Kathleen Schmitt Kline: So, today is Thursday, August 14th, 2008. We are at the Water Institute in Milwaukee. I am with Fred Binkowski, who is a senior research scientist at the Water Institute and also the aquaculture specialist for UWC Grant Institute. Fred, I just want to ask you a few questions just about your background, where you were born and how you came about coming to the Water Institute.

Frederick Binkowski: Okay. I was born at Deaconess Hospital, which no longer exists here in Milwaukee. I spent my very early years in Milwaukee. A lot of time during the summertime, all the months, all the summer months, I would be up in Northern Wisconsin in the little town of Sobieski, Wisconsin, where my grandparents farm was. Actually, both my parents are from dairy farms. They were born and raised up there and grew up on dairy farms. So, my background, at least family background is up from that area there. Much like –

KSK: That's around what town is the –

FB: Well, it's around Little Suamico, Abrams. It's North of Green Bay. Much like Ron, when Ron talks about his roots are really in Butternut.

KSK: Right.

FB: Same thing is true for me. Then I went to Marquette University, transferred from Marquette University to the University of Wisconsin, Milwaukee. Got my bachelor's degree in Zoology and then went on to graduate school and got a degree in Zoology in 1975, I think it was. I spent some time actually in Chicago from about 1969 to about 1975. I lived down there. I was actually living down there when I was going to graduate school here. Moved back to this area, lived in one of the suburbs of Milwaukee, Greenfield, which is a Southwest suburb for about – let's see [19]87 – about five years. Then we moved up to Cheboygan County, and I've been up there for sixteen years. I don't know a combination of things just to get out of the city. I mean, we have a really big piece of property and it's very private. The one thing that wasn't a concern to me, the commute could be like 50 miles on the highway. But I do a lot of work on Winnebago as – just like today happened. If I would drive from here to Winnebago, if I was living in Milwaukee, it would take me almost two hours to get to the airport where it takes me about an hour and five minutes from my home in Cheboygan.

KSK: It is just an hour?

FB: About an hour and five minutes. Yeah. Then also I was doing a lot of work on Green Bay back in the late [19]80s. I'm sorry – in the late [19]90s, and then into 2000. I'm an hour away from Green Bay, so my work kind of corresponds to less travel because of where I live.

KSK: How did you come about getting the position at the Water Institute?

FB: When I graduated, I was in the zoology department for probably a couple years as an academic staff person, academic staff scientist. I don't think they call them scientists in those days. I think they just call them researchers. Then I transferred from there to the Center for Great Lake Studies, which at least the name still exists, it's around. Then the Center for Great

Lake Studies and other entities that were here, that were part of that, they just all were kind of folded in and evolved into the Water Institute. So, I've been part of this whole program for almost thirty years now. But the Water Institute, probably from the time that it was actually designated that, which is I don't know, 2000s – maybe 1999 or 2000.

KSK: Okay.

FB: So basically, I've been around, just moved from one unit to the next unit. When one unit disappeared, you just move on to the next one. [laughter] They went away and I didn't. [laughter] I survived it all.

KSK: Just like the sturgeon.

FB: Yeah. Right.

KSK: So, what were you researching early on in your career?

FB: Well, in graduate school I was more involved in what you could consider environmental physiology. I was interested in doing work. My work was on alewife, which is an invader to the Great Lakes to Lake Michigan. It became a very important fish because of the fact that – well, first of all, it became important because it was dying in huge numbers. Then it had a huge impact on other native fish and a huge impact on the plankton population. But then it also became an important fish with regards to the stocking of the salmon. It was the major forge fish for the stock salmons. So, my work was focused on studying the alewife. When I say environmental physiology, not on the molecular level. It was more organismal where I was looking at things like digestion rates, food consumption, maximum daily ration, how much they could eat in a twenty-four-hour period. Their routine metabolism, active metabolism as measured by oxygen consumption. So, that carried over into quite a few other species, which a lot of that work was funded by Sea Grant. Certainly, all the alewife work was funded by Sea Grant. Then some of the other pro bono work that I did in that area was also funded by Sea Grant. So, starting out, it was in that area probably for at least, probably almost eight years. Maybe even more than that, maybe even beyond ten years. Right about that ten-year point is when sturgeon became part of my interest.

KSK: Is it okay if we started talking about how that came about?

FB: Sure. The story on that – and this is the story that I know, but there may have been something going on prior to that in 1978. But in 1979 at the Wisconsin chapter of the American Fishery Society, which was held in January of [19]79 at Stevens Point, Wisconsin. Jim Addis, who at that time was the bureau director of fisheries management, approached me and asked me, if I would be interested in cooperating with the DNR on the sturgeon work that they started doing. Now, again, as I said just a few minutes ago, there may have been some initial work done in 1978, and I think there was, and I think it was done with the New London Group. But it never was, how could I say it, well enough organized for any chance of high level of success. There was a lot of risk associated with it.

KSK: That was going on. That is in the Sturgeon for Tomorrow chapter. You are right, it did not work. They gave it one shot up in New London, and I think it was Fungus. [laughter]

FB: Yeah. Well, that would be one of the things that would always put – during the earlier years - put people under. So, anyways, Addis, he approached me at this meeting and asked if I would be interested, because they didn't want to literally put all their eggs in one basket at one hatchery, which was Wild Rose at the time. (Don Saskoba?) was the hatchery manager there. I thought about it and got back to him shortly after and says, "Yeah, let's work together." In the spring of 1979 May, I went to Wild Rose, met (Don Saskoba?). I probably talked with him on the phone maybe several times before that. But I physically drove up there and picked up lake sturgeon sac-fry. I would say maybe three or 5,000 brought them back here. Not here, but actually to the Kenilworth building, which we were in before we came here in 1979. Because I didn't have to do any egg incubation and hatching out. I mean, the sac-fry were there. I just had to work with the sac-fry. My interest was twofold. It was what Jim Addis asked to kind of be a backup. Then just to start doing things that I thought would be maybe the best way to culture these fish. What I was using, I was drawing on the expertise and the skills and the knowledge that I had from the previous ten years when we were doing work with alewifes and smelt and other Great Lakes fish and applying those kinds of culture techniques. Then eventually, feeding techniques. The project in terms of success, we had obviously had some fish die. But I think overall, the majority of those fish survived as a result of these different feeding studies. I have what I refer to as a menu for a six-month period. I have that on slides, and I'll see if I can find it. I'm sure I'll be able to find it. I might even be able to find a hard copy, and then you can take a look at that and see if you're interested in using that. But it really lays out all the foods they would get for about a six-month period from the time that they first hatch out what all the foods are there. Then maybe like twenty-five days later, and then forty-five days later or something on that order. It entails a whole six-month period.

KSK: You said they are very picky eaters.

FB: Yeah. They are very, very, very picky eaters.

KSK: I mean compared to all the fish you've worked with.

FB: Not all the fish, but most of the fish. Yeah. Like use trout as an example. You can feed almost all the salmonellas. All of the salmon and the trout that we work on here in the Great Lakes, you can feed them a commercial diet that's a stock shelf item that you can buy. Where sturgeon, right now there's still some doubt about whether that can be done successfully. You'd get some survival, but it would be less than five percent which is not good. It's still better than the Wild, but it's still not as good as what you would want to get in captivity.

KSK: See, I find that really surprising because then later on when they are adults, they will pretty much eat whatever, will they not?

FB: In the lab –

KSK: They have preference –

FB: In the lab or in the field?

KSK: I guess in the field.

FB: Well, sure in the field. But in the field, they're eating everything that - they're eating what they want to eat.

KSK: That is true. They are going out and finding it.

FB: So, what they have right from the get-go is what they want. Then as they get older, as they grow and get older, they just keep transitioning into these other foods that are available. If they're not available, they go looking for them.

KSK: In the lab, they're stuck with what you give them.

FB: In the lab we control that. We manage their feeding. But managing, the feeding in the lab is done partly because of you want to make it cost effective too. But we found that if you want to also have the fish to do different kinds of studies on them, you have to throw a cost effect aside and feed them like steak all the time, three times a day. [laughter]

KSK: [laughter] So, baby lake sturgeon is expensive.

FB: Yeah. Baby lake sturgeon is very expensive. In fact, we have some data. I'm just going to do this off the top of my head, but I might be able to find this. I think a fingerling or six-month-old sturgeon, it costs somewhere between $6 and $7 a piece to raise. If you raise a fish to something like let's say two years old or older, it's like $27 to $30 a piece. Well, there's just no way commercially, there'd be no way for you to make money on that. That's just too expensive. I think if you raise it to the intermediate size there, the juvenile size, I think it's something like $12 to $15 just to raise it to a one-year plus fish. So, those are all pretty hefty price tags.

KSK: How much does it cost you to raise (Porkchop?)?

FB: Wow. (Porkchop?) is an exceptional case because, he had very I guess, he had his own feeding habits that were unique to him. So, he overate. [laughter] He cared little or nothing about his health. [laughter]

KSK: He enjoyed life.

FB: Yeah. By the way, our best guess right now is that (Porkchop?) is in Lake Puckaway. Because he has not gone past the sonic receiver at Princeton. So, he's somewhere in that upper part of the Fox River, or he is up in Puckaway. Puckaway is our best guess because Puckaway is a large body of water, shallow. It would be like going to a Chinese buffet or a Mexican buffet. It'd just be a lot of food.

KSK: It would be the perfect place for (Porkchop?). [laughter] That's funny. Okay. So, back to

those beginning studies.

