

Oral History Cover Sheet

Name: Larry Blus

Date of Interview: September 16, 2005

Location of Interview: Portland, Oregon

Interviewer: John Cornely

Approximate years worked for Fish and Wildlife Service: 1966-1994 (28 years); retired in 1998 from U.S. Geological Survey

Offices and Field Stations Worked, Positions Held: Patuxent Wildlife Research Center

Most Important Projects: Contaminant research projects on Sharp-tailed shrews, brown pelicans, royal and sandwich terns, and sage grouse

Colleagues and Mentors: Lucille and Bill Stickel, Eugene Dustman, Chuck Henny, Dick Stroud, Woody Hill, David Hoffman

Most Important Issues: effects of pesticides on wildlife

Brief Summary of Interview: Mr. Blus started his Fish and Wildlife Service career at Patuxent Research Refuge in 1966 and would work with various biologists such as Lucille and Bill Stickel, Eugene Dustman, Chuck Henny, and David Hoffman throughout his career. He worked on a number of projects involving different types of pesticides including DDT, endrin, dieldrin, lindane, dimethylated, lead, and numerous others. He discusses testifying at various hearings concerning contaminants, how the types of pesticides affected animals differently, and the move from Fish and Wildlife Service to the U.S. Geological Survey.

JOHN: This is John Cornely, it's the 16th of September in 2005. I've got the privilege this afternoon to visit with Larry Blus, a long-time research biologist with the Fish and Wildlife Service. He's going to tell us about his life and his career with the U.S. Fish and Wildlife Service and subsequently with the U.S. Geological Survey.

LARRY: Thank you, John. Well, I was born in Tilton, Illinois, in 1933, and was reared about Tilton and graduated from high school and grade school, and went into the Army in '53 and served two years. Got out, and went to Southern Illinois University after that, on the GI Bill, and got a bachelor's degree in zoology, minored in botany, and I was in the cooperative wildlife research laboratory there under Dr. Klimstra. And then I got my Master's degree there in '63, and then I transferred to Nebraska for my first job with the Nebraska Game Forestation and Parks Commission. I worked on pheasants for a very short time, a few months, and then I was assigned project leader of a Federal Aid project dealing with prairie grouse, sharp-tailed grouse, and greater prairie chickens in the Nebraska Sandhills. So I worked there for about four and a half years and did basic ecological research on chickens, or grouse; I was working by myself primarily, and did jobs with habitat and banding, hunting, and a number of different things, so it was a very great job. However, the benefits and perks were few and far between; there were great people there but I saw a job advertised for Patuxent Wildlife Research Center in Laurel, Maryland. So I applied and Dr. Stickel called me, Lucille Stickel called me, and said that I had the job. So I was really overjoyed and moved my wife and small daughter

to Laurel, Maryland, from Theford, Nebraska, in 1966. We lived in an apartment there for a year and then we got a home in Maryland City and spent the next 11 years in Laurel, Maryland. While there I worked under Lucille Stickel and her husband Bill, and a number of other great people who were working in contaminants and other projects there at the Center.

So I started out, my first project was with sharp-tail shrews in captivity; I was trapping shrews in the wild and doing contaminants research with them. At that time, organochlorine pesticides were big, so I was using endrin, dieldrin, and DDT and giving them these diets contaminated with those materials. Also, in addition, I established a breeding colony so we were able to breed them in captivity and use all these animals in toxicity tests in analysis of their tissues for residues.

Then the Brown Pelican Project came along in 1969, and so I began the Brown Pelican Project, which lasted until 1976. The Pelican Project was in response to the Region in Atlanta's [Region 4] call for help with contaminants research. So I went down to South Carolina, primarily, and did work on Deveaux Bank, and an island in the Edisto River on the coast, all these pelican nests on coastal islands down there on the ground; in Florida, they nest in mangroves, and Cape Romain, there were colonies nesting there. So I started the project and the primary reason for the project was to determine the effects of contaminants, particularly DDT, on Brown Pelican reproduction. So we found that the DDT did indeed have an effect on the Brown Pelicans down there.. We found that there was eggshell thinning and some reproductive effects as well; in other words, the number of

