TRANSCRIPT
INTERVIEWEE: **Walt Davis** (DW)
INTERVIEWERS: David Todd (DT) and David Weisman (DW)
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(misc.)
DT: My name is David Todd. And I'm a representative of the Conservation History Association of Texas. And we're near Albany, Oklahoma, which is just on the north side of the Red River, not exactly in Texas. But in a ecosystem that's quite similar to much of what you'd find in northeast Texas. We have the good fortune of being on Walt Davis' ranch, which is a beef cattle and pecan operation I believe. Mr. Davis has been doing a lot of creative and innovative work on making agriculture more sustainable. And I wanted to thank him for taking this time to discuss some of the things he's been doing.
0:01:48 – 2115
WD: David, thank you. Glad you all are here.
DT: Could you tell us a little bit about how you came to be in this part of the country and the kind of operation you have here?
0:01:59 – 2115
WD: We came out of west Texas, David, in the early '50s looking for water. We drought out in west Texas, Nolan County and came up here looking for grass and water. And started putting this country together. And we made all of the mistakes that most people make when they change countries. We were under the impression that if we could ever get to somewhere it rained 40 inches a year that that'd solve all our problem. And I don't mind telling you we nearly went broke the first four or five years we were here. Because we didn't know how to operate in the country. We couldn't understand how a cow could stand knee-deep in grass and starve to death. So it entailed a—a learning process on our part. A brief history of what we did. We—we made the transition from a range operation in west Texas with no hay, a winter program of maybe a pound of cake a day for 90 days to a country where we wound up literally farming for the cattle. We came here intending to produce year-round grazing, which we started clean-tilling wheat, over-seeding Bermuda grass, inter-planting various crops. And before we knew it, we were farming twelve hundred acres and losing money every year. We
0:02:29 – 2115
had an extremely high-tech operation. We produced a tremendous amount of beef. But we weren't making any money. Our production was very high but our costs were higher. We realized that we had to make a change if we were going to survive. In 1974, we had a market wreck that waked us up. Plus one of the other things that was happening, we didn't like what was happening to our country. We didn't like what the materials we were

handling. At one time we were using at least 100 pounds of actual nitrogen on all of our country, high rates of herbicides. We were spraying horn flies every 28 days. We were worming everything with chemical wormers twice a year. Tremendous inputs, tremendous technology usage, tremendous production, but no profitability and definitely no sustainability. And one of the things that happened about this time is that I got sick and went to the doctor here and no help. Wound up going to a clinic. And one of the doctors after they had poked and prodded and looked said, "What chemicals have you used in the last year?" I took his pad off his desk and wrote down a list of 15 or 20 chemicals that I'd handed in the last—handled in the last year. He looked at it and read it and just pitched it back to me. He said, "I cant' help you." Well it turned out that wasn't the problem. I wasn't chemically poisoned, he had brucellosis. And we finally found out and they treated it and that was the end of it. But it started me thinking. I was handling and asking my help to handle; at the time I had three little girls, my wife washing the clothes that I was bringing in. Material that was so virulent, well for instance Ethyl Parathion that we use routinely. You dip a matchstick in it, touch the skin of the back of

0:05:35 – 2115

your hand and you're dead before they can help you. This kind of stuff we decided there has to be a better way. And we started looking for a better way. And the first thing we did was to replace our nitrogen fertilizer with forage legumes. All plants have to have nitrogen to grow. But it doesn't have to come out of feeds(?) out of a cycle. So we began to replace nitrogen fertilizer with forage legumes. We began—began to subdivide our paddocks to have—pastures to have better control of what the animals were allowed to eat, when to get better utilization out of it. And also to allow us to control the height and density of the material. So that we'd keep the mixtures going. A long learning process. We started out thinking four or five paddocks per herd was plenty. We know now that minimum in this country of 20 to 25 paddocks per cowherd. 30 to 40 is better for a stocker herd. But we began to get a handle on being able to control our animals. And thus control the land. What we're doing basically is mimicking nature's method of grazing. All of the great grasslands of the world evolved exactly the same way. They evolved in areas of erratic rainfall, under the influence of herding animals, whether it was the Pampas of Argentina, the Plains of Africa, the High Plains of Texas, large herds of grazing animals kept in a herd mode by predators. This was the secret. This was what we mi—didn't understand for so long. There's absolutely no difference in the way a buffalo grazes and a cow grazes. They're both mass grazers that come out over the top, they take one bite, they take the second bite and if there's nothing left, they come back and take the third bite. But they graze exactly the same way. The difference between what happened when the buffalo was grazing this country and what happened when the cows were grazing this country is that the buffalo was kept in a compact mass by predators, wolves so that the herd had to stay together. If the herd has to stay together,

0:08:04 – 2115

the herd has to go to graze where there is sufficient density and height of forage that all members of the herd can fill up with a reasonable expenditure of energy. Grazing is the work grazing animals do. If they don't get a living wage for their work they die. So under the nature's method, the herd goes to graze where the forage has recovered from the last grazing. It is sufficient height and density and sufficient quality that each member of the herd can, with a reasonable expenditure of energy meet their needs. They don't go to the

