees. And the wind's always blowing up here. That doesn't help either. So yeah, how do you.... I don't know.

RM: So last [question]: what sort of advice would you give your successors?

DR: That's a good question, and I thought about that. I'm usually not about giving advice, but here's what I'll say. When I was a young range conservationist, I was all about helping ranchers get as much as they could from rangelands they owned and leased. Over time in my career, I began to see that pushing the natural limits of rangeland resources was not a good thing. And I now believe that moderation is the best for good land management, and I think it's the best for a good life, too. So I think stocking rates need to be designed to accommodate both good and bad years. Any grazing systems should be tailored to the needs of the land and the people that use it. Grazing management that allows plant communities to recover from loss of photosynthetic tissue, allows forage species to reproduce and persist in the community, and to maintain enough plant cover to protect soils from erosion are what we need. This is a saying I like, and some of you here can relate to this, I think: Too soon old, too late wise. And it's very true for me. It took a long time—and I'm not saying I'm wise yet, but I'm learning—I think that's true, and in my case it took many years before I appreciated the wisdom of using things in moderation, and curbing our natural appetites and our desire to shape things to fit what we want to see, rather than using them and living with their natural potential. So, I would hope young range conservationists, range specialists, would consider this today as they make decisions that might have long-lasting consequences.

SEVERAL: Thank you so much.

DR: You're welcome.

SM: I have a final question—maybe it's a discussion. Sometimes when we think of change—environmental change, climate change—we think it's gradual and it happens, and you see year by year. But we've also discovered that it can happen pretty fast.

DR: Yeah.

SM: So, in your experience from soils and vegetation, how long can we sustain this grassland?

DR: You know, I really don't know, and I certainly don't predict climate. I know we've had episodes in the past like this where we've had drought, and then we've gone back to more normal times. The wild card here is the increasing temperatures, and how that's going to impact our climate. And you know, I'm a fan of science, and I listen to the climate science people, and I think they know a lot better than I do, and the things they're saying really makes me wonder about what's going to happen here. I think we still have a lot of natural diversity here in these grasslands. We are losing some species, like blue grama and Plains lovegrass. But we have other species in the plant community here that can tolerate desert grasslands conditions, and they will probably increase. So it won't be like Great Plains grassland, it'll be more like desert grassland. It might be dominated more by threeawn species, Arizona cottontop, tanglehead and bush muhly. Shrubs like mesquite and succulents like cacti will increase. It's still going to be here—it's going to be less productive, and it's going to be different. And I hope we can maintain diversity of plants and animals. Fair enough?

SEVERAL: Yeah! Thank you so much!

SM: That is actually a little bit more optimistic than.... I was afraid you were going to say we're going to have total vegetation and soil loss!

END OF INTERVIEW