young that were reared was lower. So we continued the study for several years, started in '69; by '72, DDT was banned so there was far less DDT coming into the estuaries there from the rivers and from agriculture. And so the residues started to decline pretty quickly and the pelicans responded by having increased reproductive success and the population increased dramatically by the time I left there in '76; there were thousands instead of hundreds of pelicans. And also at the same time I was doing some work in Florida, but it was mainly collecting eggs from different sites; we didn't follow the nests or reproductive success of the birds; we did follow eggshell thinning and we found that the DDE, the metabolite of DDT, was indeed correlated with the amount of eggshell thinning. And at Patuxent and other places, they did experimental work with DDE and indeed, that this effect could be duplicated in the laboratory and so we had the proof, both from the field, the correlative evidence from the field plus the experimental evidence from the pen studies that were done, that that was indeed the case. And of course, by that time, the amount of interest in this increased many fold; there were quite a few studies going on determining the effects of DDT and its major metabolite DDE effects on birds and mammals.

And so the eggshell thinning phenomenon, we called it, was first discovered in Great Britain by David Peakall. He was out working on peregrines and other raptors and he noticed that the eggs appeared thinner and there was some breakage in nests and he actually measured the eggshell; he actually called it the eggshell thickness index, as a measure of eggshell weight, empty eggshell, and the thickness. And so he found that indeed

there was a decreased eggshell thickness or thickness index with time in these birds. And this was collaborated in the US by going, I think Joe Hickey at the University of Wisconsin and Dan Anderson, his student, went to museums all over the country and were measuring eggshells of a number of different species; they published in *Science*, I think. Peakall published in *Nature*, his initial paper and lo and behold, there were all kinds of species that were undergoing eggshell thinning. However, the interesting part was that not all birds experienced eggshell thinning. The raptors and the fish-eating birds like pelicans and osprey were really sensitive to the eggshell thinning, or the DDE, whereas the gallinaceous birds like chickens and pheasants, you could hardly cause their eggs to thin by giving them DDE. So this was one of the real interesting aspects that I found during the years, was that you have these great differences in species and groups of species in response to different chemicals. But sex, species, age, weather, soil type, and a number of different factors that affect how a chemical will persist in the bird or animal and also how long it will persist in the environment and how it is taken up. So there are many, many factors here related to studies with wild birds.

First of all, you have to find out what an affect is, is there affect going on, or you could alternatively find, look for residues in the bird's tissues or eggs or mammal tissues or whatever and go that way. Or you could determine the effects as I said, effects are reproductive effects, mortality, and a number of other issues. So first you have to find out the residues in the birds, the effects, and then you have to determine how the bird's being affected, whether the

population's being affected, and a number of other issues; reproduction and other things. So that's very difficult to do all this and do it in convincing manner. Of course, you had to have, or should have, the collaborative evidence from the experimental studies to go along with the correlative evidence.

Another way that we did some of this in the field to make it more experimental, so to speak, was to have an area where a particular chemical was used. One study in Washington heptachlor was used on wheat for wireworms and the Canada geese were getting into the heptachlor. And in another area they were using lindane, which is far less toxic, it's an organochlorine but far less toxic than heptachlor, and the geese weren't having any effects from the lindane in the area in Washington we looked at around Walla Walla. And around Umatilla, the geese were dying and the reproductive success, of course, was really poor. We also had Chuck Henny, my colleague up there, also found effects on American Kestrels that were nesting in boxes that we put up around the roads. So anyone that works with these compounds and species and really knows that it's very difficult to determine all these various aspects in the field.

Well, in South Carolina, I also worked on a number of other species, far less intensely than Brown Pelican; I worked on Royal and Sandwich Terns and I worked on some of the egrets and herons down there and oyster catchers and some other birds, but the main emphasis was on the Brown Pelicans. We tried to visit the colonies as infrequently as possible and to keep our visits to an hour or less, so we really had to work fast to do that. Some of the birds, like the Black Skimmers were

really sensitive to disturbance and so we had to go in and spend very little time there and preferably during the cooler parts of the day because they nested right on the bare sand, just dug a hole, laid an egg and the young hatched there. They were very skittish, they were flush way ahead of time, so those were some of the things we had to look out for.