burn where it burned last week and it's only two inches tall, even though that tastes quite good. They don't go down in the creek where it's six feet tall and hasn't been grazed all year. They go where the forage is growing and of high quality. It's exactly what we're trying to mimic now with fencing or with herding. That's the basis of what we're trying to do. Everything else evolved from that. What we're standing on right here is all old cotton land. All of this country was cropped in cotton for at least a hundred years. And when we bought this—well this particular place bought in '64. But for instance, whether you—the pecan trees right down in here. When we came here those were growing on bedded ground. I don't know you know what bedded ground is or not. But ground that is ridged up to plant cotton on. And when we came here in 1964 those trees were already this big around growing on bedded ground. Whoever had bedded walked off and left it. And pecans grew up on it. So we didn't start with exactly fertile soil, we grew—we started with some soil that had been grossly abused for a long time. It's been slow. But it has been very productive. Up until the last two years, we were stocking this upper country at about a cow—about an animal unit to an acre and a half to two acres. And this supplies the total diet.
DT: Can you explain what an animal unit is?
0:10:30 – 2115
WD: Textbook explanation is a thousand pound dry cow is an animal unit. Now we more commonly use it as a cow and her calf as an animal unit. And that's what I'm speaking of here. The textbook is a thousand pound dry cow.
DT: So your operation is basically to raise calves for slaughter.
0:10:57 – 2115
WD: What we do is run a cow calf herd. And then we carry our own calves over the following year and sell them as heavy feeders. We try—we normally sell our calf crop the following summer as seven to eight hundred pound heavy feeders. And if at time—if we have the capacity we'll buy extra stocker calves to go with the cow calf herd with our own (?). As we were talking earlier, we've recently gotten back in the sheep business here.
DT: Could you explain why you expanded into the [inaudible]
0:11:31 – 2115
WD: We have some resources here that we aren't utilizing. We have forbs growing up here, whether you can pick them up. But here's plantain, here's curly dock. Weeds according to the cow, except the cow will take the curly dock in the early spring. But we have a lot of forage here that the cattle don't relish and the sheep considers to be ice cream and cake. So the more fully we utilize the forage resources here, the less material that we allow to go senescent, that we allow to die of old age, the higher the energy. All in the world we're doing here—all the world agriculture anywhere is doing is harvesting solar energy. And the more efficiently and effectively we harvest solar energy, then the better the agriculture. If we can keep our forage base in a vigorous vegetative state, we more effectively capture solar energy.
DT: And that means having the grass not too short nor too old [inaudible]
0:12:42 – 2115
WD: Exactly. And also it means having a mixture of plants there, both warm season and cool season. We want something green and growing there for as many days of the year as—as the climate will allow us. If you have, for instance, a field of coastal Bermuda grass, that's all there's in—that's all that's in it. Actually that plant is at its peak physiologically in this

country from about May 15th to July 15th. The rest of the time the sunlight that falls on that land is wasted, or at least not utilized to the capacity. But if you have an area that has maybe Bermuda grass, cool season legumes, warm season legumes, annual warm season grasses, cool season grasses, all growing in a mixture that in any point in time when the temperature and moisture conditions are correct, you'll have vegetative growth. And therefore you will collect the solar energy that falls on that. All we're doing in agriculture is we're—if we're operating correctly, is that we're trying to maximize the conversion of solar energy to biological energy. And then to some form of wealth. Whether that wealth is wildlife or meat, wool or milk or whatever it is, is to maximize that conversion. The more effectively we do that, then the more energy flows into the system. And if we're doing our job as agriculturists, all we do is harvest the surplus. We harvest the energy that is surplus to the needs of the system. And that by definition is a sustainable system. When we start taking more energy out than we're capable of replacing with solar energy, it becomes a mining operation. And therein lies the problem right now on agriculture worldwide is that we're exceeding the capacity of the system to produce energy. We're taking more energy out than the system can regenerate. Short-term, we can make up with inputs, nitrogen fertilizer, tillage, chemicals. Long-term, the trend has to be down.
DT: I guess what you're saying is you've basically been mining for nutrition [inaudible]
0:15:19 – 2115
WD: You become mining—you become a mining operation. Not only are you mining nutrients out of the soil, you're mining diversity out of the whole system. What we're trying to do is build biological capital. Because this is what builds stability. The most stable system know to man is a climax grassland. Now I don't like that term. It's kind of antedated now. But a grassland that is in all it's glory, the tall—the tall grass prairies of the North American plains, the Pampas of Argentina in their original state, these were grasslands that had been there relatively unchanged for thousands of years. And that is one of the most stable systems know to man. Primarily because it is one extremely complex in its life forms, not only plants, animals and perhaps most important, micro life in the soil. The full range from bacteria, mycorrhizal fungi, molds, yeast, the full range of life forms in—in a tablespoon of fertile prairie soil. There are several billion organisms—live organisms in a tablespoon of fertile soil. Some of them we don't what they are. But they're there. And this is what creates true soil productivity. It is also what creates the stability of these systems. Any time that the full range of resources of a system is being utilized, moisture, nutrients—mineral nutrients, sunlight, then the energy level goes up. And the species diversify to fit all of these little niches. One organism's waste is the feed source for the next organism. And this multitude of organisms all interrelated, interdependent, is what creates true stability. It's also what creates true productively over long periods of time. Coming back to strictly personal level. If we can build the organic matter in our soils, if we can build the diversity of organisms on our soils, if we can build the insect diversity that we're trying to, the earthworms, the dung beetles, the sand wasp, I don't even know what they are that prey on the horse flies, the spiders. These are the reasons that we can get away from the toxic crisis chemistry that has taken agriculture where it is today. For years we sprayed horn flies every 21 to 28 days on this place. I haven't sprayed horn flies in over 20 years. And we don't have one more horn fly now than we did when I was spraying every 28 days. But we do have sand wasps now that take the horse flies out in about two weeks in June, after the—after the sand wasp population builds up. We have no more horse flies. Because of

