

TRANSCRIPT

INTERVIEWEE: **Clark Hubbs** (CH)

INTERVIEWERS: David Todd (DT) and David Weisman (DW)

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Numbers mark the time codes for the VHS tape copy of the interview. "Misc." refers to various off-camera conversation or background noise, unrelated to the interview.

(misc.)

DT: Can you tell about some of the places that you went on these field trips?

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CH: Well, when we did this, much of the work was done in a study of the Great Basin. What my father was trying to find out was the connections between isolated valleys and the major valleys and we would catch the fish and if the fish were like ones in the major valley, we knew the water had to have gone back and forth between them during the (?) periods during the (?). One of the things is well known is that there was a thing called Lake Lahontan and covered about 1/3 of Nevada and the fishes in that lake were designed to live in that lake and the adjacent valleys had similar fishes but they were slightly different. Since the (?), they have changed and therefore by checking this and also using some altimeters and things like that, he was able to work out the drainage basins in Nevada during the (?). And much of the—many of the fishes that we were collecting in those isolated basins were (?) and therefore we got a dollar each. Except for

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couple of places, real isolated places, then we got five dollars. And that was, of course, for a teenage child, that was a—a major reward. Of course, remember this is 1934 and 1938 and that probably is equivalent of ten times that much money in present day economies. We—we were pretty well off. Of course, my father got the papers out and, of course, that meant he got pay raises and promotions too. So getting the extra money was a value to him too.

DT: The places that you find these fish, were they mostly desert springs?

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CH: They were desert springs and, in those days, the ranchers were very happy to see somebody coming because they—the roads were let's say less than they are now and they're bad now. And I remember one time, we went to a place in 1938 I think was in '86 I went back there for other reasons and the child who we came along with us because it was something strange was now the rancher and he remembered with a lot of pleasure a trip forty years ago when we were there doing it and he still talks about the good old days when he was there. It was a—one of the highlight of his life so we visited his ranch—actually it was his father's ranch then. And his father probably was, by that time, deceased. And it was just a pleasure for him to have seen this sort of unusual approach that you do when you catch these fish and then take them back to the museum. It was different than he was used to.

DT: Do you find that ranchers and landowners are equally welcoming now?

(misc.)

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CH: Are ranchers agreeable to people coming there with a certain aspects of the Endangered Species Act, sometimes they are not. I mean, some of them are and some aren't. It's very different depending upon which attorney talked to them. Some of the attorneys that try to make money off of them, try to make them oppose the Endangered Species Act just because they get money as attorney from them. Some of the other ranchers are supportive and the—the ranchers I go to and I went to yesterday, the rancher is very happy to have me come there. He owns a ranch which has one endangered species on it. And he owns an endangered species, in fact, and he's very pleased to do that.

DT: Could you tell about some of your field trips in Texas then?

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CH: Well, I've been many, many places in Texas. Starting in—well actually bef—one of the trips was with my father so my real work in the state was as—as a teenager but after I joined the faculty, I—I visited probably 200 different counties in Texas and collected fishes in—in all of them. And sometimes I go back to find changes. Right now I do a fair amount in spring areas and the springs have changed because spring water is

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very valuable to the economy and if you use it for economic growth, why you make a short-term gain. If you save it, it's a long term gain. And much of the problems that we have with endangered species such as the Barton Springs salamander, the fountain darter are because someone wants to make money quick and not make money for the long term. And if they were to not use the water up as sometimes they do, the long term economy would be good, the short term economy would not gain. But there are serious potential problems when you use up water because water is—when you have water in—in the ground, in the aquifer, the only mouth it really comes out is the mouth it comes out and if you take more out then there's less in the aquifer and the aquifer dries up and then the City of San Antonio no longer has the water supply. And that would be a disaster. I mean, San Antonio is—is facing potentially a discontinuation of water available for drinking and that would be very bad. And they—if they are much more water conservationists, they can have water forever there and they'll be much better off economically, long term. Short term, no. Short term's fine. They make money now and they don't worry about tomorrow. I worry about tomorrow. Even as old as I am. I—I think of problems for my grandkids and I would like to have my grandkids have all—all the economic benefits I had.

(misc.)

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CH: There have been—there have been two court cases relative to the Edwards aquifer. The first was the Sierra Club versus Lujan et al. He was the Secretary of Interior under Bush. That was the big case where Judge Bunton decided that they had to protect the endangered species in Comal and San Marcos Springs and the thing that bothered me, as much as anything, is that San Antonio spent so much money on attorney fees that they could, rather than spend money on attorneys, have bought water rights from everybody under the sun for—for less money than they spent for attorney fees. The—the—there's no question that the overdraw of the water from the aquifer is hurting the endangered species as it is right now. Well not right now because there's plenty of water because the October rains filled up the aquifer and it's full. But probably in August or September it will start to have a negative impact on the endangered species during the drought and that will be a

serious problem. The other one is a court case of the Sierra Club and me for various reasons against the Department of Agriculture. They pay money to farmers to—to irrigate fields. The law reads that they should pay money to farmers to use water carefully to irrigate fields and that is a decision of the judge which has been affirmed by the 5th Circuit. So that is the law that—for agricultural pay—payback, you've got to use water conservation entities and that is the other court case that's involved. One—one of them was—the first one was relative to general water use. The second one was just exclusively to agricultural water use. And if you use water carefully, then you get federal money. Federal money to a farmer is a very big thing because a fair amount of is there. Those are the two court cases. They're slightly different but they really are both to preserve the—preserve the endangered species. And primarily that's the fountain dire.

DT: Can you describe how groundwater pumpage affects the...

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CH: Well there—there is—there is a given amount of water in the aquifer. It—it comes from several sources in—including basically Nueces and the Frio Rivers and the Sabinal and other—other areas. When the water—those streams flow across the recharge zone, that water commonly goes in—most of it goes into the aquifer and that's the water available for the City of San Antonio, the farmers and the springs and the downstream farmers which use that water sold to them by the Guadalupe Blanco River Authority as irrigation for rice farms. It also is useful for the bays and estuaries, it's inflow to the bays and estuaries which mean shrimp and shellfish and other fish captures. If you cut down the—the water there, there's less shrimp available for the commercial fisherman. There's less red drum available for the commercial fisherman. The water has a lot of values besides just the direct value to the City of San Antonio or to the irrigators, the downstream water users, have a—a economic value to that, value to them as well.