So after I worked on the pelicans in South Carolina, we also did work in Florida as I mentioned, we also had some eggs collected for us in Louisiana. Louisiana was a special case, the pelicans down there; Louisiana is the Pelican State, and the pelican is emblazoned on their flag. However, the pelicans were extirpated as a breeding bird by 1961. So they found a small breeding colony down there and this one fellow was doing behavioral studies, the next years there were no pelicans breeding. So what we think happened, we're not sure, there were some things that happened down there that were coincidental with the pelican die-offs, or pelicans disappearing, we don't know if there were die-offs or not because no one was studying it, but there were huge amounts of menhaden and catfish, other estuarine fish, dying at the mouth of the river; there were millions of these fish were dying. And they were dying from endrin, which is an organochlorine that is very, very toxic; one of our most toxic organochlorine compounds, related to DDT. However, unlike DDT or DDE, it does not persist very long in the environment. And so the effects had to be fairly immediate with that material. But it was coming down the river into that estuary, primarily from the manufacturing plant in Tennessee. So they think that that's what happened, the way most of the endrin got down there. However, they were also using endrin, as

I recall, in sugar cane production. And so, we don't have any evidence of pelicans being affected by endrin earlier, however, after DDT was banned in '72, they started using endrin for a couple of years for sugar cane and other purposes and we did have die-off of some of the birds in Louisiana that had been transplanted from Florida to supplement the loss populations, so to speak. And they started breeding and increasing in numbers, but then we had this die-off and the birds did have endrin in their brains around a part per million, which established at Patuxent, was a lethal level in the brain. So a lot of these, organochlorines were studied at Patuxent by the Stickels and other people and they established lethal brain levels, so that was very interesting that you could find the bird in the field and analyze its brain and you could be relatively sure that if it died, if it had over a certain level, that it died from that material in the brain from the chemical. So that was something we did down there, we never did find too much mortality or very little mortality from DDT in pelicans in Louisiana but they certainly found some mortality, I think it was '74, in Louisiana. And as a result they stopped using endrin on sugar cane, and never used it again there.

However, several years later they were using endrin on grasshopper control in Montana and there was a big concern about that; we didn't work on that but worked on endrin in fruit orchards in Washington State. And after I moved out to Corvallis, Oregon, in 1977, I was working on endrin there, and along with Chuck Henny. And we found that after the endrin was applied for rodent control on the fruit orchards in the fall, late fall, that there were numbers of birds that would die from this material. And the birds were things like

quail, a number of raptors, and one lady came into the state game laboratory in Wenatchee with a sack of 13 California Quail. She said, "I saw these guys spraying endrin outside my house," because at that time a lot of the orchards were around the homes right in town. And she said, "I looked out a few hours later and there were all these California Quail in convulsions." And so she brought the sack of them in and indeed they all died of endrin, all 13, because they had a lethal level of that in their brain. And then we found coveys of cubbies, which is a game bird, a gallinaceous bird, that died from endrin. And then we found a number of hawks and owls and other birds that had died from endrin. So this material was really, really toxic. However, we studied Canada Goose reproduction up there in the river, Wenatchee River, and we found no effects on reproduction, very little in the egg, at that time, because that stuff was applied once in the winter and then it doesn't last very long in the environment or in the tissues.

So then they started using anticoagulant instead of endrin up there for control of mice. And anticoagulants were very toxic to certain mammals, but they weren't toxic to birds; this is another case of different groups of animals reacting different to the compound. So we actually fed some birds some of these anticoagulants and the one was an apple-flavored, high protein diet, really sounds strange, and the birds gained weight on it and didn't have any problems with the anticoagulant at all. However, mice, the target species up there, had a great deal of problem with this material. We fed it to one, one day, and the next day it was dead with blood all over it. So, and dogs were very susceptible and porcupines,

most of the mammals and the mustelids were quite susceptible and the farmers quickly learned that they better broadcast it out like they're supposed to rather than put it in a pile because their dog might die. And the only effect we found on birds from anticoagulants, one particular anticoagulant was based on a paraffin, well, it was mixed with paraffin. It was called Rozol, and I think it was chlorphacinone was the name of the material. And what would happen was, the gizzard of the bird would selectively accumulate paraffin in its gizzard and the bird would effectively die from starvation because the gizzard couldn't work, it was full of paraffin. And we also found this in one bird in the wild, I don't think it occurs very often at all, but we were able to duplicate it in our little laboratory studies. So birds weren't very sensitive, they were sensitive to another rodenticide they used, zinc phosphide, and they would eat it and then of course they would die from that material; it was very toxic. So there's all kinds of ramifications, differences in species as I said before, that we had to consider. So anyway, they never went back to endrin in orchards, which I was very happy for.