the—the sand flies have taken them out. We have dung beetles that now, when conditions are right, will come out of one of these paddocks that's been grazed at 12 to 18, 20 thousand pound stock density per acre, will come out of one of those paddocks and in 48 to 56 hours there's no manure left in the paddock. The dung beetles have completely buried it.
DT: Can you explain how that kind of grazing density is different from maybe some of your neighbors?
0:19:07 – 2115
WD: Okay, well I—I better define some terms. Because stock density is either the pounds or number of animals present upon an acre at a given time. In other words if you have—if you have ten acre—if you've got a hundred acres out here with ten animals on it, you have a stock density of one animal to ten acres. If you break that into ten equal size paddocks, ten ten-acre paddocks and you put all ten animals in one paddock, then you're stock density goes to one animal per one acre. You're carrying capacity or your stocking rate is the same. You have ten animals on a hundred acres but the stock density goes from ten acres to one animal to one acre to one animal. Follow? So stock density I'm speaking of the number or pounds of animals on an area at a point in time. What this means, for instance in the example we just used with ten paddocks, 90 percent of your land is resting at any point in time. Ten percent of it is being used. 90 percent is resting if you have ten paddocks and one herd.
DT: And you do this with electric fence, is that right?
0:20:31 – 2115
WD: We do it with—primarily with electric fence since — because — simply because that's the only way that it's economically feasible.
DT: Well maybe you can show us some of these implements that you use, I mean the electric fence might be a good example of it.
0:20:42 – 2115
WD: (talking over David) Sure. This is the basic fence that we use on the cattle operation. It's a single high tensile wire at 30 inches. If you look right across the land, there is another high tinsel wire at 30 inches, which creates a lane. We are trying on this ranch to develop our system of fencing to where one person can take an animal from one paddock to any other paddock on the ranch by himself, simply by throwing out on a lane and following where we're going. We've been a long time developing this and it's one of the things that it has to be done in an economically feasible way. I mentioned a while ago that we got in severe financial difficulty here when we first came here. Over the years, particularly when I took over management, one of the decisions I made was that we were not going to go in debt to make these improvements. We would only make improvements we could pay with this year's profits. So it's been slower than perhaps if we'd borrowed the money and gone on and done it. But I'm convinced that if the decision is a good one, it has to be valid economically, ecologically and also sociologically. It has to meet all three of those criteria, or it's not a good decision. And one of the main things that's wrong with agriculture today is the pressure on our farmers and ranchers to be economically viable is so severe that they're making decisions that they know are not ecologically sustainable. No because they want to, but because they
0:22:51 – 2115
feel like they have to. They're making decisions that are not sociologically acceptable to them. Because they feel that the economic pressures are so severe that they have to do

these things. I know that we don't have all the answers. But I do know that on this operation and some other operations, we've seen changes made that it doesn't have to be that way, not in all cases. There are other ways of doing things that are both ecologically, financially, and sociologically sound. Not always, but a lot of the time. And if we can—if we can promote that type of thing, we can promote the type of thinking that Alan Savory has promoted in holistic resource management. All holistic resource management is, is making good decisions, making decisions that take you where you want to go. And that has been an invaluable took and invaluable resource for American farmers and ranchers and.
DT: More so than fencing?
0:24:16 – 2115
WD: This is technology. This is—this is simple stuff. This is—this is the video camera, this is simple stuff. The important stuff is what goes on up here. And that's where 90 percent of the problems are. You go somewhere and say, "Well, yeah, that'll work for you but it won't work here." Everybody, and we mentioned hay a while ago you asked how much hay I fed. I don't feed nearly as much hay as I used to feed. I still feed too much hay. And the reason I feed too much hay is because it's hard for me to turn loose with him right here. When there's eight inches of snow on the ground, I want some hay out there. Whether the cow needs it or not, I want some hay out there. It's more for me than the cow. Now if my management is good enough, I will never get completely away from hay in this area. We'll make hay at times if for no other reason to maintain quality on our pastures at some point in time. But we will reduce the amount of hay that we're feeding dramatically. We've already reduced it dramatically. We will reduce it more. But there again, that's primarily a problem in my mindset rather than any real technical difficulty so.
DT: Can you give some other examples of how your mindset has changed since your original efforts [inaudible]?
0:25:37 – 2115
WD: (talking over David) Give you a real good one—give you a real good one. And one of the simple things that one of the—one of the things that has made a real difference in the way we operate. Anyone who has ever weaned calves or goats, kids or lambs, real traumatic experience for both the offspring and the—and the—and them. For years we had a big board corral up here, high—six feet high fence. And we separated the cows and the calves; we put the calves in the pen and the cows outside. And for a solid week it was pandemonium. The calves were bawling. The cows are bawling. The calves are walking the fence, calves get sick. They bawled themselves hoarse to where the second or third day they can no longer bawl. They've lost their voice. And I ran into a friend of mine in Kansas one time, Steve McCoon(?), he was working for Devore Ranch. And he told me about weaning on hot wire and I said, "Steve, you're silly, you can't do it." And he said, "Just go try it." And we've been running—operating with electric fence for years. So the next year we put in a wire like this except, well the first year we didn't. But we put another wire at 20 inches, cold wire at 20 inches and hot wire at 30 inches. And we decided we'd try it. We went into the pens with the cattle, separated the calves from the cows, turned the cows out on one side of the fence, the calves out on the other side of the fence. You say, "What's the difference between putting them in the board fence?" Here the cow can reach over and smell her calf. She can see him. She can smell him. She can hear him. She knows where he is. She knows he alright. In that pen, all she knows is that there is a mob of churning, bawling calves in there that are terrified. If she sees her calf she doesn't mean anything. A cow