FB: So, May of 1979 is when we got involved in this. We began this whole thing. Our involvement again was focused on culture and developing culture techniques. Again, drawing on what we knew from past the past ten years, working on other fish. I was somewhat cautious about doing this. But, probably in the fall of 1979, there was a call for scientific paper presentations. At that time, I believe it was called the World Mariculture Society, which eventually evolved into the World Aquaculture Society. We submitted an abstract, myself and (Don Saskoba's?) name on it, and basically to give a paper on these early culture techniques for lake sturgeon. The paper was accepted. I went to the meeting. I think it was in March of 1980 in New Orleans. I know it was in New Orleans. I know it was 1980, but I'm not sure if it was February or March. But I'm pretty sure it was March. That's something that I could check that out. I will try to find that abstract for you too. I presented the paper. As I said, (Don Saskoba?) was a co-author. Now, at the same time that we were doing the work in 1979, there were also other people in the country working on both coasts, working on sturgeon. On the East Coast, there was Ted Smith working on shortnose sturgeon and Atlantic sturgeon. On the West Coast, they were working on primarily on white sturgeon. But there was a little bit of effort even directed at green sturgeon at that time. There was little or no work going on with shovelnose or pallid sturgeon, but in the Great Lakes, it was the lake sturgeon, the big interest there. That was here and at the Wild Rose Hatchery. But none of us really knew what the others were doing. Going back that far - we probably knew the names of some of these individuals just by reading the papers and knowing the names from the literature, but not really knowing them personally. But at the meeting in New Orleans, I can remember, and I'm sure they all went and listened to the paper presentation that I gave. But Wally Clark, who was at the University of California Davis at the time, who was a good colleague of Serge Doroshov; Ted Smith, he was at South Carolina, that was his location; and (Graham Gal?) who was also from the University of California Davis. I believe there may have been another person. But we all kind of bumped into one another and we're in the hallway talking and we decided that we should get together that evening and talk more about sturgeon. We did that. We talked about a lot of different things. But the one thing that I remember is, these are all older and more established people, prominent scientist already doing other work, but now starting to work on sturgeon. But I remember, I think it was Wally Clark who said, "How is it that we didn't give a paper here? How come we overlooked that? Why did this young upstart guy come out of the gate charging and he got the paper?" He was being tongue in cheek about it. We should have been giving a paper here too. Doroshov wasn't there. He was not at that meeting. Yeah, he wasn't there.

KSK: Was yours the only sturgeon paper presented?

FB: Yeah.

KSK: Okay. So, you were the only one.

FB: So, it was very unique. Yeah. So needless to say, they're interested in finding out more about what we're doing. As a result, I'm finding out more about what Ted is doing and what Wally Clark and his team is doing and (Graham Gal?), he's a geneticist. Wally Clark is more of a reproductive person, cellular person. Ted Smith, I think is more of an ecologist.

KSK: What sorts of things had they been working on up to that time?

FB: Well, up to that time, they're doing the same thing we're doing. Getting the eggs, trying to incubate them and hatch them out and get some success in keeping stuff alive. That's really what the focus was there too. If you look at what people do or have done throughout the years, if there's a species that's relatively new and you don't know a lot about it. You know about the life history from what other people have maybe written from studying them in the wild, but little or no work was ever done in captivity. Usually, what people do is when they start out, they immediately try to figure out how they're going to raise this thing and keep it alive. Because that would be the best way to study their life history characteristics. If you're going to do it in captivity.

KSK: Start right from the beginning.

FB: Yep. So, that's what they were doing. Now, as I said, Doroshov was not at the meeting, and I really didn't have a chance even at that time to interact with him. But, in the summer of 1980 – and I'll have to look for this information too. I know that I have a folder on it. Also, when I say things here that we need to be careful about how we use it, I'll say off the record.

KSK: Sure.

FB: So, off the record, the Fish and Wildlife Service was involved in organizing this meeting at Lee Town, West Virginia. I'm only saying this because you've heard me and Ron talk about the role of the fish in Wildlife Service, which is no role. But Bob Stevens, who was a Fish and Wildlife Service biologist, a good guy and very prominent scientist working in the area of striped bass. He organized this meeting. I would say there were probably about fifty people there. It was at the National Fisheries Laboratory in Lee Town, West Virginia. Many of the people that were there had little or nothing to do with sturgeon at that point. Because again, the circle of people that were working on sturgeon in 1980 was really a small group of people. But there were –

KSK: This was a meeting just for sturgeon? This was a sturgeon meeting.

FB: Yeah. This was just for sturgeon. Organized. This was my first opportunity to meet Doroshov because he did come to that meeting. So basically, I've known Serge now for 28 years.

KSK: Were you excited to meet him?

FB: Well, yeah. Because I read his work, and I knew that he had come over to this country by way of Cuba as part of a defection. I knew he was doing work here on sturgeon, especially after 1979. I had found that out. But prior to that, when he was in Russia, I think there were other species that he worked on. But he always worked in the area of reproduction and development. So, his work was really important for me to know about. Have you ever met him? But you've talked with him?

KSK: No, I talked to him on the phone.

FB: Yeah. If you meet him, after a short time, it's almost like you've known this guy for a long time too, just because of his engaging style and personality. He's very honest. I knew that that would be a good relationship. As it turned out I got to meet his whole family, his wife Julia, and his daughter Tanya, who was married, and Paul, his son. They would come here, I would go there. So, it was one of the better things that happened early in my career to meet up with him. Because he's tremendous collection of knowledge with regards to fisheries. He's a person who understands it from the academic side very clear and very well. Yet at the same time, he sees how this should be applied in management applications or just in the wild fish and their ecology and their behavior and all that. Just that he's really a smart guy. Just no doubt about it at all. So, we had this meeting in Lee Town. I think the meeting lasted a couple days. I believe that like a lot of these meetings, even subsequent to that one, there have been sturgeon meetings that really haven't really gone too far beyond that. That meeting didn't really bring people together to work as part of this big group. Because a lot of these people that were there as you asked, they're not, were they all Sturgeon people? No, they weren't. But they're fish people. Some of them probably just drifted away. But the core which was really the 1979 group. And then as graduate students came on and it just built that way. It just became bigger and bigger and bigger with those kinds of people being involved. But it was still really that core group that stuck together. Ted Smith and Wally Clark, and Doroshov and Graham Gaal, and then their students, and (Don Saskoba?) and the work that we were doing here. The only unique story out of that meeting in Lee Town, after about a day of discussing sturgeon, because it's so unique with regards to even the eggs. You start with a holoblastic egg, and then you work up to this fish that doesn't have a backbone. It has [inaudible]. A cartilage skeleton is not all that unique because a lot of fish have that. I remember Bob Stevens at the end of that day saying something like, "Well, we've heard a lot of different characteristics related to this fish described by a lot of prominent people here, and people who know what they're talking about. We initially viewed this as a fish group, but I think there's no way that we can call this fish a fish. We have to call it an animal." [laughter] It's not that funny. But it was kind the way he put it all together. He says, "This is just an animal." [laughter] Because it's so different than fish. A lot of people nodded. "Yeah, you're right." We have a lot more to understand about this fish in order to be able to work with it and do what we need to do to help it if it needs any help. So, then that rolled over into 1981. I can go back and look and see what kind of files I have from the summer of 1980 up through the fall. But there probably isn't very much there. We still had these fish from the 1980 hatch.

KSK: You kept those then for a while?

FB: We kept those for a while, but right on top of that. Then we had 1980 eggs too that we had. So, that summer when we went to Lee Town. Again, that was in the summertime. I'll find that file to give you the exact dates. But then that spring we went to the Wolf River, and I'm pretty sure it was at Shawano. We got eggs at Shawano again too. Again, working with (Don Saskoba?).

KSK: Well, I do not know if you know, but the fish that were up at Wild Rose and the fish that were in your lab, did they get stocked out?

FB: I don't know what happened to all the Wild Rose fish. I'm sure that there might be some records that talk about that. But there was, I mean, there was no strong research emphasis placed on the fish that were there. If they reached a certain age, they would stock them. I mean, they were gone. But the stuff that we were doing here, in order to be able to work on these different life stages or year classes, we had to keep them around. Much like we have now. I've got 2003 and I've got 2005, and I have 2007. We just hold onto them until we're ready to do something with that particular year class because that's what we want to work with. Eventually, there would be some turnover, but there was always a carryover for at least two or three years. So, the 1979's were still around when the 1980s were on the scene.

KSK: Okay. So, sorry. 1981, that is where we are.

FB: Yeah. 1981 just evolved into another effort of focusing on culture techniques. Trying to make the best decisions on how we could do the incubation, how we could feed them, and how we could get the highest hatching success and then survival as they passed through their early stages. Then eventually up to fingerling and post fingerling size. It was a big struggle because the foods that we were using were the standard trout diets that were available. Sturgeon's not a trout. So, the foods they weren't accepted well by the lake sturgeon. However, on the other hand, the people that were working on white sturgeon out on the West Coast found that the white sturgeon was much more flexible in their conditioning or manipulating them to go onto these other commercial feeds where we weren't able to do that. Which goes to show you, there's something about, the lake sturgeon and the fact it lives in this more, this colder temperature environment where the Atlantic sturgeon and the white sturgeon perhaps they don't have the same kind of temperature depression that lake sturgeon exhibit here. So, that changes things a bit, certainly changes their physiology.

KSK: The white sturgeon, do they mature earlier?

FB: No, it's about the same.

KSK: Same. Okay.

FB: Yeah, it's very similar. Although those times now are going to probably be looked at more carefully because of the stuff that Ron has found out with his research with regards to males and females maturing. He's finding now that maybe males aren't maturing until they're like 21-year-olds maximum, where we thought it was like 16 years old.

KSK: Because of those aging?

FB: Because of the work. Yeah. Because of what he's doing. Then also he is finding that the females that may be as high as 29 years old and not 25 years old. Then the ages are older too. The numbers are higher. So –

KSK: Can you just describe a little bit, Fred, about when going back to that first time when you brought the eggs back from Wild Rose to hatch here in Milwaukee.

FB: Those were sac-fry. In [19]79 we brought sac-fry.

KSK: What is a sac fry?

FB: It's a hatch day. It's an embryo that just hatched out.

KSK: Okay. So, they are the little, tiny embryos?

FB: Yep.