And then we had another study with Chuck Henny, he was the lead on it I think he was thinking there was some problem with magpies in certain areas. Of course, most of the ranchers and farmers don't care that much about magpies anyway, but I think most biologists really consider them to be really terrific birds. We thought the birds were feeding on the backs of cattle that had been treated with famphur, an anticholinesterase compound. And so Chuck did sort of some experimental work with cattle, where he had the farmers apply it at the recommended

dose and he would pour this material down the backs of cattle. And we thought initially the birds were getting the material through the feces. But what happened was the magpies feed on the backs of cattle and they'll come in and ingest the hair, and the hair, as we found out by analyzing the samples, contained thousands of parts per million of this famphur. And so any magpie that came in contact with this material was essentially dead; it was a very, very toxic material. We also found several Red-tailed Hawks dead that had eaten either a starling or a magpie that had been on the backs of cattle. That was secondary poisoning, one case, I think this is the only record, someone called in and we had a great horned owl dead under a tree. And the Great Horned Owl had eaten a Red-tailed Hawk that had eaten one of the black birds. But you could tell that this material is very fast acting because otherwise if it had waited a day you wouldn't be able to tell what happened as the food digested. But it was just like a bang, bang, bang, it was a tertiary poisoning, so it was really pretty interesting stuff.

And then I was working on lead in northern Idaho in the Coeur d'Alene area, and the Coeur d'Alene River and up near Kellogg and then we go all the way down to Lake Coeur d'Alene and beyond. And we found that there were really high levels of lead in the sediment and the waterfowl particularly up there. They were getting the lead primarily through sediment but also all through the vegetation and some of the vegetation accumulated lead, and some more than others. We found that Tundra Swans were most susceptible because they were down on the bottom digging up huge amounts of sediment and eating some of these plants, roots like wapato and other

species and so they were getting huge amounts of this material from these sources. So we found that there were a fair number of Tundra Swans that died from this material but to complicate the picture: we had some other waterfowl ingested lead shot somewhere; apparently died from lead poisoning from that source. But they were few and far between; I think we had the relatively few waterfowl that died up there from lead poisoning that actually had the lead shot in the gizzard. So we surmised that it was primarily the lead from the sediment and the plants that was killing them. And I think this holds true because if we look at the waterfowl die-off records from lead poisoning, almost all the ones that died from lead poisoning have shot in the gizzard. So that was pretty interesting stuff. We also found out that the Wood Duck, although it accumulated some lead, it was more or less a top of the water feeder, it also feeds to some extent on plants so it didn't accumulate as much lead but some of the birds still had pretty high levels of lead. I think there was only one Wood Duck found dead in the Coeur d'Alene basin over the time we were over there. I think it wasn't our group; it was another group that found this bird. So this stuff was really occurring in the sediments, they found out in other studies, you know, thousands parts per million of lead; there were also other materials down there like zinc. But as far as birds were concerned, lead was a major issue; I think zinc was a problem with aquatics but I didn't have any direct study of that. And so we worked on the Superfund site there with EPA and Fish and Wildlife Service and a number of other agencies, the tribes, so we worked with them on this problem. And did primarily the waterfowl work, Chuck did

the raptor work, but we didn't find much in raptors up there, the lead wasn't getting into the Great Horned Owls, it wasn't getting into the kestrels, even though they were along the rivers there, so that was kind of interesting. Osprey didn't pick up too much, they had some, so it was primarily the waterfowl, particularly the ones that were mucking around on the bottom that were getting most of the effects.