DT: I understand that some have argued that groundwater pumpage doesn't affect close to some of the springs, how do you respond to those?

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CH: I would use an obscene set of words. It's—it—it's totally incorrect. It—to say that water taken out of an aquifer has not affect on the discharge form the aquifer is incorrect. Period! It's a wrong—wrong comment. There's—there's a certain amount of water goes in and if you take some of it out, come out in the springs somewhere else or doesn't available for, let's say, for the City of San Antonio. I mean, the classic case is the so-called catfish farmer who takes about a third of the water that San Antonio uses and—and re—and uses it for raising catfish and that water use is a substantial withdrawal from the City of San Antonio. And—but on the other hand—hand, he—he thinks he has a right to take all the water he wants. I think the Edwards Aquifer Authority may have an argument with him on that. Once, of course, the water supply in the aquifer is closed down. Right now the aquifer is—is pretty well full and therefore, you can use the water.

(misc.)

DT: Could you tell about the trends that you perceive...

(talking at same time)

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CH: I would argue that the problem associated with the Edwards Aquifer is a statewide problem. There is a very serious problem near Balmorhea where again we had an endangered species problem and the water in that spring has declined about 98%. And

the—it—it's a serious problem. It—the—you may recall, there was a court case about someone whose well was dried up by someone who pumped water out for, I think, (?) water. That's East Texas. The problems are—are all over the state. Water in the—in
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the—in this country actually and this state particular, is a very valuable resource and using it should be done with great care. There's no need to panic. There's lots of ways of—of conserving water and not using too much. For example, in our house, our front lawn is made of buffalo grass and we water it probably a quarter of the time that people who have carpet grass water it. And that saves water, although there's no serious water problem in Austin, it's just that there's lots of ways of saving water. We don't pay as much for our water in—of our yard as somebody else and I'm a cheapskate. I like to save money. If I can save money, I save money. And it also benefits the state as a whole, although the Colorado River has a lot of water right now. The—the water storage in the Colorado Basin is—rather large. Right now it's in good shape.

DT: What sort of role do you think the Water Authority, the River Authority, etc., what sort of role do you think they play? (I couldn't really understand all of the question so this is sort of ad lib)

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CH: Well each—each state agency and—and—and the various River Authorities tend to be in—they're economics is a sell water to someone who uses it and therefore, they want to have more water sold because that means they get more money and that water does not go to the estuary. It's sold to go to farmers. And that—that somewhat aggravates the problem. Some of the water agencies and their boards are more environmentally conscious than others. And, at times, a River Authority is less water conscious than other

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times. Back in the 1960's and '70's, most of the executive directors were ex Army Corp of Engineer officers and they didn't have a—a great deal of environmental consciousness. The more recent ones tend to be more environmentally conscious and even the Corp of Engineers has become much more environmentally conscious when they lost a bunch of court cases. And when they lose court cases, they wind up—the colonel in charges gets early retirement and he doesn't like that. So the next colonel that comes in there is much more environmentally conscious because he doesn't want to lose a court case and therefore, they've learned a lot, the hard way. And I've been involved in two or three where a colonel got early retirement.

DT: Can you tell about some of those instances?

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CH: Well, the—the first one I ever got involved with was a river in Arkansas called the Costatot(?). They wanted to build a reservoir there and their knowledge of the—of the environmental ecology was effectively zero. And therefore, they lost and the Corp of Engineers colonel got retired. The—the next one I did a lot of was in the Tennessee River Water Canal thing. That was a very big economic thing in those days—it's a—it's a boondoggle for Eastern—Eastern Mississippi because all they did was pour a bunch of money in there to do very little, really either economically or environmentally. But 3 billion dollars in those days and because it got enjoined, another Corp of Engineer colonel had an opportunity to watch TV on his afternoons rather than be a—be a colonel

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and he didn't like that. Eventually that got reversed but—in fact, all of them got reversed but—because NEPA is the court case that accused—NEPA—NEPA is—is a unusual law case. If you say we're going to mess up the environment thoroughly with everything we do, that may be bad for PR but means you can get by NEPA regulations, you say we do—we're going to do horrible things and—to the environment and NEPA only says you got to tell the truth and if you don't tell the truth, it doesn't—you—you do horrible things. But, of course, that means your PR is horrible. And most—most Corp of Engineers like good PR. But—and they—they do things—as you may recall, at one time I got involved in what was called Glen Canyon Environmental Studies. That was on the National Academy Review Panel and we made a few recommendations that got passed. Some of them didn't, including some tests of letting water go out as an artificial flood from Glen Canyon Dam. Bruce Babbitt got a lot of PR from turning the—turning the faucets to make—make the artificial flood and that did help the endangered species downstream. And it also helped the environment thoroughly downstream. The problem with the Grand Canyon is that in Grand Canyon National Park, there were some tests run as to how many of the native—what fraction of the fish are the native fishes and what fraction are—are introduced or exotics. The exotic fraction is 98.5%. The—that doesn't leave much for the native fish. And that's in Grand Canyon National Park which is supposed to be designed to protect the native ecosystem. And there nothing we can do about it cause you can't get rid of the endangered fish but that—that does cause a prob—the—the flood helped things out. The artificial flood—they run the artificial flood, the native fishes will go up to about 5%. That's a huge number compared to 1 ½. That's a threefold increase.

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That—the Bureau of Reclamation, the Corp of Engineers are the really the major dam building entities in the federal government and they've learned a lot. They're much better off now than they were. Of course, it depends upon who is the Secretary of Interior or the Secretary of the Army and those are appointments by the president and those are way beyond my control. What the president does making appointments may or may not be an environmentally conscious individual. Bruce Babbitt is very environmentally conscious. I'm not so certain about the Secretary of the Army. I don't even know who it is. And he—and he appoints the colonels. I mean, he's the guy that puts the colonels there that run the various districts of the Corp of Engineers. And, of course, their job is to get water for people and the environment is not necessarily high on the legislative agenda as passed by Congress. And Congress, of course, controls a lot and my influence with the congress is probably not very high.

DT: It seems that Congress also is not very receptive to environmental concerns but it seems the public is more interested. Can you speculate on why...