KSK: I am trying to get to the personal things now. Were you really excited? Like, "Wow, this is a really cool thing."

FB: Yeah. I don't know if you have ever seen sac-fry but –

KSK: I do not think so.

FB: I have pictures that I could show you. So, then maybe when you're writing this you have a better feel on how you want to put some of these personal, window dressing words on it, or whatever you want to call that. But it's like a little mass of tissue. I would say more than half of it is this yolk sac. They can't move around very easily. Like a lot of sac-fry. They kind of wiggle around because they've got this big yolk sac that they're carrying around with them. So, I mean, that was my first opportunity to see them. I never saw them prior to that. I had no idea what that would be like. Then also their behavior that they exhibited early on. They have a very photo negative kind of behavior. They go and they hide in the dark corners, and they exhibit this thing called potting behavior where they all clump together –

KSK: Really?

FB: – like puppies. Yeah. They probably do that as a security kind of thing. Then they start using the yolk sac and they become more streamlined and eventually they initiate first feeding. But the whole thing is gauged by temperature. If you want to have more detail, I'll say something now, and if you want more detail on it, we can talk about it at this other time that we get together. But typically, what you would do is you would – the sac-fry that I picked up in 1979, they were probably like eight or nine days from the time they are fertilized. So, they were like one- or two-days post hatch. So, again, not knowing all of the temperature requirements, food requirements, a lot of this was guessing. So, what I did is I used the Wolf River as my measuring stick for what I should do with regards to temperature. I think it was something like 15, 16 degrees centigrade was a good temperature for them to incubate at and then they would hatch out. Then by looking at records from USGS gauging stations or wherever we were able to get temperature data, it was obvious that the river temperature was warming up. We'd go up to maybe like about 19, 18, 19, 20 degrees centigrade. So, we try to simulate that kind of a condition in the lab then. As a result, you then would cause these fish, because it's warmer, the metabolism is a little bit higher, they're using the yolk sac. Then once the yolk sac is gone, they have to come out and they have to start exhibiting external feeding behavior. Initially we tried

brine shrimp nauplii, which we used on other fish. But the reason that we went with that immediately is because just looking at the fish when they were sac-fry, we knew that the mouth was going to be large enough for them to be able to take this. It's about maybe, let's say roughly 300 microns in size and their mouth, the gap of their mouth was much larger than that. It's a live food too. It has been fed to all kinds of fish. It worked out pretty well. I think I told you this story about how we tried to do different types of feed. Because at that point we're saying, "Okay, they'll eat this, and they'll grow." They were and they were surviving. But can we now give them something if that's the case, it looks like they're easy to feed. Will they eat on anything? Well, that wasn't the case. They won't just eat on anything. We were just lucky enough to hit on something that was, again, ribeye steak. So, we tried different types of commercial feed and that didn't work. We tried taking frozen brine shrimp nauplii, which you could buy from a pet store, and that didn't work. So, I thought, well, why don't I take the freshest stuff, the stuff that's alive, I'll put it in a microwave and nuke it, and then cool it down and give it to them and see what they do with that. Surprisingly, they ate that. That they ate. It must have something to do with the nutritional value or the smell or something is still there to say to them this isn't frozen, and it hasn't been sitting in a freezer for six months. This is freshly killed, and I can eat this. I want this. [laughter] What that ended up doing is leading us into a whole another area of research into the mid-[19]80s where we were actually looking at different food items with incorporated smells in them. Because sturgeons and olfactory feeding fish, it depends on that a lot. So, we did studies where we tested. Again, I can look at the data and get the data out for use of you want it to be spilled. But like red worms, we would make extracts from red worms and plankton. Some chemical extracts we used. We did these studies where we'd actually have the sturgeon in a tank. We had like a bullseye or target zone, and there was a tube, vertical tube that went down into the tank. Then we would drop by eye dropper, drop this, extract down the tube, and they would smell it. Then we would record the number of times how fast and the number of times that they would go into this target zone, and how many fish would do that. Some of these extracts, obviously, it elicited a better response where they were there like in five seconds, and then they would stay in there for twenty seconds swimming around. But then they realize there's no food there. There's just a smell. So, we have the data from those experiments.

KSK: You did not have Sturgeon for Tomorrow trying to market that as a sturgeon perfume to put on people's decoys? [laughter].

FB: We never presented it to them. In a way that they would've thought of that. But it was a pretty good study.

KSK: I will not write about that. [laughter]

FB: It was a pretty good study in one respect that the things that we fed them that were more likely for them not to respond to, because we already knew they wouldn't feed on Zeigler or range and fish pellets. We made extracts out of that. Sure enough, they just ignored that. Where if took five seconds for them to respond to say tube effects worm extract, it might take like two minutes for them to even consider coming into the bullseye or target zone if it was just a pellet, a fish palate. So, that confirmed that there were these endpoints. There was this stuff out here that again, is like ribeye steak and porter house and filet mignon. Then there's all this stuff down here that's like oatmeal and cereal. [laughter]

KSK: Flax. [laughter]

FB: Yeah, tofu. [laughter] Those studies were going on in the mid-[19]80s along at the same time were going out and getting eggs and contributing to that supply of fish that we would need in order to do those studies. That work was actually incorporated with work that Sam Meyers at Louisiana State University was doing. I don't think Sam is even alive today. He was doing a lot of research in this area of olfaction and using smells as a means of attracting organisms to come to the food. So, we worked with him, and we also did work with Tom Ziegler, who is the president and owner of the Ziegler Fish Feed company. Tom used to love coming here because he'd always try to schedule his trips with a Friday, and then we'd go out for the Friday night fish fry. He thought that was just the greatest thing. [laughter] That Wisconsin had this one day of the week that everyone ate fish. [laughter] Then we gave a paper. I think that one was in Washington DC at the World Aquaculture Society meetings. I think it had already been shifted over to that. The paper was on this feeding work that we were doing, these different attractants. Sam and myself – I gave the paper. Sam was a co-author on the paper. I'm not sure if Sam gave – no, Sam didn't give a paper. That was the only one that we gave on sturgeon. Unfortunately, that data is still sitting there. It hasn't been published. It should be because it's actually pretty good data, but we'll see. So, that was another meeting that we went to. Now by 1985, people are moving and shaking and rolling. I need to back up here now because I missed a huge window here with Doroshov and myself.

KSK: Yeah. Okay.

FB: In 1982, Doroshov and I decided that with the 1983 American Fishery Society meeting, the national meeting, it was going to be held in Milwaukee. We wanted to do something special with regards to sturgeon, and we wanted to do it at that meeting. So, we organized a day and a half symposium for sturgeon. It was built as an international symposium because the Canadians came, but we invited other people from around the world. Russians were invited. Other people in Europe were invited. I believe Chinese were even invited too. We tried to do some of these invitations through the State Department. So, I believe it was August 1983, we had this sturgeon symposium. That was one of the bigger AFS meetings in the [19]80s. I think it probably came close to 900 people. It may have even set a record. As I said, we ran that for about a day and a half, and there were papers presented that covered just about all aspects of sturgeon. We had white sturgeon, and we had lake sturgeon, and we had green sturgeon, and we had shovelnose sturgeon, and we had shortnose sturgeon, Atlantic sturgeon. Most of the seven, six or seven species in North America were handled. In fact, we even had a time period in there where we included some of the other Acipenserid fish, like paddlefish. I think there may have been like a couple paddlefish papers too, because they're in that order, but not in that family. Acipenseriformes are in that order. Paddlefish, I don't think it happens too much anymore, but they always felt like they never had a slot, the paddlefish people. Because they couldn't get enough people to have their own symposium, so they had to tag along. But I think over the years, they've just been like, just go and do it your own. Then they have published some nice books out of it too. So, okay. That was done and over with. Doroshov and I met with Eugene Balan, who's the editor of Environmental Biology of Fish. We struck a deal with him for publishing the proceedings from the symposium. He also published a select number, like maybe

eight or nine papers that were, published in the journal of Environmental Biology. So, that all got done recorded –

KSK: I have that in my office.

FB: – and we're off and running. So, that was my first big interaction with Serge. Having it at the AFS meeting was a, was a big thing for us too. Then that came out in 1985. So, you can see that a lot of things were going on from like, after 1982. I mean, it only took a couple years. That's probably what's pretty unique here too. We didn't know each other in [19]79. We met in the summer of [19]80, and by 1982 I'm visiting California and he's coming here and we're doing research together. One of the papers that was published in that journal of Environmental Biology was Yuan Wang and myself and Doroshov on the paper. It has to do with looking at the different effects of temperature on egg incubation, hatching, success development, the holding embryology paper, three different temperatures, white sturgeon, lake sturgeon. It's really a good paper. Very good. So, that was done. Again, not necessarily juggling a lot of balls, but we were doing a lot of different things together. There was a lot going on, but it was pretty [laughter] interesting that it only took that short period of time for us to come together and trust one another and start working at that high intensity level. Then this has nothing to do with Sturgeon, but Doroshov, I believe it was in the fall of [19]85 so it was going into 1986. I can check on this, but he came here on sabbatical with his family. Well, not Tanya.

KSK: In Milwaukee?

FB: Yep. He was here, and he came here in the fall. Julia, Serge, and Paul. Paul was enrolled in Greenfield High School because we lived in Greenfield at the time. I got them an apartment on Grange and just west of 27th Street. So, they had a furnished place to live. Then Serge and I did this lake trout project up on Lake Superior with the DNR at the Bayfield Hatchery. We wrote that paper. It's sitting in a draft form, and it hasn't been published, and it's a shame.

KSK: So, he came here because of you then?

FB: Yep.

KSK: Wow. For a whole year, you said?