We also had some problems with mice, but this was just a small study so we weren't able to do too much with the results from that. But the Superfund Site is still up there, the lead is still in the sediments, although they're trying many, many different things to ameliorate the effects on wildlife and fish. The Coeur d'Alene River was devoid of fish for many, many years, and I don't know if that situation has improved lately or not but it was just too toxic around the area of Kellogg and for a number of miles practically for any fish to survive. So that was an interesting aspect. Also the hillsides were denuded up there around the smelters, but they stopped most of that activity in the early '80's. And so the hillsides are coming back, but it's going to take a long time, of course, there's tremendous amounts of lead in the sediments there.

Okay, well let's see now. I think this one study was about the same time, or a little before we were doing the lead study; we got kind of out of sequence there temporarily. Another study that we worked on was very interesting was the sage grouse study in Idaho. And Woody Hill a biologist at Patuxent in Laurel, Maryland, found that there was some die-offs reported in Sage Grouse in alfalfa potato fields and so he had some data for us. And then we got reports from the state of Idaho that there were

die-offs of birds in alfalfa and potato fields, Sage Grouse. And so we started a study there and for several years and collaboration with EG&G Idaho [technical consultants] and it was funded by EPA. So we were working on these birds in Idaho around Mud Lake and in that general vicinity. And we found that when we were instrumenting birds with radios, the first year we found some birds that had died, and the alfalfa had been sprayed with dimethylated. And the interesting thing about dimethoate was that had been very, very few die-off records for dimethoate. And it's an organophosphorus compound and it affects the cholinesterase, it inhibits cholinesterase, which is a nerve firing enzyme and there's an anticholinesterase, which comes along and destroys the acetylcholine. So unless you destroy this material, then the brain, the nerves just keeps firing so it's pretty weird; I don't know if I got that quite right or not. Anyway, the birds are affected by this. And I know in humans, the humans get exposed to these materials and these nerve gasses essentially, like they used in World War I, and some of them are related to sarin and there can be really toxic material. And so you have it sprayed on these fields and they were spraying it on alfalfa two different times for weevils and then one other pest that they were spraying dimethoate. And so what happens, it was a really unique situation, the Sage Grouse come into these alfalfa fields from the sage brush, the sage brush is their primary food. And they feed on this lush alfalfa in the summer. And we found that when they sprayed the stuff, they didn't know the difference between sprayed and unsprayed, so they were eating sprayed material, there was no, I guess it didn't repel them at all and

so we were finding that birds were dead and dying in these alfalfa fields. Now some of these we had marked beforehand so it was like we had a marked number of birds, I think it wound up that we had a 15% or so of our marked birds that died from these materials in '86. And so one case we had about 200 grouse in an alfalfa field were feeding early in the morning when the plane came over and sprayed the dimethylated, and we had a couple of technicians out there that were watching all this. In addition there were laborers in the field and they were sprayed too, so this is an interesting aspect. So the grouse start dying, so then we got a sample of birds that we had radioed before that had no obvious problems that we had trapped, and we were primarily interested in young but we were getting the hens with them, trapping by night lighting and then radioing them. So these birds were found dead or in some cases dying, so we thought well, we'll put radios on some of those that are dying to see if they all die or not and as it turned out, not all the sick ones died. We had almost all of them, around 75 or 80% I think were the ones that were sick that died. These birds were very interesting in that, if you've ever seen an animal that's been exposed to this material, as I said, humans get headaches but these guys become incapacitated, they salivate profusely, and also they cannot use their legs, they can use their wings but they can't take off. So if they're not too severely intoxicated, they'll try to swim through the alfalfa but eventually they may succumb, however, not all of them succumb; you'd think all these birds would die but the cholinesterase recovers and so they were able, some of them were able to recover and fly off. One of the studies we

wanted to do on this in subsequent years was to determine the rate of survival and how well these birds did the next year after they survived this severe intoxication but we were never able to get around to that.

So we also had, besides the dimethoate, we had methamidophos on potatoes and the birds were actually eating potato leaves, if you can believe that. And they would spray this stuff on potatoes and of course it was just like the alfalfa, the birds were in there eating potatoes and insects as well, but they're primarily vegetation eaters. So they would eat this material; and methamidophos monitor is very, very toxic and we found that birds had died from this material in some of the potato fields as well. So that was pretty interesting, but we weren't really able to affect the usage of dimethoate or methamidophos, either one, at least with these studies. Of course as I said, dimethoate, this was essentially the only problem that was noted in anywhere where they had used this material in the field. And I know the Sage Grouse in many places, populations are going down but it remains to be seen whether the pesticides actually had any influence on these population declines. I think most of the declines were in Oregon where they don't grow a lot of these crops and don't spray, so I think there it's primarily habitat loss. But certainly one has to be concerned with these materials. We also found that in the potatoes; a lot of these were seed potatoes in Idaho. Of course Idaho is the potato capital of the world or whatever and so they were growing potatoes for seed. And the buyer of these demanded that they spray with this material, methamidophos, and so he wouldn't buy the seed potatoes unless you did that.