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CH: Well there has been a—there's a real neat test made years ago in Colorado where they have problems with endangered species. They tested—tested three groups; the environmentalists who were all in favor of the endangered species, the general public which was more or less in favor of the endangered species and the politicians—these are Colorado politicians—who were basically against endangered species. The politicians

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are behind the time relative to the basic concern of the population in general. Running our reason—reasonable environmental platform might get you elected as a politician. Running

as an anti-environmentalist might easily get you retired. And then that, State of Colorado—I think it was a difference of 15% of the—(?) endangered species between the general public and the politicians. There's a much more favorable environmental concern by environmentalists. General public was much more concerned about the environment than politicians. And I think that's true here. This—this State, the environmentally concerned politicians are probably a minority and the majority of our legislature is—is still behind the times. They'll—they're—they'll catch up sometime but the way it'll happen is when someone gets retired early. They don't like that.

DT: Can you talk about some of the surface water reservoirs and other projects here in the State?

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CH: Well, of course, it—it—it's now passed the day when you build new reservoirs. The frequency of reservoir construction has declined since about 1985 and the amount of reservoirs that are being built is vastly less than it was—it was in the past. We did a study a while back starting with 1953 and checking the amount of change in the fish community and if you take the amount of change and then you make a plot of those data, make a plot of the acre feet of reservoirs constructed and the two lines are identical, more times than—more reservoirs built, the more rapidly the environment changed and the—

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when they slowed it down, the environmental change stopped. Or it didn't stop, it slowed down. So the—the change in the aquatic ecosystem and I—I work with fishes—I'm convinced that that is the entire aquatic ecosystem that's involved and the changes are directly correlated with the acre feet of reservoirs.

DT: What is the connection between reservoirs and damage to...

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CH: Res—reservoir—Texas did not have a natural lakes. It had streams and a reservoir is not a stream. If you want to really destroy the aquatic system of Texas, you do either of two things. You build reservoirs or dry the streams. Those are equally bad. The—the—they cause a very serious, negative effect on the native flora of the state. Now to some people, native biota may not be very important because many of the reservoirs have good bass fishing and good bass fisherman like more bass fishing and they don't do it all—a lot of bass fishing on streams. They do it on reservoirs and therefore, those people like more reservoirs. But the—but the day of reservoir construction in—in the—in the—in the United States is more or less done. It won't happen very much anymore because the Endangered Species Act and NEPA more or less make it very difficult to build major reservoirs anymore. There—there may be 3 or 4 more built in the state but, at one time, they were building 10 a year. And now there may be—they may build 3 a decade. That is a big change.

DT: With the dams that exist, do you think their operation is going to change or they'll be taken out perhaps

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CH: Well, I don't foresee any reservoirs being taken out in the state. They're all fairly new. The reservoirs that are going to be taken out are old reservoirs in—particularly in New England States. Those reservoirs are—are old and the dam construction was not done in the best—back in—say 1890, you didn't build a dam like you built in 1930 and therefore, the dams have other problems in addition to what they cause to the ecosystem. They also

in—in—in the northeast they've stopped salmon runs and salmon are a major economic value. And it has not yet come—come through that red drum have a value and when you keep the water from going to the estuary, red drum don't become so abundant and therefore, an economic loss. You—you'll note I used a different word for what commonly is called red fish. Red fish are really red drum. For—for—for technical reasons, the proper term is red fish—red drum rather than red fish but they're sold as red fish all over the state. And it's a very major economic value to the state. Shrimp is a major economic value. And you don't let water go to the estuaries, the—you—you lose shrimp and red drum and that's an economic loss to somebody. And I like to eat—eat shrimp or red drum or—or crab and so on. You may or may not know I take revenge on crabs. At one time, a crab put a hole through my leg. It was very mad at my students and he got the professor instead and I had a hole through my leg and the—the minor part of my injury was a tear down my leg which took 28 stitches. The other part was—was much worse. And I—I got fairly seriously injured by a—a—a blue crab. It was a male because it had to be a male because the females don't have that big a claw and it went right through my calf. But so I—so I eat blue crab whenever I have a chance because I got to get revenge.

DT: Speaking of shrimp, I think a lot of the shrimp in Texas and from around the world now is from aquaculture farms. Can you talk about the...

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CH: A good aquaculture is superb. Most aquaculture facilities of the state stink! They—their capacity to do things is terrible. They turn—they release products into the—the discharge canals that include their shrimp which are—which isn't to say they are not Texas shrimp. They do—no one raises commercially Texas shrimp. They should try to figure out how to raise Texas shrimp and they'd be much better off and the regulations would be less. They're exotic shrimp and they carry exotic diseases and the exotic diseases may wipe out the coastal shrimp industry. There is a very serious concern that the shrimp industry could—could wipe out the—so the shrimp aquaculture industry could wipe the valuable commercial industry from commercial catch because diseases could—could kill them all. And that—that's a problem. The other half of it is the—there's catfish raised. The catfish actually are a native catfish so they're not—if they get loose, they're not too bad. There is also what's called the tilapia industry and the tilapia industry is a disaster economically to the recreational fishing in this state.

DT: What's the threat?

(misc.)

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CH: All right, I'll go back through—the problems with shrimp industry is that they are exotic shrimp and they have exotic parasites. Those exotic parasites are not contained within the shrimp farms. They are being released into the estuaries and they could wipe out the shrimp fishery. There's a reasonable probability that no more commercial fishing for shrimp will happen—well maybe no more is too strong a word—maybe the—the shrimp industry is caught by shrimp fisherman offshore, may be at 10% of what it is now and that's a fairly serious decline because the—that—tho—those parasites could negatively impact the abundance of shrimp and that causes a serious problem. There's another problem and the fish—fish farms use two kinds of fish. One is the channel catfish. They're native and turning them loose won't cause much of a problem. The other is tilapia. Tilapia turned loose has a very serious negative effect on live mouth bass abundance and

live mouth bass fishery which is an economic value, may be destroyed by those releases. There is no question that the release of tilapia is—in the—in some places has been seriously impacted. Over half of the bio mass in the Rio Grande downstream from the Amistad Reservoir is tilapia. That means the other fishes are down by almost cut in half and that's a fairly serious negative impact.