identifies her calf by smell and by sound. The smells are mixed up. The sounds are mixed up. The calves are all bawling. The cows are all bawling. Everybody is terrified. It's chaos. Here, the first time we did that, it was a little later than I had intended it to be. We got through about five o'clock when we got through. And we turned out. And the cattle had been in the lot longer than I wanted them to. The cow is grazing over here. The calves are grazing over here. Everybody's quiet. About sundown, calves began to drift up to the fence. Cows began to drift up to the fence bawling for each other. No big—no big turmoil. We went in, ate supper. About nine o'clock it got completely quiet. And I told my wife, "Well the fence is down, they're all back together. I'll sort again in the morning." At daylight, I was standing on that fence. The cows were laid down on this side of the fence. The calves were laid down on this side of the fence and both of them asleep. Anybody that's ever
0:28:34 – 2115
weaned calves will tell you that no calf sleeps the night he's weaned. But if he knows mama is right there and she knows he's right here, the entire program changes. We no longer have sick cattle when they're weaned. The calves gain weight during the entire weaning period. The calves stay on that side. The cows are over here. Four or five days we'll open a paddock over here and let the cows drift out and still come back to the fence. Another two or three days and we'll take the cows on. And four or five days after than, we'll begin to rotate the calves. Now one thing we do do, is that we put some babysitters in with those calves. We put some dry cows or some big heifers, something, to act as a stabilizing influence on those calves. You wouldn't take a bunch of junior high kids and throw them out on their own. And that's exactly what you're doing with those calves. So we put a few older animals in there to act as the nucleus of the herd. The herd is the social unit of cattle. So with the stabilizing influence are these older cattle, in a few days we're rotating that calf herd just like we're rotating the cowherd. We go out, call; open a gate, and they follow us.
DT: I'm curious. You've been using a hot wire to wean with or keep you're calves healthy, maybe you could show us one of the other ways you keep your animals healthy without using parasiticides or pesticides. I believe you have a little set up over here; maybe we could go over and look at it.
(misc.)
DT: Can you explain how this rub works and how it's alternative to more conventional practices?
0:31:54 – 2115
WD: Okay, David, this is—this is what you call rescue technology. The idea is to plan around problem. And head them off so that you're not constantly, you know, crisis management stomping fires. But sometimes things break down. We have a problem in this country with lice, cattle lice. It is primarily a nutritional situation. But any time you have particularly young cattle on a reduced nutritional plain, for whatever reason, wintertime, you're apt to have an explosion of cattle lice. We had got into that in 1998 on this place. And that's the last time this rub was used. We got a set of calves in poor nutritional health because of the drought. And we had an outbreak of lice. I didn't want to go back to the chemical pesticides so we rigged this rub up. And charged the rub with garlic oil and were amazed at how well it did work. Now like I say, the—the long-term solution is to correct the nutritional problem. Don't try to just fight the crisis management battle. One of the tenants of holistic management is to try to always understand what you're doing. Much of agricul—many of agricultural practices are directed at symptoms rather than at problems. For instance, in

these pastures, we don't have weed problems in these pastures because we got weed seed. We've got weed problems because our management is such that it favors the weeds over the forage plants. And it doesn't matter how many times we spray the weeds with a chemical herbicide. If we don't change our management, as soon as we stop spraying, the weeds will be back. Weeds are just nature's way of filling a vacuum. Nature abhors bare ground. If you have
0:34:11 – 2115
a pasture with nothing in it but weeds and bare ground and you spray the weeds, you'll have no weeds. But you'll have the bare ground, which is much worse than having bare ground with weeds on it. Because the weeds are nature's way of trying to change conditions to raise succession, biological succession. And as pasture managers, that's what we're doing. We are constantly trying to nudge biological succession into the direction that we want it to go. In other words, by biological succession we're trying to bring about a condition that those organisms that are present are tuned to the environmental conditions. That will happen, right or wrong, good or bad, we do influence the biological succession of our pastures. If our management is correct, it is good, succession with grow up. If our management is poor or nonexistent, it'll go down. Under continuous grazing, biological succession will always trend down. There's no way it cannot trend down under continuous grazing. We have to mimic the conditions under which grassland is formed if we want to create that high successional grassland.
DT: Continuous grazing is where … [inaudible]
0:35:45 – 2115
WD: Where animals are always present on an area, where the forage is always subject to being bitten at all times. And under that condition, what happens is that the most palatable plants, the more nutritious plants are bitten repetitively until they are overgrazed and forced out. And of course what happens is that the less palatable, the less desirable plants, the plants that are lower down on the successional level, proliferate and take over. It doesn't matter whether it's mesquite in west Texas or red cedar in Osage or broom reed in this country. There's always a lower successional plant waiting in the wings ready to come in to take the place of plants that are being forced out by our management.
DT: I guess one of the limiting factors on the succession of your grasses is the health of your soil, maybe the major limiting factor. Can you talk about some of the indicators that you might see that would indicate whether your soil is healthy or not?
(misc.)
0:38:24 – 2115
WD: To answer your
DT: I was hoping you could explain some of the things that you look for in this kind of tree that tell you whether the soil is healthy or [inaudible] cycle is working as it should?
0:38:37 – 2115
WD: Alright, David, what the primary dis—primary difference between healthy soil and unhealthy soil, contrary to common belief, is not mineral nutrients. It's the amount of life that's in that soil. I contend that the three most important factors in soil productivity are organic matter, organic matter, and organic matter. Everything else comes behind that somewhere, for the simple reason, if you have organic matter in the soil, you will have soil life. And if you have soil life, you will have available mineral nutrients. Now understand I don't mean that some soils don't need additional mineral nutrients. If you don't have

sufficient calcium, for instance, then you're soil is not going to be as productive as it can be. But we have become obsessed with mineral nutrients to the point that we have forgotten what truly creates soil productivity. And what creates soil productively long-term is soil life. And to answer your question, "How do you know when you're getting there?" One of the best indicators is the earthworm. This pile of earthworm castings right here, we're standing under a tree where the cattle have stomped off the grass so we can see them here, but they're under the grass out there as well. This earthworm goes through the soil taking in soil, digesting the organic matter in it and excreting these castings. If you analyze the mineral nutrients in these castings, every single mineral nutrient would be higher than in the soil from which they came. The earthworm is a crawling fertilizer factory. He takes in the soil, takes it through his digestive system, digests the organic matter, treats the soil chemically, and excretes it. This in a—when the conditions are correct, if we go—if we have soil moisture and the correct temperatures and we go two or three weeks without rain, this particular pasture and most of these others on this sandy clay loam will be completely covered with three quarters to an inch of earthworm castings. That's fertility that you can't buy. It's fertility that's being generated by the organisms in place on the ground. Right here we're also looking at some other indicators of this biological capital that I'm talking about. The armadillo is considered a pest in most places. And he is, he's—he's—he's a little bit of a bother. But he also serves a purpose in the entire system. He serves as a soil aerator. He c—consumes an enormous amount of grub worms and grubs. There are no pest organisms in nature. Every organism in nature serves a purpose. And if we manage our