Well, one of the land owners out there, their son was sprayed in the field and unlike the laborers in dimethoate alfalfa field that apparently didn't have any effects, at least the landowners said they didn't have any effects afterwards. This high school student, son of the landowner, got really sick for several months so they decided that they didn't want to use this stuff anymore. So they were going to ladybugs but I don't know what happened to that project whether the ladybugs were able to eat the aphids, it was a green peach aphid that came over the mountains by air, so it was just a weird scenario. And this aphid would cause wilt in the potatoes, and so the potato growers, particular seed potato growers, were really, really on the alert for this insect. If they found any at all they would start spraying with this material, certain of prophylactic type exposure or application of this material. So we found primarily Sage Grouse had died up there, we didn't find too much else that was affected; of course, diseased birds were in the fields, were eating material and it was kind of interesting.

Another little study we had was the result of a call by Dick Stroud at the forensics lab in Ashland; at that time they didn't have any method of running cholinesterase samples and so he called us and wanted us to run some samples for him; that was about the only lab work we could really do. But he had some geese, these were [Canada] geese that were killed in the Snake River between Idaho and Oregon. And these were goslings that they picked up out there in summer, of course. This land owner had, again seed alfalfa, which they're really, really concerned about the pests on seed alfalfa. So they were spraying for weevils, or whatever, and so

he decides to put on three chemicals at one time. So he put on two organophosphorus compounds and one carbamate compound. And I thought surely this must be illegal, but then I found out that no, if they don't exceed the application rate for each of the chemicals individually, they can apply as many as they want; of course, it's not economically viable to do that very often, but it, anyway, it was totally legal; but of course, it wasn't legal to take the geese. And so this lady was out there with her daughter, she was going fishing, catfishing, channel catfishing in the Snake River, which is a really, really nice place to go channel catfishing, I guess. Anyway, she noticed these dead and dying gosling out there in the alfalfa. So she and her little daughter, I don't know how old the daughter was, wasn't very old, started gathering up these geese. And the daughter started getting sick, and so they stopped that and so this lady called the police or the game officer or whatever. Anyway, they came out and examined, picked up a number of dead goslings and cited the farmer for illegal take of migratory birds. And so he went to trial and I testified at the trial in Boise, but he was sort of made an icon of the farmers being abused by the federal government; they had a big picture in the paper and everything. So anyway, to make a long story short, he was fined \$25 and this was later overturned at an appeal and the Fish and Wildlife Service figured they didn't want to appeal any further, so that was the end of it. So these are all interesting little sidelights that you get into in this type of work.

And I know with Chuck Henny, he was working on a number of different projects; I retired in '98 and Chuck continues to work in Corvallis, Oregon.

And he was working on cyanide, and Chuck had been with the Service since I think 1970, working on populations of birds, I think it was his doctorate, in 1970, and in relation to, primarily to DDT and other chemicals. So I knew Chuck for many years, and so we worked together on a number of different projects and wrote papers together and everything.

Okay, I was with Fish and Wildlife Service after coming over from the state of Nebraska Game Commission, and I was with the Fish and Wildlife Service from '66 to 1993, or it might have been '94. Anyway, what happened was Secretary Babbitt, Bruce Babbitt, Secretary of Interior, decided that he would like all the biological research in the Department of Interior to be under a particular agency that would be called the Bureau of Biological Survey, I think, and I think that was the name, but anyway, the name changed so many different times. Well, what happened was it became a real political nightmare and according to the people in the know, what happened was Newt Gingrich and republicans who were in power at that time, decided that Bruce Babbitt didn't follow all the steps in establishing this agency that he should have, he didn't consult congress, if he did, it wasn't the right way of consulting or whatever, I don't know. Basically that's the story, so they were going to make Bruce Babbitt pay. And so they said, we're going to make him pay by totally eliminate the whole new agency. And we were on the chopping block not too long after we were established, '93, '94, somewhere in there. And also at that time, the Bureau of Mines and NOAA was also on the chopping block; well, the only one of the three groups that was chopped out was