DT: Can you comment on exotics, many of which have been introduced from grass carp to other kinds of fish?

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CH: Yeah grass—basically exotics are released and they don't have the—the natural biological controls. And therefore, they become very abundant. I mean, the grass carp has had serious negative effects outside of this state. They're not really very thoroughly abundant in this state presently. Their use is banned other than using a—a type which is called triploids which have three sets of chromosomes and have very reduced fecundity and with reduced fecundity, they—they won't dominate so badly as using a normal diploid. There's two chromosome sets versus three chromosome sets. If you have three chromosome sets, you tend to be—have low—lower fecundity, lower reproduction. They usually call them sterile. They're not sterile. They have reduced fecundity and reduced fecundity means instead of producing 100,000 eggs, they may produce 100 eggs and 100 eggs is—is a much less likely to dominate the population than 100,000. And that's the grass carp situation. To use grass carp in this state, you've got to use triploids or else break the law. Now the grass carp raisers in Arkansas, they would like to send diploids to the state and they probably do but, of course, it's illegal. But the only person that gets the impact is the guy that bought them, not the guy that sent them. The guy that sent them should be the one that gets penalized, not the guy that bought them. They advertise them as better than the triploids. They—they don't care about Texas law. It's Arkansas and they're controlled by Arkansas law.

DT: I understand that Parks & Wildlife was involved in introducing these fish and then they've had...

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CH: No, no they've always opposed it. It was introduced—it was introduced—the original introduction to the state, legal introduction, was done by legislative act into Lake Conroe and the legislature passed a bill saying that they can be put in and they were diploids. They were put in. And what happened was they became reasonably abundant and some of them went downstream and now there is a grass carpet fishery in the Trinity River which is downstream from Lake Conroe. They have problems in Lake Conroe. It was—there was—it was—the problem in Lake Conroe was based on an exotic plant, hydrilla, which caused problems in—in—in boating in—on the lake. And therefore, they wanted to get rid of the hydrillas so they could—could boat. They put the—the grass carp in, they got rid of the hydrilla and therefore, there was no vegetation on the shore and the shores eroded with—with wave action. So basically when you turn loose an exotic and you turn loose without the control and, of course, I don't think they even should use—I personally don't think they should use triploids here but I'd much rather them use triploids than diploids. Diploids are a much more serious problem with the exotics.

DT: Can you talk a little bit about the introduction of exotic, aquatic vegetation?

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CH: Well hydrilla got originally brought into Florida and it got introduced elsewhere and

got introduced into Texas. The problem with hydrilla is that if you have an outboard motor boat and you take it from one lake to another lake which is commonly done and you have a little bit of a strand of hydrilla on your propeller, it's an annuli and it's in—in essentially all waters in the state. It's causing very serious problems with regard to San Marcos and Comal Springs. The—the native aquatic plants are definitely being impacted by introducing hydrilla all over those lakes. And causing problems associated with presence of endangered species. So hydrilla has gotten everywhere because it just got turned loose. That's all. I mean, if you could persuade all fisherman whenever—or—or water skiers, every time they move between one lake to another, make certain that they have cleared their propellers and their bilges of all aquatic plants. It wouldn't be introduced. It's almost now too late because they're probably in 90% of the reservoirs in Texas causing all kinds of problems with regard to recreational use to the—to those reservoirs.

DT: What about things like Pfiesteria that are affecting some coastal waters in other states...

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CH: Well in other states, it—it has not occurred in—in this state to my knowledge.

Pfiesteria it causes problem that impacts the aquatic vertebrates which we usually call fishes but they could be called sea turtles. And, of course, if you happen to be wading into the water, it could impact you. And humans don't like to have their legs—parts of their muscles or legs decompose and fall off. It's a—it's a fairly serious thing elsewhere but it does not occur in Texas and because people are very careful about that one, I doubt that it will get here. I think it's prob—we're probably safe at least for another half century or so.

DW: Where do they have this because I'm not going there?

CH: North—North Carolina. North Carolina is where the problem is. Least—least I think.

Now remember I—I haven't done anything with this. All I've done is read—read the newspaper accounts and I will be in a meeting in North Carolina the—in a couple of months and I'll probably hear a hell of a lot about it but I'll be inland and I won't go in—in the water there. It—it's an estuarine thing. It occurs only in brackish water so if you work in fresh water, it doesn't occur there. Red tide is another one which occurs occasionally in the state but that's a natural event and it's an—it's something the—the system is accommodated to take care of. There's another one which occurs in inland saline waters. It's called the golden tide which in the late '80's, effectively wiped out all the fishes in the Pecos River between New Mexico and Amistadt Reservoir. Killed every fish.

DT: What was it?

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CH: It's—it's something like red tide except it's the golden tide. (?) rather than (?) whatever it is. It's different—different form. It produces toxin that kills fish. There's evidence that it killed fish back in the '30's in the Pecos River and probably back in the

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1830's. It—again it's a natural event and—and the river now has recovered and it's back in the state it was before. Now the Pecos River is not really a very major river. As some of you may be aware, the Pecos River probably has a commercial fishery, recreational fishery of say 1% of the Colorado River between here and the coast. And that's—it's a very small economic component.

DT: Can you talk a little bit about the efforts to restore fish in some of the West Texas springs?

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CH: Well, there have been problems with exotics in West Texas and one of the problems was an area that's now owned by the Nature Conservancy. It's called Diamond White Springs. It's on what is called Diamond White (?). It's the outflow from Leon Springs which is now dry because it's—it dried up for irrigation purposes. Diamond White Springs is much too saline for people to use for agricultural purposes therefore, it's a pretty good spring. It still works pretty well. Somehow a exotic fish got in there and effectively wiped out an endangered species there. On two occasions, we've gone in there and taken out all of the—them and had the endangered species in a hatchery and we put them back after we took care—took out the—the exotic introduction. We used a chemical which is called rotenone or another chemical called antimycin. These are—are toxins to aquatic ecosystems and if you do it carefully you—you can help things out. If you don't know what you're doing, you can really mess things up rather badly