0:41:58 – 2115

operations to work with nature instead of against her, then we can take advantage of this diversity, take advantage of this multiplicity of organisms and their uses. It's only when we become convinced that we know more than nature and we're going to force nature to do what we want her to do that we get in trouble. And the first thing we've gotten in trouble with is we have destroyed the habitat. And like I told you earlier, I call the earthworm the elephant of soil life. It—it's like an ecology sys—ecosystem in Africa. The elephant survives only in the higher end systems. You can have the gazelle or you can have the predators. But it's only in the relatively unspoiled systems that the elephant can exist because it is so large. And they require so much in the way of resources. The earthworm requires a high organic content soil. It will not exist in a soil that has low organic contact. It just—it just cannot—cannot exist there. So if you see a soil that has a high number of earthworms in it, you can be guaranteed that the organic matter is pretty good. You can also be guaranteed that the other members of that community, mycorrhizal fungi that can extend the effective root system of a grass plant ten times by infecting it. The beneficial nematodes. We talked earlier about the fire ants. The best way to discourage fire ants is to hav—have a biologically active soil. Because then that biologically active soil the beneficial nematodes, the fungi prey on the fire ant. We talked a little bit about grasshoppers earlier. Well if grasshoppers, fire ants, right now the

0:44:15 – 2115

spotted spurge in the northeast, knapweed in—in the northwest, all of these pest organisms, mesquite in west Texas. These plants and animals become pests because they are exploding in a simplified community. The fire ant explodes here because he came without his natural enemies. The phorid fly that they're trying to introduce now that lays an egg in the head of the fire ant, keeps him under pretty good control along with some

fungi and other things in Brazil. The fire ant got here without his normal predators and parasites, therefore exploding. The same thing happened with rabbits in Australia. They imported rabbits into an area with very few predators. They exploded. The mesquite has exploded in west Texas for a little different reason. But basically the same. The habitat has been changed to favor the mesquite so the mesquite flourishes. There's no—nature is totally logical. There are not illogical happenings in nature. You can always trace back and find out why these things happen if we have sense enough to follow it back to the source. And sometimes that difficult.
DT: Something else I was also hoping you might be able to show us
0:45:50 – 2115
WD: Okay, here's some dung work—here's some worked dung but it's…
(misc.)
0:46:19 – 2115
WD: That's a ground beetle. Yeah. He's part of the—he's part of the system. Did you know that of all of the animal species on earth, 90 percent of them are beetles?
DT: Is the dung beetle native to Texas or an African brown beetle?
0:46:41 – 2115
WD: No. No. The—the one that's doing us the most good is the African, onthophagus gazella; onthophagus gazella and onthophagus intermedius. And now we've got the European beetle onthophagus taurus.
DT: Do they all look the same?
0:46:56 – 2115
WD: Pretty much. We'll go up here behind the cattle—with the cattle and maybe I can show you some beetles. The—the taurus is distinctive in that he literally has horns. The male does.
(misc.)
0:47:40 – 2115
WD: This is not a perfect example of what we're talking about. Beetle numbers are way down because of the drought. But this manure pile if you look, has been worked by the onthophagus gazella beetle. See the tunnels right here? The adult beetles tunnel down through the manure pile and bring up dirt. You can see the dirt that is stuck on the bottom of this dung pat. They bury it, dig a tunnel. The female goes to the bottom of the tunnel. The male brings her bundles of little balls of manure in which she lays an egg, seals it off. And he brings her another one; she lays an egg in it and seals it off. That's the way they reproduce. Also working on this same dung pat is earthworms. Now the earthworms only work on the dung pat after it is pretty well deteriorated. As you can see right here earthworm castings coming up in the manure pile. This we can tell pretty close to how old this is since there is a little pecan that was shed off this tree. That would have been shed in early May. So this manure was dropped probably in early May. And the earthworms are now beginning to work on it. It's old enough that the earthworm have begun to work on it. Earthworms don't work on fresh manure, only on manure that's weathered for four to five or sixty days. You look underneath, you can see the holes going down where the gazella have taken down the manure, bred—they're brood balls. One of the things that we're doing here on the place now with Dr. Richardson and Texas University where we had a little research program running, trying to measure the difference in water infiltration, difference in nutritive value, and differences in biological composition where the dung beetles are active and where