the Bureau of Mines. So we survived but we went through several stages, name changes and eventually we were transferred over to United States Geological Survey, much to everybody's chagrin to speak of, there were very few people that wanted to transfer to Geological Survey. So they made a new division, the Biological Division, along with Water and Volcanology; I can't remember all the divisions, the other three divisions. So we were working in that group and I think most people were just, I initially favored the new agency but by the time we started transferring over to USGS, I certainly had severe second thoughts and there were a lot of people that opposed it all the way and there were efforts to change us back to Fish and Wildlife Service, but it never happened. And so I have been away from that situation for seven and a half, almost eight years. I'm not sure people will, I think there's a lot of younger people that come in and so they're probably getting used to the idea. But certainly the older people, almost all of them opposed it and we would work with Park Service people, BLM people, and numbers of other biologists on these issues. So it was pretty traumatic and particularly when we were on the chopping block. So we survived through the years and at our office we did essentially what we had always done: we worked on contaminants and wrote papers and essentially were doing the same things. We weren't severely affected, we became part of the Forest and Rangeland Experimental Science Center in Corvallis, Oregon, and that's when I retired in '98 and Chuck Henny is still working there.

So that's basically it, it was just one of those unfortunate experiences that you go through. I think initially Babbitt

had the right idea, but boy, it sure did turn out they were wrong, but we'll see what it does over time, maybe it will work out but I think most of the people still miss the Fish and Wildlife Service; people who were in the Fish and Wildlife Service because I really felt privileged to work at Patuxent and work with all the people there and the Stickels. And the Stickels were special people; they did things their own way. But their major concern was for the resource and they had undisputed ethical and moral values and were only interested in the resource, how things were going, how research was conducted and that sort of thing. I remember one time, Bill and Lucille went to a meeting I think on endrin or dieldrin, and endrin and dieldrin were manufactured by Shell Chemical Company among other things. And Shell Chemical Company was going to give everybody there a free lunch; well, they walked out and got their lunch somewhere else; they said they didn't want to get a free lunch from Shell Chemical Company. Well today, I don't think there'd be very many people that would do that. I think today we have too many hard guns that will go where the money is and do the studies and so you get a lot of bias, but they were impeccable in the way they did things, but didn't always agree with them and they had their own little ways of doing certain things but certainly in the end, why they had the right idea.

And some of the other people I worked with, Eugene Dustman, he was the Director there when I first went there. And also there were numbers of other people there that I worked with that I really looked up to and admired. Lou Locke, he was a veterinarian and he did a lot of things, worked with a lot of different birds and he transferred to

Madison Health Lab in Madison, Wisconsin. And also I worked with a number of biologists there that did contaminant work and other work as well. Some of the ones that I worked with and really admired were David Hoffman, and Barnett Rattner, and some of the other people there that, Gary Heinz, Nelson Beyer; some of those people were really superb people that did really excellent research and in the field and in the environment as well. So we had a mix of field and pen and laboratory studies. And Dave Hoffman was really great to work with, he was a physiologist and we worked with him and he was just an incredible guy; he would work on just about any study you wanted him to and collaborate with you. So there were lots of other people like that through the years I could mention, a number of chemists and biologists and physiologists. It was a real privilege to work with that group; I felt really honored to be there.