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because, at one time, there was a policy in fishery biology in North America that you go to the reservoir, you wipe out all the fishes in the river basin so you could start out with what you wanted there. And they—the classic case was the so-called Green River operation where they had what's called Flaming Gorge Dam and they're going to have—put a rainbow trout fishery in there and they wiped out all the fishes or tried to wipe out all the fishes in the north—the southwestern corner of Wyoming. They made a mistake and instead of not only killing those fishes, the poison got downstream into—into Dinosaur National Monument and that caused a minor explosion because they killed all the fishes in a National Monument. The Secretary of Interior got some noise and since the money was paid for by the Fish & Wildlife Service who also works for the Secretary of Interior, someone got his anatomy chewed rarely thoroughly. And they did it in this state but they don't do it anymore because it very obviously did not succeed. It was based on work—there was very good work done on farm ponds in Alabama and when you treat a reservoir, you don't kill all the fish. A few fish survive and they tend to be the fish you don't want. What—if you talk about suckers and carp, they're very resistant to rotenone and therefore, they're the ones that survive and then a year later you put in the—the fish you want but, by that time, the other fish have had a year there to grow, be big and have babies and you got more of the bad fish than you started out with. So when you try to improve it for—for recreational fishing, in effect you—you hurt the recreational fishing because you'll increase the number of fishes that aren't used for recreational purposes. This is no longer done. I mean, the—the amount of—of fish killing like that is done very carefully. Before it was done just as a routine procedure and people did not understand the ecosystem and they treated and they killed out fishes and they shouldn't have. And I—I didn't think it was a good idea and got notorious for thinking it was a bad idea.

DT: Can you tell us about what might have been one of the stupidest things you've ever seen?

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CH: Well one of the stupidest ones was the Green River operation I just discussed. I mean, it—it—it costs probably a million dollars of recreational fishing money. And—and it wound up as a—about a 40% negative to the abundance of recreational fishing. So instead of helping recreational...

(misc.)

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CH: Well the Green River operation wound up as a—probably a negative recreational fishing benefit of—of minus 40% so it—it hurt. And it also hurt in this state when they did—they—they treated streams to do the same thing and it was a negative environmental bene—benefit. As far as recreational fishing is concerned. It just simply does not work because the—the system was artificially designed. Now when—when these things—these explosions came up, I—I got involved fairly thoroughly. Some people thought I should be—should be canned and so forth but I didn't care. They didn't

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can me. I still kept my job and kept my permits to—to do my work. They wanted to pull my permits so I couldn't collect fish anymore in the state, all kinds of things. The people in charge of it basically are now gone. They're all retired. The—the—they're either retired or dead so that the—the younger generations don't support this kind of activity. Back in the '60's when this was happening, the American Fishery Society had a—a—a—a discussion of this and they had a vote. The vote was 2 to 1 in favor of doing the Green River. Nowadays if they ran it again, the vote would be 2 to 1 not to do it so that the younger people are now much more inclined toward being environmentally conscious in that organization. The—there's another organization which was very much opposed to the Green River, it's called the American Society of (?) and Herbert (?). They tend to be the theoreticians and they thought it was a dumb idea and—and their—their votes were 90% before, probably their vote now would be 99% against. So the biologists have learned some of the bad lessons. I mean, we've been through these in other areas when they—they use insecticides to clear out fire ants. They've learned that it doesn't work anymore and you have to use other techniques and—and those people have learned that you have to look at the whole ecosystem rather than just the target species you're looking at. And I hate fire ants, by the way. They—they bite me and—and I don't like it. They hurt like hell. So I—I don't like fire ants and I—I don't like most exotics.

DT: Do you have any thoughts about the aquatic herbicides...

48:40 - 2013

CH: There—there are some discussions and I'm really not qualified. I—I have heard good things about some of them. The—those older ones were arsenics and they're terrible but they're using mirex and things of that—and I've forgotten some of the other names of these things. Apparently they—they've gotten better chemicals that are more species target specific and they—they use them but they have to use them with maximum care and—and that means air spraying is not maximum care. Air spraying is, in my estimation, should not be done around aquatic ecosystems. You should be able—you should use short spray and things like that. But that's my personal position. Not necessarily everybody's.

DT: Can you talk about taking personal positions that are often unpopular?

(misc.)

DT: How independent do you feel? What kind of pressure ...

49:52 - 2013

CH: Well, I personally had basically no personal pressure on me. I had—got tenure and tenure makes you feel free but I don't think I would have paid any attention to it if I didn't have tenure. If they want to fire me for speaking out for the environment, so be it. I mean, I—I can get—I can get another job. I could've gotten—I'm too old to get a job now but when one time I thought there may be problems for me at UT for very other—

50:24 - 2013

very different reasons and I—I sent out 4 job applications, got effectively—I got one job offer. I got another interview and, by that time, I was—the problems I considered at UT were taken care of and I turned them both down. A little job offer I had was 1 ½ times as much money as I was making at UT but I didn't want to freeze—it was a job in Fairbanks, Alaska and that would have been cold as hell. And I didn't want to burrow through the sand—snow but I knew there was a marvelous problem or two I could've taken care of there, had a good time there but as—as I say, my problems were taken care—taken—local problems were taken care of. It was over the well known affair of the appointment of Loreen Rogers to the presidency and caused all kind of faculty unrest here and I was amongst the unresters. But nothing happened. She—she did not think I was sufficiently bad so she didn't do anything to me. I got a big pay raise. Some other people got no pay raises and I knew that if I got a big pay raise, I was in good shape with the president. No problem. But I—I knew I could get a job at any time I needed one. If there—someone wanted to fire me they—I—I—they had one advantage, I wouldn't have done it in Texas unless A&M decided they wanted me.

DT: What do you think about the attitude toward academics toward society at large and what role they play in the...

52:05 - 2013

CH: Well sometimes academics go too far. I mean, I limit myself to what my expertise is and—and—and that's all I talk about. I don't talk about things like non-academic

52:23 - 2013

affairs and so on. Although I must confess I have a fairly good record relative to minorities. I—I supervise minorities, graduate programs, one of whom you've probably heard of. It's—it's Wilhelmina Delco's husband was my graduate student and he was the first African American with a Ph.D. here. He's a good student. Had a good head. That's what counts. Rest of it doesn't count. I mean, what color your skin is—is irrelevant. I supervised the first Mexican American who got an appointment at Parks & Wildlife as a biologist. He's the first—I've got a fairly good record in—in that area. But—because they are good people and they did good jobs and that's the only thing that counts. Skin color and so forth is irrelevant.