they're not. One of the things that we're finding is that water infiltrates into these pats that have been worked by dung beetles by a factor of six to ten times over the same soil right next to it, tremendous difference in the ability of the soil to take in water. We're in the first year of that research now but we'll know more in a few years. We're going to run it at least three years. But the value of this little animal when you consider all of it's multiple factors, the b—for instance, most of the pests that we—insect pests that we're dealing with in cattle are laid in the manure. If that dung beetle desiccates or buries that manure pat, then the stomach worm egg that comes through in that manure, the horn fly egg that's laid in that manure does not mature, we break the cycle of those pests. That's the reason that we no
0:51:00 – 2115
longer have to spray for horn flies. That plus the fact that we are moving the cattle all the time and moving beyond the range of the horn fly. We're leaving the horn fly behind. But when the dung beetle buries that manure within 48 hours, then all of the insect pests that are in that manure are buried. They're gone. The same on the—well, I've got to tell one little story. For years I couldn't understand why we no longer had heel flies on this ranch. Heel fly is a pest that early in the spring the mature fly literally lays an egg on the heel of cattle. That egg hatches, but worm burrows into the skin, travels all the way up through the body of the animal, up through the back, cuts through the—into the chest cavity through into the esophagus, drops into the stomach, later comes out of the stomach, back up through the back again, burrows through the muscle again and eventually comes out the back of the animal. For years we thought we had to use an organic phosphate in the fall of the year to disrupt that cycle. We quit using organic phosphate as much on principle as anything else. I didn't want to handle it. And I'm not going to ask anybody else to handle it. But we woke up one day and realized we had no heel flies. And I couldn't imagine what we had done. I could explain away the horn flies. I could explain away the horse flies. I knew why our stomach worms were reduced. But the heel fly didn't make sense. Until one morning I was coming out of the end of this pasture behind us. It was early in the morning. The dew was on the grass. And I got out to open a gate and looked out across that dew. And it just looked like diamonds. And I—it took me a minute to realize it looked like frost. I couldn't understand what I was looking at. And I walked out there; it was cobwebs, masses and masses of cobwebs strung between grass blades. And that's it. That fly has to emerge
0:53:21 – 2115
from the ground. When it comes out the animal's back, it goes into the ground, pupates, and emerges an adult. When it emerges as an adult, if that total area is covered with spider webs, a tremendous percentage of those flies never make it out. They become feed for the spiders. And that was the thing that was breaking that cycle was that our spider population had exploded when we quit using the pesticides. Now, we still have an occasional heel fly. We have some horn flies. We have some stomach worms. But we don't have a stomach worm problem. We don't have a horn fly problem. We don't have a heel fly problem. Because the diversity has created situations where they cannot explode. We have a grasshopper explosion right now because, due to the drought, we have a reduced forage load. The grasshopper requires bare earth in the fall to proliferate. We've had bare earth in the fall for four years now. Therefore we have grasshoppers. We've had low moisture content at the soil levels in the fall. That means that the fungal diseases that normally attack the grasshopper eggs did not. And most of them hatched. So we have a grasshopper problem. But there's nothing we can do to change that in the terms of technology that

wouldn't make the problem worse. If we came in and sprayed the grasshoppers with a chemical poison, we're just pushing succession further back. It will kill grasshoppers. But we'll do nothing to change the conditions that have allowed the grasshoppers to flourish.
DT: I grew up in a city, what is the bad thing that the grasshopper do? Why are so many of them suddenly so common [inaudible]?
0:55:24 – 2115
WD: Well if you have twelve grasshoppers per meter—per square meter, you have the equivalent of a cow to the acre. They eat that much grass. This pecan tree here that's dead, grasshoppers defoliated it last July and killed it. I—we're going to lose, I don't know how many, 40 or 50, 70-, 80-year old pecan trees. Because they've been defoliated in July and August by the grasshoppers. So, you bet, it's a—it's a—they're a real problem.
DT: I was wondering if we could talk about some of the natural controls that you've been relying on versus some of the more traditional. As I was saying, it would help me if you could explain some of the differences between your approach to agriculture and maybe more traditional land-grant industrial agriculture approach. And maybe use the dung beetle as an example. You've been talking about Truman Fincher's research on how that creature can be used versus some of the more chemical approaches that have been used [inaudible].
(misc.)
0:56:53 – 2115
WD: …in a pile. But maybe one beetle where normally we've have five hundred. This is onthophagus gazella. It's an African beetle introduced into the U.S. by the Agriculture Research Service. Dr. Truman Fincher was instrumental in bringing in these beetles. Tremendous lost agriculture when his work was stopped.
DT: Can you explain why he was needing to introduce dung beetles?
0:57:31 – 2115
WD: Yes. What we have in the U.S. an unusual situation. There are literally thousands of species of dung beetles in the world. The U.S. has very few. And of our native beetles, most of them are not really significant in disposing of grazing animal manure. There again that's onthophagus gazella. It's a burring beetle. Dr. Fincher's is of the opinion that during the last period of glaciation, most of the beetle, the dung beetle, populations that were here were forced south through the Isthmus of Panama. And then the development of rain forests in that area effectively sealed them off from the plains. So we wound up with a situation of a lot of large herbivores. But without the normal component of dung beetles that all—all herbivores everywhere in the world have. And it was his contention, and I think he was proved correct, that we could introduce these beetles from other places in the world under extremely tight control of quarantine. In fact
0:59:02 – 2115
what they would do, they would collect the eggs of these beetles in Africa or India or wherever and literally dip the eggs in formaldehyde, which, as you can imagine, would reduce viability tremendously. But it also prevented bringing in any exotic pests on these beetles. When they were brought in, then they were grown for numerous generations in captivity in the U.S. before they were released. Make certain that we didn't bring in any pests from other—other countries on those beetles. The work was proceeding very well. A number of beetles were brought in, introduced, and—like this gazella, when for whatever reason, The Agriculture Research Service decided to discontinue the program even to the