FB: No. He was on sabbatical from about September. He came, let's see, I think he came in the summer initially for a week or so, just to get everything set up and organized. Then I think right around Labor Day, he and Julia packed everything up. They drove here. They didn't bring a van or anything like that. Because I was able to get this apartment and get it furnished and all that saved them a lot of trouble. So, he just basically came in a kind of – it was like an SUV and that was it. I think they went back in, I believe it was early December. So, pretty much for the all of fall, going almost into winter because the work was done. So, he didn't have to stay here in order to keep doing the work. The work was done. Now it's just a matter of analyzing everything. But we spent a lot of time up in Bayfield. Paul was in school, so he couldn't come up all the time. But Julia would be up there and then she'd drive back, or I would drive back and drop Julie off and then Serge would stay up there. Then I'd pick up Julia and Paul and come back up. It

was –

KSK: That sounds fun.

FB: – pretty. Yeah. It was. [laughter] I have pictures. I have slides of all that too. So, that was another big interaction with Serge. Mainly because he was interested in the lake trout. He was interested in the embryology. He was interested in the reproduction. A lot of this had to do with, we were injecting the lake trout with induction substances, LHRH. I think we were using maybe CaR pituitary just looking at these different hormones to initiate spawning. That was one of his research areas that he was interested in. Lake trout responded pretty well to that. So again, it was a learning experience for me because I hadn't done anything like that. So again, to be able to be side by side with him, learning all this was just a valuable experience. Very much appreciated.

KSK: Did you say that Doroshov is one of your mentors?

FB: Yeah.

KSK: Probably without a doubt.

FB: Yeah. Because he picked me up at a point where I had already invested a fair amount of time in this area of this, I call it, environmental physiology, but not anything that would really - Although I mean, it got good funding. There was always money for it, especially with Sea Grant. I don't know. I don't think using a word like dynamic or flashy is the best way to describe it, because it was important, but it wasn't the big visibility thing. It pulled me back out into working in the field more too. Because of all of these things that we were doing, had a field application to it, it had a management application to it.

KSK: Are you happy being there, being in the field?

FB: Sure. Yeah. My field work for the earlier years was basically go out and catching these fish especially alewifes. Then either getting adult fish and spawning them and raising the eggs. Initially, a lot of it was just spent in the lab. But that was good too, because I developed these, really pretty good lab techniques, work habits in the lab. I mean, just like super anal work habits. So, minimize risk, get rid of risk completely, and just make sure that everything's going to work the way you hope that it's going to come out, not have any variables there that you can't account for. But then Doroshov came along, and it was almost like just branching out at a 120-degree angle into all of this stuff that was in that area there. He helped out a lot with the sturgeon, just by kind of suggesting and guiding and recommending, how to do these things and how to work, how to look at the data and how this should be used and things like that.

KSK: Interesting things to maybe look into?

FB: To follow up. Yeah. He'd say, "Well, so you got that far. There's other things you hear now that you could build on by looking at these other aspects of this through research." Yeah. He was a mentor.

KSK: It's interesting. From my perspective, it seems like – so a lot of his research, and probably because of where he was, and it sounds like UC Davis really, when they brought him on board, they were very excited to have him work on white sturgeon and maybe go toward their caviar go that way.

FB: Yeah, they did. That was probably one of their primary goals for bringing him.

KSK: Yeah. That's what it sounded like from talking to him. He said, "Well, I have kind of worked on sturgeon before but –

FB: He didn't work a lot.

KSK: – I was not a specialist."

FB: No. When he was in Russia, that was not one of his primary fish. Again, he's such a smart guy. All this just by osmosis, this stuff would stick to him.

KSK: So, it is kind of interesting that his path has gone kind of that way, whereas your path has not. Wisconsin, that is not going to - well, for right now, it's not going to happen Wisconsin. So, you are dealing, I do not know, it is just kind of interesting to think about.

FB: Yeah. The only thing that came out of it for Wisconsin is that, like with Lac du Flambeau and Larry Aronowitz, that, you can use the aquaculture toolbox to raise fish for rehabilitation purposes. So, if you want to raise them for food, it's not going to be cost effective. So, you aren't going to make any money. But if you want to raise them for rehabilitation, you have to put a lot of effort and money into getting the fish that you want to use for rehabilitating. But that's important to do, even though it's expensive. But you're doing this for a different reason than slaughtering the fish and eating it. You're doing this to try to rehabilitate a wild population.

KSK: I guess in California yes, you are killing those fish, but that is also being done in order to take the pressure off of the wild population.

FB: Right. Yep. There's probably about at least a half a dozen or more sturgeon farmers now in California and caviar producers too. (Peter Scrafneger?) that's near Sacramento, or in Sacramento, that's a huge caviar production facility of domesticated fish that they raise in captivity.

KSK: Yeah. Sorry. Because I am just curious now, and we will go back to where we were. But I did see that there was a report, maybe this was in 2000 or something. There was something that kind of came up in the legislature about can we –

FB: Yeah, sure.

KSK: So, what became of that? How did that happen? How did that come up? Then what became of it? Would that ever happen again?

FB: Well, what was happening is that the Wisconsin aquaculture industry wanted to get the law changed with regards to sturgeon. So, then they could have sturgeon on their farms. But at that point, they couldn't do anything about it, because the law said that you were not allowed to have sturgeon. If you were caught at a certain time of the year with sturgeon, there'd be a $3,000 fine. So, DATCP got involved with the Wisconsin Aquaculture Association. They tried to build a case, make a case for this. So, they went to the legislature. This was about the same time that DATCP was taking over the fish health responsibilities for aquaculture, where before that it was the DNR's (Simal Quinsky?) and her people. So, at the same time, DATCP wanted to try to convince the legislature that Wisconsin fish farmers should have an opportunity to use sturgeon for aquaculture purposes. The DNR for obvious reasons, including Ron, they were very much opposed to this because the risks that would be involved in it. First of all, the genetic risks, potential contamination of the wild population with pathogens, and then the illegal market of sturgeon. If you're growing sturgeon on your farm and you're near the Wolf River, and you harvest a bunch of wild fish, put them in your ponds or whatever, that's all you got to do is say, I raised those. So, that became a big concern. So, then the DNR started actually producing some written material to support their opinion that it would not be cost effective to raise sturgeon for commercial purposes. I gave you some numbers earlier. For a fingerling $6 to $7 to raise a fish up to six months of age, that's ridiculous. So, they came to me, Ron also, and they said that they were going to build a counter argument and a case for this. It is just not cost effective. So, then what they needed is they needed data or publications that have data in it that refer to that. I was the only one that had work that was published and that they could reference. The aquaculture industry didn't view that as the DNR writing up their document and then making statements, but referencing where the support for that statement comes from, like you do in a scientific manuscript. They viewed it as I was on the side of the DNR, and I was taking sides with them. That I was saying that. That those were my words. Well, they are my words in a way, because they're coming out of my papers, my published work.

KSK: It is your research.

FB: But the DNR is just referencing it. That's all they're doing. The Wisconsin Aquaculture Association or DATCP could have done the same thing if they could have found someone who had published something that said, it'll be cost effective. So, it needless to say, the Wisconsin Culture Association and DATCP they didn't win that one. They lost that. The legislature went along with the Sturgeon for Tomorrow complaining.

KSK: Sturgeon for Tomorrow had a word [inaudible].

FB: Yeah. Huge word. Because they understood this problem too, with genetics and contamination and the illegal harvest that could go on. So –

KSK: Can I just ask one thing though. How have they been able in California to make the white surgeon - because cost effective? Could you technically do that to lake sturgeon speed up their material?

FB: No. Because again, as I said earlier, the people in California found out Randy Budington,

and - mainly Randy, they found out very early that feeding white sturgeon, especially from the youngest stages that they could train them to go on these cost-effective commercial feeds. The feeds that were commercial diets that were on a shelf, stock items you didn't have to prepare anything special. So, that was a big leap forward for them.

KSK: So that's really the key then?

FB: It's one of the keys. Yeah.

KSK: Lake sturgeon will not do that.

FB: Lake Sturgeon won't do that with all of the things that we've tested up to this point. But I would say that some of the work that we have done recently with regards to perch aquaculture, especially all early life stage work. Some of the work that we've done recently with perch and some of the work that we've done recently with spotfin shiners. We're interested in that fish because of its reproductive characteristics. Has unique behavior patterns. We found some diets in common. Using them in combination with other things that we have now seen a higher response to wanting to feed on it and growing and surviving. So, now I was telling Ron last night this might lead me into an opportunity to go back and do some real – redo some of the really early culture work and use these new things. I mean, again, this is like twenty-five years later. Well, twenty-five years, you should learn something.

KSK: [laughter] So, back to the beginning.

FB: Yeah. The beginning with the fish is still the most critical time. I said earlier, I have my copyright statement, "Perch were born to be fried" and my other one is, "Fish are not born big." [laughter] Neither are people. [laughter]

KSK: All right. So, sorry about the sturgeon farming aside. I was just curious about that.

FB: But that has been laid to rest. Whether it ever will be resurrected again. I hear things like the Wisconsin Aquaculture Association should be allowed to raise sturgeon. Well, I'm not against it. What the DNR wanted is they wanted to get information that would support their argument, and that's what they got. If the Wisconsin Aquaculture Association can get the legislature to change the law and the DNR goes along with it, then they can raise sturgeon. I think they'll find out very quickly though that it's not easy to do and it's very costly. Unless they would hire me. [laughter] I'm not interested in working for them and doing that.

KSK: A hired gun. Okay, sorry. We had just left off with Doroshov had come to Milwaukee for a sabbatical that was around 1985. Then –

FB: I'll look that up just to make sure we get those dates.

KSK: But somewhere mid-[19]80s. So, let us continue from there then.

FB: Okay. Then actually there was so much happening in the early [19]80s. So, I have to

actually go back to that. Also in 1983, this was probably after the AFS meeting. It might have been - I'll have to check on the date. It could have been [19]84, but I'm almost certain that it was [19]83. You'll appreciate this one. Sea Grant said, "Sturgeon." [laughter] Not Wisconsin Sea Grant though. Probably came out of the national office. Bill Hershberger, who was at the University of Washington in Seattle, hosted a meeting at the university. I'm pretty sure that it was supported by the national program. They heard about the symposium at the AFS meeting and was like, "Hey, what's going on here? What do these guys know that we don't know? What's going on? Why don't we know that?" So, they invited myself, Doroshov, Ken Beer - have you had a chance to talk to Ken Beer? You should talk to Ken Beer. He was Doroshov's first graduate student.