DW: From a historical perspective, a lot of the people we spoke to so far might not have quite your seniority and when they say they are excited about the environment, it sort of falls some time between the publication of Silent Spring and the first Earth Day but you seem to have been on the scene long before that.

53:41 - 2013

CH: You, if you read Silent Spring, you will find a comment in there with rele—related to the Colorado River and that information went to Rachel Carson from me. I knew Rachel Carson. Remember now, the first time I was worried about endangered species made that thing go extinct, that was 1934. So I've been worried about endangered species for, what is it, 64 years? I—I been around a long time. I'm an old man.

DW: But not everyone held that view in 1934. Some people didn't seem to get that till 1964. Were you, at that point, like well, "I've been telling you so?"

54:27 - 2013

CH: Well, no—well there was a—8 years back, there was a thing called the Texas Water Plan which was to import water from some place outside the state and—and—and carry it up to the Panhandle, make a big reservoir up there with water to—to supplement the

water supplies up there. I opposed it and so did Professor Blair, who is a senior faculty member here. He's not a deceased. And we opposed it and we got a big hearing with a couple of legislators and we—we argued with them and they said, we have to support it. The reason we have to support it, we want to be reelected and that took precedence over—for those guys, over what we were arguing and we—I think we provided information that it was not a wise idea. But the—it was a senator and a very young representative who happened to be a good personal friend of mine by the name Billy Clayton, who you may have heard of. And—and Billy and—and I get along very well but in this case we disagreed. We—we—I just don't think that system will work and I—I'll—I—that was way back early. That was 1968 or something like that. I can't remember the actual date—date of that but it was a very early one. But remember, by that time, all those times I'd—I'd been given tenure so may—maybe I was safe with tenure.

DT: What do you think drew other people's attention toward conservation? Was there a watershed that you saw here?

56:08 - 2013

CH: Well I think the first watershed was—was Rachel's book. That—that was the one that really showed that there were serious problems. Mostly she showed it about birds. But—but if you want to get people interested in—in the ecosystem, do something about birds that has—or—or mammals. That has much more PR public—than—than fish.

DT: Why's that?

56:41 - 2013

CH: Well it's—it's human nature. I think they—I mean, fish are under the water and you can't see them and you can't pet them. You don't—don't do those things with—with those you do with birds. How many people belong to the Audubon Society ver—versus equivalent society of—of fish watchers. It's 100 to 1. And the—the—there are more people interested in birds. That's all. More people are interested in mammals. You can get a lot more—I mean, if you look at the amount of money spent on the Endangered Species Act, something like 40% goes to birds. 40% goes to mammals. 20% goes to everything else and all the evidence is that the aquatic ecosystems are the most troubled ecosystems in North America or the world, freshwater ecosystems. They are much more troubled. All the data say that. But the money's not there. And remember now, that's an environmental bunch of people that are putting their money where the people want it. I mean, how much money has been spent in—in rescuing the—the bald eagle? Probably 10 times or 100 times the amount of money that's been spent to do—do something for the

58:12 - 2013

fountain darter. 100 times more than—the fountain darter is in much more trouble all time than—than the bald eagle. But it's a little fish. It's just a fish. That's all. Bald eagle's a bald eagle and they're much more concerned about that. That—that's something that I—I don't agree with but I—I know I have to live with it. I work with—with a group that—it's not unpopular. It's just that it doesn't get much attention.

DW: You referred to some fish you had extincted...

58:57 - 2013

CH: Well we—well we've—we thought—that was very early—what we did is we went out there and we caught one individual in a—in a pond and we said, gee whiz, we made it go extinct because there's only one there. Then we said, if there's only one there, it's a normal sexual animal and you need two to have more—more individuals. So we thought we had

made it go extinct and we started to worry about it right then and there. And that was my first concern about endangered species. We made something go extinct. But then we found another pond—puddle about twenty miles away that had lots of water and lots of fish and we didn't make it—didn't cause a problem because there were a lot of fish elsewhere. That—I think that was the story that I think I told—you're—you're referencing.

DT: These early hunting expedition trips of yours you had said were motivated by your father.

59:52 - 2013

CH: My—my father was—was studying the biogeography, that is the distribution of fishes in the Great Basin, the—the interior basins to determine what—which—which springs in which areas and we went and saw all kinds of springs in Nevada and Utah and actually Oregon and—and Texas. We went to a couple of springs in Texas including San Marcos Spring and places like that.

DT: And it was through the Depression?

1:00:27 -13

CH: Well, yeah it was—it was at that time frame. It was the—the two major trips I remember were '34 and '38 and that was depression time. I don't think I mentioned the word depression but it was during the depression. But—but he was on the faculty at—the University of Michigan and he stayed there till '46 when the University of California decided they wanted him and bought him. And it's always nice to be a faculty member for somebody that wants to buy, that means you make a big salary increase.

DT: And you were paid by the fish as well?

1:01:01 - 2013

CH: Well, I was paid by the fish, that is the number of fish we caught and how new they were was our allowance.

DT: Who else was discussing endangered species in the '30's?

01:01:15 - 2013

CH: A few people. My—My father was interested and—and some of his students. But it was—I mean, I'm sure there were people working on endangered birds and endangered mammals who were worried about it. I mean, all my contacts almost entirely are—are people working on fishes and therefore, I only know about that component. I do not know what mammalogists were doing in those days. I'm sorry but my—my circle of—of acquaintances are almost entirely fish scientists. That—that's—that's my thing.

(misc.)

DT: Texas Organization of Endangered Species [TOES], if you could tell about the origins of that group.

00:28 - 2014

CH: The Texas Organization for Endangered Species was actually primarily started by the Soil Conservation Service. They were very interested in—in the—in endangered species and they—they really organized it. They—they take responsibility. Now—nowadays, they're—they're—they renamed it. It's got another name to it but they're no longer involved.

DT: Do you know why they started because this is before the Endangered Species Act?