And, of course, I worked in the glory years of Patuxent when pesticide research was going on: I testified at the DDT hearings in 1971; this was probably the finest moment of EPA. If you remember, the EPA was established by President Nixon, I believe, and the first Director, I believe, was Ruckelshaus and one of the first things they did was hold hearings on DDT. And so I had some information, some data on brown pelicans, and so they asked me to testify and along with a number of other people from Patuxent; along with a tremendous number of other people from Fish and Wildlife Service. So Fish and Wildlife people were doing tremendous amounts of research and at that time on not only birds, but mammals, fish, you name it; invertebrates. So Fish and Wildlife

Service was really important in this regard. So I was called to testify and at that time I went down to several of the hearings and of course this was the first big hearing on pesticides. And prior to the time EPA was established, a number of the agencies had their own people, like a little panel. I remember when I was at Patuxent, Fish and Wildlife Service had a little group out there, four or five guys who studied pesticide, particularly new pesticides that were being recommended. Then they made the recommendation to Agriculture; Agriculture ruled the roost at that time. And primarily Agriculture was calling the shots on all the chemicals. Well, of course, Agriculture was not EPA, so what happened was we frequently got into trouble with some of the decisions that Agriculture made. But anyway, EPA took over and called for these hearings before an administration law judge. So I went down to several of them and the lawyers for the chemical companies were really tough, if you ever read the transcripts, they were really treating people like criminals. And no one was looking forward to testifying down there, it was very terrible and the people were going down there and they were really traumatized by everything. And these were good people, I mean they knew their stuff, but the problem was they would get you into an area that you really didn't know as much about as you thought you did. And then if they found a little error, like in one of your papers, a decimal point or something, they would dwell on this. One case, they dwelled on a paper that a guy had written, Jerry Longcore, on one black bird trying to mate with a dead black bird, as if this meant something. So they were trying to hit you from all sides and, of course, this could be pretty successful,

people have their own agendas and if you went down there and started out the wrong way; you really had to know your limitations and your stuff, otherwise they would really get to you. So I know Bill Stickel from Patuxent once said, "I don't want anyone from Patuxent coming to watch me testify." So no one went down from Patuxent. And Lucille, she decided to drop out after the lawyer for EPA revealed some of her data to the Ag attorneys. So she decided she really didn't want to testify, which was unfortunate because she testified at the Madison hearings, which were precursor to the main DDT hearings, and just blasted them away with Patuxent information on eggshell thinning from DDT and the other reproductive effects, so they had really good data and then people were just in awe that Patuxent had so much data there. Anyway, that was the way it went. So I got up on the stand and started talking about my data; at that time, I didn't have a lot, it was only '71 and I only started in '69. But anyway, I had eggshell thinning data and I had some residue data. So I got up on the stand and started testifying; the first question they asked me was about the equatorial countercurrent. I had just read Robert Cushman Murphy's book, *Oceanic Birds of South America*, several weeks before and I knew where he was heading because what happens, the El Niño. So anyway, they asked me about equatorial countercurrent. So I explained to them what it was, well, equatorial countercurrent is really just an equatorial countercurrent. What happens is if the water warms up, then it's an El Niño; so I'm not sure if I answered it correctly. But anyway, the lawyer was satisfied that I had, and because down there when the water warms up off of Ecuador, wherever these birds are

nesting, pelicans and the cormorants, and other birds, they start dying off or they just don't reproduce; the food down there is in such short supply. So I knew that, and then he was asking me about data about several other things, but I really came out of that very lucky. If I hadn't read Robert Cushman Murphy's book several weeks before and didn't know about equatorial countercurrent, I probably would have gotten led down the rosy path of staggering off the stand like several people did, but anyway, I did okay and persevered. As I said, I didn't have that much data, but I did have some data on initial thinning and residue, so that was very important as well. Anyway, they asked people all sorts of questions and a lot of problems down there. And finally we had a lawyer from Interior, I can't remember his name, he came over to help protect the Interior witnesses. So he did a pretty good job and of course you're still feeling intimidated. Then the administrative law judge, Sweeney, was his name, Judge Sweeney, ruled afterwards that DDT was no problem, in essence. Well, he was overruled and, of course, DDT was banned, so that's the way that happens. I also testified at the dieldrin hearings, which were really pretty civilized hearings; no one got out of line or talked bad about people; the administrative law judge kept it on the straight and narrow. But then I also did a little bit of work on DDT again in Louisiana after it was banned; that's when they started using endrin. I went down and attended some of the hearings and wrote a paper with one of the chemists about using DDT in Louisiana again. Fortunately, it was never used again after that, but they wanted to use it on sugar cane and other crops.

So that's basically it. I've also testified at different hearings, here they were not trials but they were like endrin and heptachlor and some of those that were basic hearings in the northwest.