KSK: Beer, B-E-E-R?

FB: B-E-E-R. Ken Beer. He owns the fishery in California. Big Sturgeon. Yeah. You need to talk to him. We should make a trip out there. Then we can go to Chinatown, and we can go to –

KSK: Wine country.

FB: Go to Napa Valley. [laughter]. Yeah, Ron and I will take you on a tour. [laughter] You'll come back. You'll weigh 200 pounds. [laughter]

KSK: Ken Beer –

FB: Ken Beer, Doroshov, myself, Bill Hershberger and there was another guy from Alaska. I'd have to go back -and again, I want to try to find that file too. Basically, to talk about what we were doing, what we did. We didn't have a long history before that, but somewhat of a history. We had the AFS symposium, all those things had happened. It was like, again, hey there's something going on here. We got to catch this thing by the tail before takes off and gets too big and no one's going to get it. So, we had that meeting there. It was mainly focused on talking about what the Sea Grant programs could do with regards to sturgeon. I'm sure I have good notes from that. But the one thing that I remember most clearly, we were there about three days and we were going to lunch on the first day. After sitting around talking and telling our stories, Ken Beer and myself and Doroshov, especially the three of us – Ted Smith wasn't there. So, if he would have been there, that would have been then the sturgeon guru group. But this guy from Alaska wasn't really interested in sturgeon, he was more of a salmon person. But after hearing all this stuff, he must have been somewhat taken by it or impressed or whatever. Because when we went to lunch, he said, "No, no, Hershberger, I don't think we should go in one vehicle. I think Doroshov should go on that one and Beer go on that one and Binkowski on that one. Then I'll drive one of those and you drive. We don't want all three of those guys in one vehicle, because if there's a crash and they all die [laughter], we don't need any more meetings like this [laughter].

KSK: That is it [laughter]. That is good.

FB: Now, I think we can finally move out of the early [19]80s. We already talked about some of the stuff in the in the mid-[19]80s. There was also another symposium. For some reason,

these symposiums were all targeted on the West Coast. This one was held in Seattle again. It was sponsored by the Battelle Corporation or Battelle Institute. Battelle is a semi-private entity interested in environmental issues. They might also work for Pacific Northwest Power Company or something like that. I'll try to find those files. But that was another meeting that we had. My guess is that it was probably in the later [19]80s. That was a much bigger group because by about that time, we now had quite a few more people from the West Coast. Wally Clarke now was there and Ted Bjornn who was at the University of Idaho. Some of these people are gone. I think Wally Clarke is dead now, even. I think Ted might be alive, but I know he had really serious heart problems. Last time I saw him was at a national lake trout meeting in Yellowstone. So, this whole thing was geared toward, again, getting people together and identifying all the classic studies that have been done with sturgeon and what needs to be done. Is it in reproduction? Is it in population? Is it in management? Is it early-life history? All these things were categorized and scored or ranked in some way by this committee. There were probably twenty people there, maybe even more. Most of them were scientists with a few bureaucrats. So, that's something that went on at that time. But again, I've been to so many of these kinds of things that, again, unless there's money, unless someone in that room has a shoebox with a lot of money in it or an old cigar box with a lot of money in it, nothing is going to happen. What really does happen is the individuals go back to their areas, to their respective universities or government institutions, and they do their work. They go out and they find the money and they do something. There's never been any big influx of money, and that's part of the problem. So, I'm a little bit uncertain about [19]88, [19]89. But I'll look at my files to see what I have. But my guess is that we're just going out and getting eggs when we have ideas for new studies, and we do that. Actually, we have to drop back down into the [19]80s again because there's Sea Farm of Norway.

KSK: What is that?

FB: Sea Farm, Anders knows them well. He knows Sea Farm of Norway really well. His brother actually knows some of the people.

KSK: Oh, really?

FB: Yes. Sea Farm, they probably read the abstract from the 1980 presentation. They had probably also read the abstract or heard the paper from the 1985 with Sam Myers. Sea Farm approached me at one of these World Aquaculture Society meetings and asked if we would be interested in doing some research for them on raising lake sturgeon in net pens thinking, again, that maybe it could become an aquaculture species. So, Sea Farm invested and supported a project here for about three years. Oh, that was great because this is foreign money. Very rarely do you get a chance to bring in money that comes from Canada as, I guess, an example. But if you can get it from Europe, that's even better. The project was done with fish that we would raise here from eggs. The project was focused on using the – which doesn't exist anymore – the St. Francis Power Plant intake pond, which was maybe fifteen minutes from here. At that time, we were we were working here, so we were close by. I have slides of this. In fact, there's a Sea Grant guy that's on one of the platforms, Warren Downs. He was one of the earlier (L Millers?). So, what we were doing is we were putting sturgeon in these net pens in this intake pond, which is basically Lake Michigan with a breakwater wall in front of the property. So, there was a good

water exchange. We were feeding them and then measuring growth and survival. Because Sea Farm, their main interest is raising fish in net pens whether it's in Norway or Scotland or wherever or Puget Sound or somewhere in the North Atlantic.

KSK: How large were these net pens that they were putting?

FB: We had three net pens set up. They were 3 meters square by 2 meters deep. So, 10 feet by 6 feet. They were attached to wooden frames and platforms. They were set up in a combination of three compartments. So, somewhat commercial scale and you were doing it outdoors. You weren't doing it in a laboratory. We did that for a couple years. We did some work inside too. [laughter] The biggest and most interesting thing that happened there is that – it was probably in December – Nor'easter blew in here and ripped up the cages and ripped everything apart. About two-fifty sturgeon escaped and they were able to get through the rocks.

KSK: So, that would be one of the first stocking projects [laughter]?

FB: Yes. Unfortunately, they weren't tagged with PIT tags or anything like that. That would have been good if we would have done that. But we didn't have PIT tags at the time. But then in the following years, in the late [19]80s commercial fishermen would pick them up in their nets as far down as Chicago area. I can remember Rich Haas, he's retired now. He's working for the Illinois DNR, "Yes, that's a Binkowski sturgeon [laughter]."

KSK: Wait, so how old were they when they were out in the net?

FB: They were probably at least 2.5 to maybe 3 years old. They were big fish. They were 25-, 30-inch fish. So, they're surviving. I'm sure there's fish out there yet. Yes, I'm sure there's a lot of fish out there. An accidental release or the first stocking.

KSK: [laughter]

FB: Not well planned, but it happened.

KSK: So, Sea Farm, needless to say, decided it was not really a go?

FB: No. They committed to funding it for about three years. So, we were getting money from them for that period of time, which was good. I'm just looking here to see.

KSK: I guess you got to find out, too, that the fish that you raised in the lab did just fine.

FB: Oh, yes. Actually, we fed them commercial pellets with feeders that were on the net pens. Then we would also process whitefish and ciscos and we would put that in there too. They would feed on that. Again, I have a pretty good collection of slides that show all that happening. Again, we drifted up into the late [19]80s. 1990, Sea Grant did fund a workshop that was held here in Milwaukee on lake sturgeon. It was a workshop. Tom Thuemler and myself organized it. Nancy Auer was involved also in organizing it. It was about a two- or three-day workshop right here. Sea Grant also funded a radio telemetry study on lake sturgeon on the Menominee

River in northeastern Wisconsin. They did an early startup. I wrote a proposal for that. I submitted it. They did an early start up for that summer, because that's when Tom and I started a project. Summer of [19]90, we tagged twenty wild fish and we tracked those fish for at least two and a half, maybe three years. In the end, we still had about fifteen or sixteen fish that we were getting. Maybe three of the twenty fish were caught hooking line during the sport harvest on the Menominee River, which they do have in the fall of the year. But for the most part, after maybe another mortality, I think there were fourteen. Towards the very end, there were still fourteen fish out there of what we originally put out.

KSK: Was that the first radio telemetry?

FB: That was the first radio telemetry work.

KSK: The one that you did?

FB: That I did, yes. Prior to that, the Wisconsin DNR, Lee Meyers, and Dan Folz, they did some work in the [19]80s. The data was never analyzed or nothing was ever done with it, but that data does exist. These were all surgically-implanted radio transmitters. They were all big fish. We have all of that data from Grand Rapids Dam all the way down to one 14 miles below Grand Rapids. But for the most part, the majority of the time, they stayed within a 7-mile stretch which made it easy to track these fish. This was the project that was scheduled to be funded starting in September of that year. Because of budget constraints, they took a couple projects off the books after they had already sent them in as being approved.

KSK: You were on the bubble.

FB: They didn't call it the bubble then.

FSK: [laughter]

FB: They called it something else. But I told you about the letter that Ragatz – I should find that letter. It wasn't his classic letter that he would give to everyone. It started out classic and then it tapered off into something more personal. Then he finished it by saying, "I know that I'm going to regret this [laughter]."

KSK: Why did you go to the Menominee River?

FB: To work with Tom, much like wanting to work with Ron.

KSK: That was Tom's –

FB: That was Tom Thuemler's responsibility. There was little or no work done on radio telemetry at that time. He was monitoring that population though, very closely. Every ten years, they would do a huge survey all the way from White Rapids. Maybe they even did it between Chalk Hills and White Rapids on the Menominee River. That's between two dams there. But White Rapids would go all the way down to Grand Rapids. Then Grand Rapids would go all the

way down to Marinette at the Hattie Street Dam. But they would collect fish and they would weigh and measure and tag them and all that. We did this radio telemetry thing. It was in the summer, July 1990. (Barry Foreman?) worked on it with me. We did all the surgery in the field, literally in the river.