point of having Dr. Fincher destroy the beetles that he had already brought over under quarantine and had ready for release. Don't want to cast stones. But the only people that I can think of that would benefit from having those beetles destroyed are the chemical companies selling chemical to do the things that we were trying to do with the biological control. In other words, horn fly control. Stomach worm control. And I do know for a fact that some of the people that were working that program immediately thereafter went to work for Monsanto Chemical.
DT: So there are parasiticides that you can buy as an alternative to natural controls?
1:00:37 – 2115
WD: Certainly—certainly. You—we have things now that you can—you can feed animals and take every parasite out of that animal for at least six months. The problem is that when it comes through in the dung, that dung pat is completely sterile. The nutrients that are locked up in that dung pat are going to lay right there until they chemically disintegrate. They are not going to become biologically active. The nutrients are not going to go back into the food chain. We've created a waste problem rather than the normal death-decay-life cycle that is the basis of all life on earth. The dung beetle, the earthworm, the rolly polly bug, the fungi, the bacteria, all of these organisms are responsible. Something that we should have talked about earlier and we have not, the decay cycle. One of the—one of the—you asked me about signs of a healthy soil. If you get into an area and you—you reach down on the soil level and there is no—there is no decay level on the surface, if there is not a difference in the color of the soil right on the surface, see how dark that soil is as compared to the soil under it, well that wasn't a good example because it's dark on down below that. But that top A horizon is where the decay cycle takes place. In a healthy soil, that area will be deep. The area of strong biological activity where there are many, many different organisms breaking down…
End of Reel 2115
(misc.)
0:00:43 – 2116
WD: Actually I'm kind of glad to see him. Our snake population is low. This manure is not; I was having to hold cattle on this pasture to use as some old forage. Fiber content is quite high in this manure. And that's why the beetles aren't working it. This is not—this is not the way you want to see manure behind a set of cattle.
DT: [inaudible]
0:01:23 – 2116
WD: Any time that manure stacks over two inches high, the fiber content in that forage is so high…
(misc.)
DT: We could try going back to that other one. There was one there, that was the only one that looked good?
0:01:35 – 2116
WD: That's the one…
(misc.)
0:01:40 – 2116
WD: Talking about the decay cycle as being one of the natural processes that we have to work with in nature, if we're going to be sustainable. The dung beetle that has buried part of this manure pile and brought the dirt up through it—incidentally I should—they've been

enough farmers and ranchers in your audience to say, “That old boy is a very poor manager” simply because this manure is very fibrous. And they’re absolutely correct. I was holding cattle on this particular area to utilize some old grass simply because we had to. We didn’t have a choice with the—with the drought. But can you see the life in that manure? Can you see the little grub worms working it? See um? Are you getting them right there, the little worms? This is a part of the normal natural decay cycle. It is what has to happen. Everything from the little fly larva right here to this little worm over here, whatever he is, to the dung beetle. Later on the earthworm will come up
0:02:52 – 2116
under it. The pill bugs will begin to utilize it. They will convert this waste product back into nutrients, nutrients for soil organisms and later on nutrients for higher plants, which will in turn be converted into nutrients for animals. Life—death—decay. It’s a never-ending cycle. And when you interrupt that cycle with something like the chemicals that sterilize this dung pat in order to keep horn flies from hatching in it. Then we kill all of the life forms in that dung pat, we interrupt that cycle. Therefore we waste these nutrients that are tied up in this manure instead of going back into the soil immediately become food for microorganisms, later food for higher plants, later food for animals. It’s a waste product. This is one of the things that we’ve lost touch with in modern agriculture. We have to work within nature’s framework. We can push on nature occasionally. We can violate the rules occasionally. But sooner or later it catches up with us. The factory hog farm is on the high plains of Texas or Kansas, we are importing nutrients in the multi-tons and concentrating waste. It’s no longer nutrients. The waste from those hog farms is being stored in open pits. Anything they can think of, they’re trying to figure out whether is to burn it. That’s the nutrient. That’s the lifeblood of our soils. If we don’t do a good job of managing the resources that we have, our civilization will fail. If you go back in history, every major civilization has failed, if you follow it back, failed because they lost their watershed. They lost their soil base. You say, “Oh no, Vandals invaded Rome.” Yeah, but by the time Rome fell to the barbarians, they had been importing corn from North Africa for two generations. The Egyptian society
0:05:37 – 2116
failed because they destroyed their soil. The Anasazai in southwestern of North America failed because they destroyed their watershed. Every society that has failed that I’m aware of has failed because they have not taken care of their resources. Now it’s bad enough that our society demands that we have cities. And all in the world a city is is a cesspool. Resources come in. Waste comes out from a resource standpoint. But now we’re doing the same thing with animal agriculture. We’re creating hog farms. We’re creating confinement dairy. We’re creating confinement chicken houses that completely overwhelm the area around them’s ability to utilize those waste materials as fertility products. They become waste products. The fertility that is mined from the soil in growing plants, transported to these factory farms, comes out as waste, it’s—it’s—it is now a liability rather than an asset. If the manure stays on the land, it is an asset. It is the source of new life in the microorganisms, in the plants and the animals. We had best rethink out methods of agriculture if we don’t want to follow the Anasazai. That sounds maybe a little farfetched. But I can take you to places that, as a boy, I knew as virgin prairie that today I can’t bury the blade of this pocketknife in the soil, even though the soil is ten feet deep. Because it is so devoid of life that it’s just like concrete. We have lost the life in that soil and therefore we’ve