01:02 - 2014

CH: Well, I think it was after Rachel Carson's things and they—they—they—they had a history of trying to do environmentally right things. That is, they would build ro—farm

ponds to catch runoff water and reduce floods and produce water sources that were more constant water sources downstream and so on. So the Soil Conservation Service does have fairly major environmental orientation to it. And whatever—it's renamed organization does and they were—they were very interested but new people came in and that concern disappeared. And—and in a sense, they also tended to build bigger—bigger reservoirs rather than small reservoirs and I like small reservoirs cause that's probably

01:54 - 2014

better for the ecosystem. Was that—and—and mostly it's not academics. And a few—a few government officials that it—it—it puts out lists of en—of endangered species which are useful to the federal government or the state government which also has endangered species lists and if something's on one—a TOES—a TOES list, it's a candidate for state or federal listing. I mean, they can blame—if they—if they're worrying about blaming somebody, they can blame TOES for having made a—made a forum endangered and therefore they get flack from the landowners who don't like it. They say, it's these guys fault and—rather than our fault and they get off the—the hook for causing problem that someone thinks they've caused.

DT: You said that part of TOES was out of Rachel Carson's...can you go back and talk about what you knew of her and...

03:07 - 2014

CH: Well, Rachel Carson was a—a fishery biologist for Fish & Wildlife Service. She, on her own, she got no real official credit for writing Silent Spring. I mean, she obviously soon got credit because she became a famous scientist and therefore, became probably got pay raises and things like that. But this was her own gimmick, her own idea, I think. And she did it and did a very fine job. But, as I say, I knew her a bit and she was a nice gal.

DT: And, as an individual, what was she like?

03:58 - 2014

CH: Well, I mean, I didn't know her well enough to really have that much insight. I know she was a good—a very good scientist with regard to her primary occupation. And that's about all I can say other than what everybody knows, she wrote a damn good book. And...

DT: I heard that after she wrote the book, she got an enormous amount of heat. Can you...

04:21 - 2014

CH: Well, a lot of people particularly those with a chemical orientation got very annoyed of what she said. I don't think they got anything through Fish & Wildlife. It was criticism in—in—in scientific journals like Science. Science had an editorial saying how bad her science was. And—but—but nowadays Science will agree she was right. I mean, the fact that she got criticized for this is passe. Of course, she's been dead now for some years but—but she was well vindicated well before she retired.

DT: Speaking of how science evolves, can you tell how your students' interest and concerns have changed since you started teaching?

05:19 - 14

CH: Well, of course, you—you—there—there's—there's two or three sets of students I have had. I've—I've had my graduate students who tend to be all—very much environmentally oriented. They're very much environmental activists wherever they are. My undergraduate students do a whole host of different things, probably half of the undergraduate students I've had are—now have an M.D. behind their name. And they're much more concerned with human health than they are with environmental concerns but some of them also have

environmental concern. But depend—depends on what class I taught. I taught lots of different classes and I taught a lot of people who—who wanted to go to medical—medical school. Those that went to medical school think I'm a—a good guy. Those who didn't go to medical school probably have a very different opinion of my teaching ability because if they didn't go, I may have had something to do with them not going. If they went, they—I may have had something to do with them going. Because if they get—got a good grade why they more likely to go to medical school than if they got a bad grade. That—that's the way it works.

DT: Many of the students you've had have followed you into field science but I imagine some have also gone into lab science. What do you think of the difference between those two...

06:43 – 2014

CH: Well, there is an unfortunate circumstance that there's a tendency for laboratory science to have priority over environmental science. At this university, the—the big money goes to molecular biology. I don't think that it's—that—that has served. I think

07:06 – 2014

the real—real—real good science is done by environmental people like Professor Bianca(?) and people like that who are really the best scientists here for biologists. But, the administrators think that there's money in—in molecular biology. They're more interested in money than in science. And therefore, enviro—molecular biology gets the money.

DT: What do you think the consequences are for environmental protection?

07:39 – 2014

CH: Well it's not helping it but it's—it's not—I mean—I mean, the president of the university who I've—I've met several of them and know them some fairly well and they have never negatively impacted me. They never told me to stop and therefore, I figure that if the president doesn't tell me to stop, I go ahead and do it. And that—that's also true of—of other people who have—are environmental activists such as Professor Bianca, Professor Maguire, Professor Hills, all those guys are environmentally active and they—they—they're very successful. And—and as I say, deans and presidents don't—don't get in my way. If they do, I'll scream at them but not now because remember I'm a emeritus and therefore they have no responsibility over me.

DT: Many people don't get the chance to go to university and certainly to graduate school but they may have the chance to get some sort of education or exposure through a place like Sea World. Can you talk about some of the efforts that...

08:48 – 2014

CH: Well, as you're probably aware I have a reasonable strong affiliation with Sea World and it's in part due to my parents. Sea World, when it was originally being designed, they went to the University of California, San Diego because that was a San Diego operation then. And they—they saw two people, a graduate student and a faculty member. The graduate student worked for my father and my father was the—was the faculty member. And therefore, he had a fair amount of influence on the original concepts be—be—behind Sea World. Sea World is—is one, a amusement park. It makes them money that way and it's an educational component. Of the knowledge of the biology of killer whales, probably 90% of the good biology has been done at Sea World. So, on other words, they have done a lot of good science on marine mammals and marine vertebrates in general. They do good—good work on fishes too. So Sea World has an educational component. They also, of course, have

an amusement component. I mean, having a killer whale jump over somebody impresses people but—but there—there—the big thing as far as I'm concerned is they have one, found out a hell of a lot about marine mammals and they've probably found out more about marine mammals than all the rest of the world combined. And they educate people about how important marine mammals are, marine organisms are. They—they have aquarium at each one of these places and people learn about marine fishes and they—they—they provide information about it. I mean, I may be biased because, as you're probably aware, I'm on the board of Sea World Research Institute. Actually it's called the Hubbs Sea World Research Institute named after my parents and therefore I may have—be claimed to have a bias in favor because it—association with my parents. But, as I say that, they've done on a whole, done a good job and done good PR. And the science is superb.

DT: You've been doing this research for a long time at UT. What do you think the environmental science challenges are going to be in the coming years and maybe some of the larger...

11:42 - 2014

CH: Well, of course, it—in—in my immediate area of interest is aquatic ecosystems and as I say, they're in serious trouble globally and we've got to do something to keep them in better shape. That's my immediate concern. Water has an economic value and peo—people have short term views about economics of water, including the Mayor of San Antonio. I—I think so, now please know that I—I—I have not heard the present mayor say anything so it may be that—that's an overstatement but the—the economic—the—the political power structure of San Antonio doesn't understand really what they're doing when they're getting the water out of the ecosystem. They should get themselves educated but they haven't.