KSK: I think I might have some photos of that.

FB: Yes, because one of the Sea Grant guys came along and took pictures.

KSK: I think I gave that folder to Tina. So, that was from what year then you think?

FB: Probably July 1990.

KSK: We also have a photo of you kissing the sturgeon [laughter].

FB: Yes, taking it out of a tank?

KSK: Yes, there you are kissing. That is good to know of you.

FB: Love affair.

KSK: Yes, exactly. That is in the title of the book. Was that the first time that you really started doing surgeries in the field like that because there is a lot of those?

FB: Yes. We did surgeries in the field for the first time. I also then did some work with (Brian Ballanger?) below the Hattie Street Dam. Because this project turned out to be so successful in terms of at least, tagging the fish and releasing them and then being able to track them, that we thought, well, let's do something below the dam where now they go out into Green Bay. I think we did ten fish there. We were able to track them. I'd have to go back and look at the data books. But we didn't have enough data to actually write anything up for a paper. But it was still worthwhile. We had some help with LTEs that were willing to go out and do it and they were interested in it. But, Brian, he was involved in that. Then there wasn't anything for almost ten years. I always talked about it with Ron and told him what had to be done. I think the one thing that Ron was most impressed with, because he heard it from me a lot, is that when you do this, you really got to be committed to it. Because once those tags are in there, now you have to go. It's not a passive thing like sonic telemetry. You have to go and find those fish.

KSK: Right, go find them.

FB: Like today, I'm up there flying around at 7:00 a.m. looking for these eight fish. We find them all the time because we just keep going and going until we get them. When he and I started this in 2002, he said, "Yes, you were right. Once you do this, you have to be committed to it." Because that's the only way you're going to get good data. That was one big plus by doing this in 1990. Then following for the next two and a half years, I learned that you had to make that kind of commitment to it. I had a couple REU students. Russell and Carmen have this Research Experience for Undergraduates NSF program. I did have a couple students – one for sure – that

did some work on lake sturgeon. I'm trying to think if there were any other. One for sure, maybe two people. I think both of them were women. They worked on lake sturgeon for their projects. There were two other guys; Chris from Montana and Casey from New Mexico who were REU students. They did habitat work on the Wolf River the summer that they were here. I think it was [19]94 or [19]95. They did a lot of their work at Bamboo Bend.

KSK: What sort of habitat work?

FB: Examining the substrates on the shoreline down close to the waterline. In the spring of the year where they were standing, that's all underwater. That's sturgeon spawning habitat. Those were the very early efforts to categorize what the spawning habitat would look like. They went out and they did that. I remember going there one day [laughter]. I knew that it was there, but I went over to where they were working. You've been to Bamboo Bend, haven't you?

KSK: Yes.

FB: Where you walk around Bamboo Bend and then just walk down that road, I guess it's going south? Well, in July – probably not anymore. I imagine they've taken care of it – that whole bank was just covered with poison ivy. These guys are rolling around working in these rocks [laughter].

KSK: Did they know it was poison ivy?

FB: Yes, they knew.

KSK: [laughter]

FB: They didn't give a shit. Casey was a twenty-year career guy in the Air Force [laughter]. They didn't care.

KSK: [laughter]

FB: These were not your traditional REU students. They were late 30s and maybe even 40 years old going back to school, though. They both have jobs now with the state agencies. But I had I had them for REU students. They walked in the door and I put them to work immediately.

KSK: [laughter]

FB: Again, they were programmed to work. They didn't even give a second thought. They asked, "What do we have to do? How do we do it?" You told them and they just went and did it.

KSK: They did it.

FB: Then I had students that were 17 years old [laughter].

KSK: [laughter] I have one quick question, Fred. So, just going back to the [19]83, sturgeon symposium, the AFS Meeting in Milwaukee, was that considered the very first International Sturgeon Symposium? When was the first?

FB: Well, I'll tell you what, I think –

KSK: Because the one in Oshkosh was the fourth, right?

FB: Yes.

KSK: It is every four years?

FB: But the one in Milwaukee was probably one of the first modern-day sturgeon symposiums. It had an international title to it because of Canada and the fact that we had invited other countries. With Doroshov being involved in it, inviting other countries was a big thing with him. He wanted to do that. However, it never got folded in with the very first one that was held in, I think it was Marseille. Then the second one was in Moscow. The third one was in Piacenza. The fourth one was in Oshkosh. Then Iran and now China. Those got established and set up on their own. So, you have different groupings or different people organizing these things. It's like the symposium that we had in 1990, it never really got recognized. But Canadians were prominent. Every providence was there just about all the way from Vancouver, British Columbia, all the way over to the East Quebec and even beyond. All the providences have lake sturgeon, so all those people were there. It just depends on how you want to spin this and tease it out. But I would say it was the very first modern-day sturgeon symposium that was considered an international symposium. I don't care that it doesn't get recognized with the others because it stands off by itself. It has its proceedings and its papers were published in a reputable scientific journal. Eugene Maughan was recognized as one of the leading editors in fisheries publications at that time. I'm not sure if he's even around anymore.

KSK: I was just curious about that.

FB: There were other symposiums. There was another symposium in the [19]90s. I think it was somewhere between [19]94 and [19]96. That was in New York at the American Museum of Natural History. Ron and I went to that. That's where we met Star Wars. Then we did that project with him, the Blue Genes Project. We worked up at Bamboo Bend getting the eggs and doing all that. I'd have to dig that information out in order to give you more detail on it. But basically, it was taking fertilized sturgeon eggs and injecting them with a dye. I think they used an E. coli bacterium to actually get this into the egg. Then raising these fish up. Because this now is in the fish, you're able to take a tissue sample and see that. I think visually you can see this color saying that, yes, this is where that sturgeon came from. Their thought was that this could be used for security purposes to prevent poaching, to prevent the movement of fish from different countries around the world, stuff like that. That paper hasn't been published, but we gave it as a paper. So, that symposium was in New York. It was significant, but again, it stands off there by itself. There was also one shortly thereafter. I think it may have been in [19]96, [19]98. I can go back and find all this stuff. So, when you go through this and are transcribing this and I'm saying, I'll go back and find that for you, some of the stuff I'll remember, I'll just do

it. But if you're not getting something that you want, then just tell me and I will go and look for it. But that one was held in San Francisco at San Francisco State University. That one, it wasn't just the sturgeon. It was the International Congress on the Biology of Fish. I think it happens every year all around the world. But that one was in San Francisco. There was a session there that Don MacKinlay asked me and Doroshov to organize. It was on sturgeon and paddlefish. There's a publication from that too, little proceedings that I have. That was a very good one. That was very good. Now, at that point, we're already 15 years into this, so we're leading the pack and everyone is coming along with us, so to speak. So, that was another one that was in the [19]90s.

KSK: Let us go back to research.

FB: In the [19]90s, after the radio telemetry work between [19]90 and [19]93 with Tom Thuemler – probably around [19]94. But these are some gaps now that Ron's going to have to fill in the data or the dates. More importantly, the dates and then the data. Or more importantly, the data and then the dates. But from [19]94 all the way through that decade, the emphasis was really placed on spear harvest. So, we directed our attention away from everything else that we were doing. At least, we didn't continue doing it on a large scale. It was spear-harvest related.

KSK: So, what do you mean?

Fb: Changing rules, having these meetings, forming these groups, looking at data to determine whether things can be changed. The big change was the size limit. Ron can tell you what year that happened in, but from 45 down to 36 inches. Sexing and staging were done in the [19]90s. Ron can tell you about that. I think the gonad book came out in 2000.

KSK: Ron wrote a little –

FB: Yes. There was our paper on spawning behavior. Well, that was part of the Oshkosh symposium. But the gonad book was really a product of the [19]90s. Ron went and worked with people in Canada at the University of Manitoba with regards to the sexing and staging. A lot of spawning site construction was done in the [19]90s. Again, a lot of this was the gonad book, the sexing and staging. The Milwaukee workshop really had a huge management component to it. Because most of the people that came to it were from management agencies, where the earlier ones were more academic. So, the [19]90s really were focused on the whole spear harvest thing.

KSK: So, really trying to get a hold then on how are we going to manage this population.

FB: Right. What regulations and rules need to be put into place to manage it better. Again, I think this is where we have to meet with the three of us.

KSK: I would like to hear about the research on spawning behavior.

FB: Well, what I would suggest you do for that is get the paper.

KSK: I do not know if I have that paper. What was it published in?

FB: It was published in the proceedings of the 2001 symposium.

KSK: Then I do have it and maybe I have read it a while ago. When you presented that, did you not also show the video that you had, the sturgeon porn?

FB: Yes.

KSK: [laughter] That was part of that, right?

FB: I think it was, yes. That wasn't published. I think that when it was given as a paper, that was shown.

KSK: That was really the first time that –

FB: That was really the first time that anyone made a serious effort to study spawning behavior.

KSK: To really see what was going on.

FB: Yes.

KSK: So, you just want me to get the paper and read that?

FB: I would read the paper. Then if you have any questions, again, when we meet with Ron, the three of us can hash it out.

KSK: But I imagine that was a lot of time in the field.

FB: Yes. It was during the spawning in the spring of the year.

KSK: That was when Ron actually got some photos of sturgeon porpoising during spawning?