lost the productivity in that soil in 40 years.
DT: Given challenges like that, what sort of advice would you give to young people coming up who are concerned about this same problem?
0:08:02 – 2116
WD: Agriculture is an extremely hard way to make a living today. It's one of the most rewarding careers that I can imagine. If it's—but it's almost like the priesthood now, you'd better have a calling if you're going to do it. Because it—it's—it's not simple. And I would not even advise anyone, any young person to take up a career in conventional agriculture. If—if you want to go back and farm like in the manner that is conventional today, I'd say go get a job selling shoes. If you want to make the complete shift to sustainable agriculture, then I would encourage you to get with people who are trying to develop the knowledge base that's being developed at this time. And it is being developed. There are people who are working very hard in the field. A lot of good work is being done. A lot of knowledge is being discovered. But we don't have all the answers yet. Part of the reason we don't have all the answers is that a lot of the knowledge that was common 70 and 80 and 100 years ago has been lost. Some of the best information that I find is in books that were published literally 80 and 100 years ago, when we didn't have the option to give a quick fix chemical. We didn't have the opportunity to get a bigger plow, a more potent herbicide. We had to work within nature's cycles. When you don't have the—when you don't have the option—and this—this is the thing that to me that is—that is truly insidious about what I call toxic agriculture. Sure, it—it's—these materials are bad. These materials are poisonous. They're—they're deleterious in any way that you want to look at them. But perhaps the most insidious thing about them it comes back to the mindset that I can solve this problem by spraying. I can solve this problem by using this quick fix. There are no quick fixes in agriculture. There are no quick fixes when you're dealing with a biological
0:10:44 – 116
system. You're dealing with an extremely complex system. And when you impose an economic system on top of a complex biological system and on top of that a sociological system, then the complexity reaches points of—you can't conceive of complexity. And every time we try to make a quick fix, we wind up creating more problems than we've solved. So, answer your question, understand that it's—it's not going to be easy. It's not going to be lucrative in the short-run. But I am convinced that the work that's going to save American agriculture is not being done in the labs now with genetic modification of organisms, or with new chemistry techniques. It's being done on family farms and ranches all over the country where we are rediscovering the techniques that allowed our grandfathers and great grandfathers to produce year after year on the same land without tremendous inputs. It is possible. It can be done. But not with the mindset of today. You asked earlier about the principles. It all comes back to managing the water cycle of the land, the nutrient cycle of the land, the energy flow of the land. If we manage these three ecological blocks; water cycle, nutrient cycle, mineral flow, we will impact biological succession. And this is what allows us to shift the environment we are working with into the direction that we want it to go. If we have a good functioning water cycle, if we have a good functioning mineral cycle, and we have strong energy flow, biological succession with advance. The whole system will become more productive and more stable. If we short any one of those, then biological succession will either stop or regress. We can have good energy flow; we can have a good mineral cycle.

0:13:30 – 116
But if our water cycle goes bad, then succession is going to gre—regress and go backwards. All three have to be managed at the same time and all three have to be going forward. What we're trying to do, and when I say we. I'm speaking primarily of holistic resource management and the sustainable agriculture movement, is to manage our resources in such a way that we achieve the goals that we have laid out. And in such a way that the people that follow us will also have those same resources. And perhaps a better condition to work with than we did.
DT: Well said. I guess I had one closing question. We've been lucky to see your place here in Oklahoma. And I'm wondering if you could describe a part of your place here that—that you've found especially rewarding or pleasant to visit. Perhaps there's another place in the outdoors that you enjoy and that gives you some respite?
0:14:46 – 2116
WD: We're standing in one place that—I farmed this piece of ground for 12 or 15 years in row crops. And putting this piece of ground back to grass I think has given me as much pleasure as anything I ever did in my life. And aside, I—I'm—I'm constantly bombarded with, "That's fine, you can do that. But I've got to pay the mortgage." This is where we make our living on this land. So if it doesn't pay we can't do it. It has to be profitable for us to do it. We've been on this—my family has been on this piece of ground since 1950. We were never consistently profitable until we began to make the changes toward what we're doing now. We would be extremely profitable one year and go in the whole the next depending upon the multitude of factors but primarily the problem was we had no stability in our prog—in our production program. We couldn't count on anything. As we have moved away from the high input type agriculture, possibly the most valuable thing we have gained is stability. This drought that we've just come through, it's been hideous. In 1988, we're in a 40-inch rainfall belt. In 1988—1998, we had 18 inches of rain on this place. In 1999, we had a 19.7, something like that. And six inches of it fell in December. We've been through a hideous drought. And our country is in bad shape. We've had to de-stock. But we came through in better shape than—by far than some of our neighbors who were still practicing what I would call conventional agriculture. We did not have to totally de-stock. We had to cut our numbers back. We cut our numbers back in 1998 for the first time since I've been on this place. And we've been practicing this type management basic—well, we started trying to practice this type of management about 1974. It was in the middle '80s when we really began to hit our stride. And I would say we were practicing something akin to holistic management by the mid '80s. During that time, we've had some extremely bad times. We had a hideous drought, hot spell in 1980. And another one in 1988. In 1990, 85 percent of this ranch went under water in a flood. Now, did we have problems? Certainly, we had problems. When 85 percent of your land goes under water. But one of the things that we saw as a result of that flood was the land that had been under what we consider good management; the longest was the land that recovered the fastest. One piece of ground over on Blue River that in 1990 had been under high stock density grazing for about 10 or 12 years, as the water receded, the water was over that particular piece of ground for 21 days. As the water receded, earthworms were opening their burrows at the water's edge. The land was still alive. Right over this ridge right here
0:18:20 – 116
where the land had been in cultivation until just shortly prior to that flood, the water

stayed on th—that about two weeks. And nothing grew on that piece of ground for the rest of the year except a few annual weeds. The soil was dead. The rapidity with which the land recovers, and when I say land I'm talking of the whole soil, plant, animal complex as being the land, the land and everything that's on it. The ability of the land to recover from adversity, whether it's flood, fire, drought, whatever it is, is in direct proportion to the amount of biological capital that's built up in that land, and amount of biodiversity in that land. That's all in the world biological capital is, is biodiversity plus the long-term effects of having biodiversity. It's the healthy populations of healthy organisms, whether they're plant, microorganism, animal. It's the organic matter that's in that soil. It is the stored solar energy in that system. That's the biological capital. The higher that biological capital, the higher the product—potential productivity of that soil, or that land, and the more stable that land is. If we have one purpose here, it's trying to build our store of biological capital. If we have that biological capital and are reasonable managers, then over time, the financial capital will follow.
DT: Thank you. I think you've taught us a lot about how to bring stability and sustainability back to agriculture and I wanted to thank you.
0:20:05 – 2116
WD: You're welcome.
End of Reel 2116.
End of interview with Walt Davis.