DT: Do you have any comments you'd like to pass on?

12:50 - 2014

CH: Well, in part, water has a—going back to the same—water has a value to economics—has a value to the ecosystem. If the fountain darter go extinct, which is

12:03 - 2014

illegal in this country, written laws, it would have a—a minor negative impact on the economy of—of the area. It—but it wouldn't—wouldn't cause an economic disaster. It would just—just hurt the economy because other things would happen after that happened. And cause—cause problems. On the other hand, my way of looking at it, who are we to say why a fountain darter should be alive or dead? I mean, it's an ethical component. Do we have the right to cause the extinction of—of—of any—any kind of (?), even a plant which remember I'm not a botanist. But the—the Texas wild rice is an important component of the ecosystem in San Marcos and if it—if it goes extinct, we—we shouldn't do that. It's just the—the—we should not be that anthropocentric that we think we're that more important than—than the rest of the systems. Sort of my philosophy.

DW: It's interesting too because when you have a Wild West kind of an ethic and you talk here of a pioneer conquest mentality. You mentioned a theme about ranchers and the Endangered Species Act and environmentalists and there's a three-way thing where sometimes—how environmentalists sometimes don't want to enforce the Endangered Species Act because if you piss the ranchers off now, you might not be able to get something out of them later. You only hear about ranchers in Texas. You're not hearing about them in Oregon.

15:09 - 2014

CH: On no, it—it's serious in Nevada. So there are problems elsewhere.

DW: But more fundamentally there's this concept that it's not always black or white or good versus evil. There's three shades, it's black, white and...

15:25 - 2014

CH: Well there—there's no question that some of the concepts of general populous are—are different and particularly if assume that someone thinks that they can't do something with their ranch because of endangered species. They get pissed as hell and then they—then they get mad and they talk to all their other—their neighbors and their neighbors hear this guy's argument but it may be that he was doing something stupid anyway, in the first place. And should—shouldn't have—he shouldn't have done it. You know, it—it may not be the—the smartest thing for a rancher to do sometimes. But—but—and as I say, there's a whole lot—mean, years ago I—I—I was doing some work in Kerr County and Kerr County was basically badly overgrazed. There was one ranch in Kerr County where they had 1/3 of the livestock that other ranches had and all their livestock was fat. They could sell for a lot more money than anybody else and they were making lots of money. These other guys had taken all the vegetation off the ranch and they were going bankrupt. Here's one rancher who—who knew to balance the ecosystem.

DT: Why did the neighbors not pay attention to that...

16:56 - 2014

CH: Because they wanted a buck today rather than a buck tomorrow. And that's the big difference. That it—a rancher that looks to the future is much more likely to be a good rancher for the environmental causes than a bad rancher. And there are good ranchers around. A lot, I mean, I was on a ranch out at Clear Creek where there's a superb ranch. The guy has more grass than you can shake a stick at and he has fat cows. No, his daughter has fat cows—they're his daughter's cows. They're fat cows and she probably makes lots of money off those cows because there's lots of grass there. Of course, he also is a crazy guy who likes to hunt deer and there's lots of fat deer there with great big antlers on them which I like to look at but he likes to shoot. But therefore, he's a—he's a hunter. But a good healthy ranch can be an economic benefit but—but the point is, you make your money over the next decade, you don't make it this year. And to some people, they want to make the money this year. And that's the—part of the problem with all—any environmental concerns because there's people who want the money now rather than then. And I think economic stupidity but you—your gains are—anyway.

DW: The second part of that was about environmental organizations like the Sierra Club or something like that. When it comes to dealing with them and the science. Is there sometimes that there's been a conflict of interest between like the group like that might want and they take your figures and try to work them to their...

18:58 - 2014

CH: No one has ever moved my figures. They—they don't dare. I mean, I'll explode. If someone—if someone takes my figures and—and manipulates them for incorrect environmental gain, I will explode. That—I mean, and—and Sierra Club is—is one of the more activist organizations. I belong to two or three of them as I'm sure you're aware. But I—I—I stay within my science and anybody who uses my data has to stay within—within my science or I won't have anything to do with them. If they try and go beyond my science, and I hear about, I—I'll raise hell. And Stuart Henry knows me well enough to know that he doesn't want to get me mad at him. He can—and—and the same is true of—of—of a

number of people because I do work with other environmental organizations as I'm—I'm sure you're aware. I work with EDF and I work with the Nature Conservancy. And...

DT: Do you have any comments about NGO's in Texas and...

20:22 - 2014

CH: Well those, I mean, each of those has a different role. Each of them have a different role and they do well in their role. I mean, Nature Conservancy buys land and—and protects the habitat from buying land. EDF tries to cut down on pollution and very active on—in chasing polluters. Sierra Club tends to sue for environmentally—they're more—they're more of—of—of—a proactive outfit. And then, of course, you got other ones that go way off like—like Green Peace and so on which go much farther than I'll go.

(misc.)

DT: One question I often ask people is—is there a special spot that you especially enjoy being that's out of doors?

12:29 - 2014

CH: Probably my favorite spot of any place is Lee Fluger's(?) Clear Creek Ranch. It's—it's just pretty. It—it—it's—he—he's got—he owns 2000 acres, not much. Fairly small piece of land and there's a spring there that I go to and, at most when I've been there, I've seen three other people. It's like going to San Marcos Springs and be there by yourself. So nobody else around and you're doing your thing there. And the springs come out at the base of the cliff. You go up top of the cliff and you look off and you see all this water just clear, crystal clear water. Lots of aquatic vegetation. It's pretty. I—I enjoy it. I like to see water. Now the other place I like as much is—is—is a Nature Conservancy place. It's called Dolan Falls and I like Dolan Falls because I like water falls. It's one of the kicks of my life. I like water falls. And the—you—you've seen Dolan Falls. Well it—it's very pretty and when I was thrown off the board of the Nature Conservancy, had thrown off because I served my terms, basically they gave me a picture of Dolan Falls. I've got a picture in my living—my dining room of Dolan Falls. Nice place to look at.

End of reel 2014

End of interview with Clark Hubbs