FB: Yes. He would do a lot of this stuff just in the middle of the night staying at some of these spawning sites to try to collect that information. There was another workshop in the [19]90s. I think it was 1998 at the University of Florida. There were more goddamn workshops. Gainesville. Wally Clarke had a lot to do with that. I think his name was Jim Sullivan, who was the director of the California Sea Grant Program at the time. I think he's dead now. Doroshov was there. I was there. Ron was there. Jim McVey from the National Sea Grant Office was there. But people from all over the country were there. By that time, 1998, there were a lot of people. Young scientists who had finished their Ph.Ds. three or four years earlier are doing sturgeon work. Again, it was one of these things like, so what are the main issues here that we need to list and identify and prioritize or whatever, that are important for managing lake sturgeon populations or protecting them or preserving them or just practicing good conservation. We selected the groups that we wanted to be in and there was good discussion. It was really pretty good. It was a good meeting. Wally Clarke did a really nice job of hosting it too. Yes, we went out to his home one evening and he had everyone out there. He had a bunch of grills going and

they were barbecuing steaks and everyone had a really good time. But again, it ended up being just like the other symposiums, people went back home and they did their thing. They worked with some of the people that were at the symposium. They were already doing work, so they didn't need to be handcuffed together or convinced that they should be doing something. People know who the other people are that are doing something that you want to work with. So, nothing really ever came out of that. There was another. No, this was something different. That was aquaculture. I was thinking of this other thing in D.C., but that was strictly aquaculture and it wasn't just sturgeon. Ron and I talked about this last night, [19]93, [19]94, it just really went full bar on spear harvest, sexing and staging. I remember to this day when Ron and I sexed the first lake sturgeon, it was on 151 at Brothertown on the road there next to the tavern. We are making a turn to go onto the road to go down to the lake and a car's pulling out and there's a sturgeon tail sticking out of the trunk. So, this guy just got a sturgeon. We stopped him and asked him if we could cut it open and stage the gonads.

KSK: So, that was not being done up until then?

FB: No.

KSK: I did not realize that. So, wow.

FB: No. When Ron got there in – what was it, [19]86?

KSK: I think so.

FB: Dan Folz was still around, so Ron had a different job. Then when Dan retired, Ron went into that job and then got things rolling after a couple years. He probably had to sit back for a couple years and just see what's been going on here? What do we have here? What kind of information do we have? What can we do with that? What direction should we go in? That's where the whole sexing and staging thing started. Ron and I did the first one on the road there. Laying on the road making, "I think we should – no? I think here. No? I think over here we should make this slit." It turned out we made the slit in the wrong spot anyways because we're looking in there and we can't see [laughter].

KSK: [laughter]

FB: Now, we know where we make the slit. I'll give some more thought to this [19]90 era. But again, it is really primarily focused on we had a lot of symposiums. We had the one in New York. We had the one in San Francisco. We had the one in Florida getting people together. We had the spawning site construction going on.

KSK: A lot of activity really going on going on.

FB: Yes. The early [19]90s were filled with the Menominee River effort that I was working on. Early [19]90s, Ron was working with the people in Canada to get this – people who are somewhat recognized experts in histology. So, histologic kind of work. He was working with them and that's how that whole staging and sexing thing took off.

KSK: Well, tell me a little bit then about how you managed to get the International Sturgeon Symposium to come to Oshkosh. That is a pretty big deal. It had never been in the Oshkosh.

FB: I was invited to go to Piacenza.

KSK: Which was the one before?

FB: It would have been Marceille Moscow, Piacenza. Yes, the third one. I told Ron that I'd be willing to give him my invitation. So, Ron went to Piacenza. There, that's when he met Harald and that's when he met Paolo Bronzi. He may have met Bjornn at that time and other people too. Doroshov was there. I'm not really sure why I didn't go to it. There were a couple things that I turned down. There was a training workshop in California. Might have been like another Bob Stevens thing, Fish and Wildlife Service. I said, "(Don Saskoba?), why don't you go to it?" I think Don and Dan Folz went to it. That one I know for sure. Then the Piacenza thing, I gave him my invitation to Ron. So, then when Ron was there, I'm sure that he had that in the back of his head. Ron, politically with regards to all that, he was still new and fresh and he didn't know all the players. But he was picking it up pretty fast. But I'm sure when he was there, he had this in his head and this idea became brighter and brighter. Then he said, "Why don't we have it in Oshkosh?" Those are every four years? Yes, it'll be four years. We got plenty of time. Really when you offer to do something like this, you don't get much resistance because you're willing to do all the work.

KSK: Because it is such a big deal to do it, yes.

FB: It's such a big deal, yes. So, then Ron came back and told me about it and asked me what I thought. Then we talked to Serge. It was really the three of us. Although, because Ron and I are here, we did the bulk of the work. Ron and I would meet. I think probably starting in 1999, so two years before, we would meet once a week. We'd meet in Fond du Lac at the Marine Technical College. Then eventually, I think it was the summer of 2000, Serge came here. We were already at the point where we were forming the scientific committee, and we were also making decisions on how the manuscript should be submitted and things like that. Harald was here. He came during that summer of 2000, my first time to meet Harald. I would say that we thought about this thing very carefully. We put all the things into place that we knew had to be done in order to make this happen. Maybe some of the 1983 national meeting that I ran was somewhat helpful because I knew about things that you had to get them done in order to have a big national or international meeting. I would say that we were very diligent about staying on top of it and just doing it and not waking up at 3:00 a.m. and saying, "Oh God, that should have been done two months ago." We really stayed on top of it.

KSK: What kind of social things happened during that meeting? What were some of the socials?

FB: There was a big reception one of the first nights in Oshkosh at that convention center there. There was smoked sturgeon and caviar. It was donated by a lot of people like Ken Beer from the fishery, Carolyn something or other from Chicago who was the caviar woman down there.

KSK: Was there any was there any Winnebago caviar?

FB: There probably was. Some of the Sturgeon for Tomorrow people may have donated some. Yes, I'm sure that they did. That was the earliest one. Then let's see. I'm sure there was some kind of a banquet at the hotel, but I don't remember specifically. But the other two things that I remember pretty well is we went to Shiocton, and I think it was the River Rail Bar where we took all the people, all four hundred or three hundred people on buses. They had a classic Wisconsin brat fry and potato salad and the whole thing. It was in the summer.

KSK: Did that go over well?

FB: Pardon?

KSK: Did that go over well?

FB: Oh, yes. Everything that we did went over well. So, we had that there. We had a fish boil here at the Water Institute, which went over really well. There were two-fifty people that came to that. That was really good. We had Lakefront Brewery come and do all the beer. It's a microbrew. We had the guy who owns the brewery, who was (Don Zamania's?) cousin. So, we had people here who knew what to say, how to say it. The French weren't too impressed with the wine that was in the box [laughter]. That's so on tough shit.

KSK: [laughter] I just heard about then you went up to the Menominee Reservation too.

FB: Yes, we did a powwow. Those were three big events. The one at the River Rail, the Water Institute here. I remember the first day reception was big too. Then the Menominee one where we actually participated in the powwow.

KSK: How did that go? I just keep trying to picture this.

FB: The food was a buffet style. It was okay. The food was okay, but it took a long time to feed all those people. Then they had the powwow. That went on forever. It just went on and on and on. In fact, the Russians left and went back to the bus to sit in the bus. We had to go and get them off the bus and bring them back, because the Indians were probably offended by it. We had to make the Russians understand it.

KSK: Why did they just want to go and sit on the bus?

FB: Oh, I don't know. Maybe because they knew they were going to go to a casino after that.

KSK: [laughter]

FB: Which they did. They went to the casino after that. But they had this program and they had the final song in the program but they never got to the final song. Even if they got to the final song, there were four or five or six more songs after that that they kept on playing [laughter]. I

said, "This will never end."

KSK: [laughter]

FB: It lasted a long time. (Rigatski?) was there. Carol Norton was there.

KSK: Did people dance? I was asking John this.

FB: Not everyone.

KSK: But some people did.

FB: What John?

KSK: John Karl.

FB: Oh, John Karl. Was he there?

KSK: Yes, he was.

FB: Not everyone did, because there were a lot of people who were sitting up in the bleachers and that. But people who were being recognized, I know I had to go down on the field.

KSK: Did you dance?

FB: Yes, you had to Indian-style dance. But you don't know what the protocol is. So, when you go down in the field, there's a line of elders there that you're supposed to go and shake hands and say hello to. I just walked in and walked right past all of them. Then someone I don't remember, maybe it was Ann Runstrom or someone, came back and got me. She said, "No, come on with me. I'll show you how to do this."

KSK: [laughter] Well, it is good to know that you did the dance. John, he could not remember and I was not there, so –

FB: No, I did it.

KSK: It was outside?

FB: Oh, yes. It was outside in their powwow bowl with bleachers all the way around. It was like a bowl.

KSK: Because they do not do the sturgeon feast there anymore.

FB: Don't they?

KSK: No. They moved it to the high school gym because I think it was the logistics with in case

it rained or something.

FB: It works out better. That's where the baseball bats are [laughter].

KSK: Yes [laughter].

FB: Rigatski stayed for the whole thing.

KSK: Really?

FB: Yes. In fact, I'm pretty sure that I paid for his registration and all that. It was really interesting. Rigatski retired, Andres took over. That's why that letter that he wrote was so significant and serious because he stayed in touch with all the sturgeon stuff that I was doing. When we did the work on the Menominee River with Brian Ballanger below the Hattie Street Dam, Rigatski was there. He was there to see all that. He went out in the boat when we were doing the tracking the very first time.

KSK: That is really neat.

FB: I think he wanted to really cover his ass [laughter].

KSK: [laughter] He was making amends. The sonic and radio telemetry on the Wolf River started around 2000?

FB: No. Well, let's talk about the radio telemetry. The radio telemetry started in 2002. I have a list here. Let's see. Let me make sure I don't have any – now, before I forget, I'll just jump ahead and then come back. In 2004, American Fishery Society meeting was in Madison. We had a sturgeon symposium there. There was never a year that there wasn't a sturgeon symposium.

KSK: [laughter]

FB: But Ron and I organized and ran that one. We had an educational workshop here.

KSK: Oh, here in Milwaukee?

FB: Yes, right here at the Water Institute and people were here. Carmen and Russell did a Mexican lunch.

KSK: Oh, fun.

FB: Yes, beer. We had a lot of Canadians again. If there was any beer left over, they took it with them on the bus. Pork Chop was a star.

KSK: Oh, I bet.

FB: They were doing frozen fish for this ultrasound and it wasn't working. I said, "Well, we should do a live fish because that's what you're going to eventually check." So, I said, "We'll go and talk to Pork Chop. If he agrees, we'll prep him and we'll bring him over here." So, we took him out, which was not an easy task at the spare in a moment like that. We put them in another tank, we anesthetized them, rolled them down to the handling area in that tank. Took him out of there, put them on the table. We did the irrigation thing on the gills like we do when we do the surgery, and he laid there.

KSK: [laughter]

FB: They were doing the ultrasound on him and people got to see it. Then when they were through, we put them in a recovery tank and took them back to his tank and put them back in there. He never knew the difference.

KSK: He never knew what hit him. How much did a Pork Chop weigh when you released it?

FB: At least 70 pounds.

KSK: 70, and his girth was?

FB: 32 inches. Yes.

KSK: [laughter]

FB: I talked about that at the IMACS thing.

KSK: That is right. That was really good. That will be exciting if they ever net Pork Chop during spawning.

FB: Yes. Or, well, spearing too. He's fair game for all that stuff. But yes, it would be cool if they netted him. They would know right away because he's just out of proportion.

KSK: He is a big, fat male [laughter].

FB: There are no males like that out there. They're all long and skinny. So, I wanted to bring that [19]84 thing in because I don't have it on my other list here. Yes, I guess I do have it on here. 2002. What we did in probably the spring of 2002, we approached Sturgeon for Tomorrow and we told them that Ron and I, meaning us, that we thought it would be a good idea to initiate a rehabilitation project on the upper Fox River. This resulted from several field surveys that Ron and I attempted to do. Maybe [19]99, or maybe 2000, 2001, something like that. We just felt that the Upper Fox River was devoid of sturgeon. That there just aren't that many up there.

KSK: Had that been dammed? Why?

FB: Well, there's a dam at Princeton. So, somewhere between there's a whole bunch of dams.

There's a dam at Princeton. Actually, you're not going downstream, you're going upstream. It's a river of wrong direction. So, as you're going up, the next one is now not there anymore. White River Dam, they took that one out. The Berlin Dam is there, and then the Eureka Dam.

KSK: So, have you been stocking them? Where have you –

FB: Most of the stocking was done at the city of Princeton, so below the Princeton Dam. Most of the stocking was done there. But then a little bit later on, I think probably in 2005 – again, I can go back and check on the exact dates on this – we stocked them on the Montello River in the town of Montello. Then they moved down from the Montello River into the Fox River and then into Puckaway. Then I tracked those fish for about a year. There were actually small fish and big fish tagged at that time. Again, we have all of that data.

KSK: That is about where Pork Chop was.

FB: Well, Pork Chop, we figured he's in Puckaway.

KSK: But you released him.

FB: No. We released Pork Chop just the summer of –

KSK: No, I was just saying that location, though. That is about the location where you released him?

FB: Yes, at Montello. Yes, they put him into Montello River.

KSK: I knew it.

FB: The Montello River is not very long and runs through town. It's deep actually there, but I'm sure he didn't stay there.

KSK: So, you approached Sturgeon for Tomorrow and said, "Hey, we think it would be a good idea."

FB: Yes. "We'd like to have you fund this. We'd like to do this for five years. We'd like to start in 2002 and this is how much it'll cost you." I think the first project was 24,000. We may have asked them for that twice and then we paired it back to 17,000 because Ron just took on more responsibility of costs, especially the surgery equipment and stuff like that. So, the radio telemetry and stocking really took place in 2002. July 2002, we stocked fish. We have all the information. But we did a stocking in July 2002. Again, I'm not sure about how many fish, but it could have been three- or four hundred. But these were extended growth fingerlings like sturgeon.

KSK: What does that mean?

FB: Just that they're bigger because they were kept at a warm temperature year-round. In 2002,

they were probably over a year old, but they were always at a warm temperature. So, they were bigger. Then in August 2002, we stocked our first radio telemetry tag fish. We then also did our first release of a thousand fingerlings, which became our benchmark number for stocking. In 2002, we did the radio tracking. The fish in August, they just didn't cooperate with us trying to follow them easily. They just took off. Three days, they were gone. They were not in Princeton anymore. They were out of the Fox River. Yes, they moved.

KSK: Was that a surprise?

FB: Yes, it was. Considering what I knew from the Menominee River, it was although these were much smaller fish. There were some interesting stories around this, like maybe the third day we're still attempting to chase him with a boat. So, myself, Hermie, and Dave Painter, I think we probably launched at Princeton. Then we went up, downstream as far as we could go. I think we may have gone down to White River Dam because the dam was still there at that time. Then we probably had to come back to Princeton, put the boat on a trailer. Then I think we went down to Berlin, launched above the dam there, and then went all the way up to White River Rapids and then back down and got out. Then went down below Berlin Dam all the way down to Eureka, take it out. It's a lot of work.

KSK: You had no idea if they were going to try and go upstream or downstream in the river?

FB: We were pretty sure they were going downstream just by the pattern. I think there was at least ten or twelve fish that we should have been getting, and we got maybe three. That night we worked until – Ron didn't come along on that one. Off the record, [laughter], he had to stay home and he had to clean the house because his wife was having a group over that evening [laughter].

KSK: Well, good for Ron [laughter].

FB: So, we're down, we're down in Omro, it's 10:00 p.m., at night and we call him at home. He says, "Well, where are you guys?" "We're still on the river." "What [laughter]?" Omro is close to where he lives, so he jumped in a truck and met us at, I think it's Clarks Landing or something like that. We didn't have any success. So, Ron and Hermie and I went out the next morning, I think at 5:00 a.m. from there all the way down to Butte des Morts, but no luck. We knew that we were going to do some flying, but we thought maybe we could do a lot of this by boat. That was the point where we said, flying now becomes a mode of transportation [laughter]. Then I flew all of August. I flew a lot. We flew the Fox up and down, all of Butte des Morts, Winneconne, Poygan. We ended up finding a fish in Poygan. We found one of those fish was up in Poygan. I'll come back to that. Then we did Winnebago. This is my first time. I flew when we did crevettes. I can't remember why we put fishing in crevettes. That was even beyond the Menominee. But that was the very first time that I actually flew and did radio telemetry. That was with Larry, the guy that you were out with. So, we would do all of Winnebago thinking that we're going to find the fish. If there's ten or twelve fish and they're all gone, they're not in the river, so we'd find them. It would take you six hours to do half a Winnebago, and then you come back the next day and do the other half. Yes, it was just really –

KSK: Did you find him, though?

FB: No. The only one we found was that one in Poygan. Now, at that time, we didn't think much of it except, hey, we got one fish, great. But the pattern has now been established that at least 50 percent of the fish go up into Poygan and Winneconne. They love Poygan and Winneconne. There's something about Poygan and Winneconne. I have four fish in Poygan right now that have been in there over a year. They were stocked at Tustin in May 1st, 2006. Was it or 2007? 2007. So, there's something unique about Poygan and Winneconne.

KSK: Are those not supposed to be the nursery areas though?

FB: Yes.

KSK: Or was that not really the –

FB: They could be juvenile areas too. The fish that are in there are big fish.

KSK: Are they big fish?

FB: Well, now they're probably 36, 40 inches now. The one in 2002 was just like, "Oh, good. We got a fish."

KSK: Found one.

FB: But then how many others were in there that we didn't find? Then in the following years when we would track fish, that was July and August. Then we started releasing our fish at different times. We released them in October. We released them in November. We released them in June. I don't think we ever did a summer one again, except for the June. Then in 2000 – I'd have to go back and look at the books – but then we did the first release in December. We stayed with December for quite a while. Then we stopped doing that because we found that there was a pattern of these fish not moving as fast. So, if you put them into Fox River, it would take them months to get out of the Fox and go into Butte des Morts. Where in the summertime, they're out in three days. Part of that is just the fact that the water is moving, they're moving, water's warm, they're active. As it stands right now, we haven't done any more of the releases in December, but we did that one in oh seven at Tustin up at the north end of Poygan. The reason that we did that is because we were seeing this pattern or trend of fish coming down to Fox. Half of them stayed in Butte des Morts for a while and went into Winnebago. But the other half made this sharp, left turn and went up the Winneconne channel and went through Winneconne and went up into Poygan. Now, they're going against the current because they're going against the Wolf River current. There's something in those lakes and Ron and I, we need to get out and do some field work and sample substrates, look for food items. There's actually places in the Wolf River where we have to do this now too, because I have fish that are north of Shiocton. One fish was there almost a year and then it decided to move and it went upstream. So, that was good because I know it's alive. If it would've went downstream, the tag could just be floating.

KSK: That is true, yes.

FB: So, this guy went upstream away, went up above Leeman and then came back down. But it came back down to where it was prior to that. Another fish has been up above 156 for over a year. Another fish has been moving around, went all the way up to Shawano Dam, but has come back down there now with that other fish. So, there's, there's something there probably that is attracting these fish.

KSK: So, they have decided to be river fish then?

FB: Yes. There are four river fish. Two are up above 156, one is below Leeman, and the other one is around Partridge Crop Lake. We tried to look at this initially as lumping all this stuff together. The more end numbers you get, the better your data will be. Well, it's obvious now that we maybe want to try to do something like that, but also look at them individually, because they all behave differently. Some of them exhibit similar behaviors, like where we have the two fish together.

KSK: So, you just said the next step on that then is to go look at where they are on the river.

FB: Right, look at the environment.

KSK: That would be really interesting.

FB: Study the environment. Why are they there? We had this one fish that's at Partridge Crop Lake. I'd have to go back and see where it was after it left Tustin. But in the winter and going into the spring, it wasn't even in the main channel of the Wolf. Now, there was a lot of water up there in the spring. Just water all over the place. If you didn't know the Wolf River, you would never know where the hell you're flying. But this one was in the backwater for months, one of the backwater areas. But I'm sure it was so deep that it felt secure there.

KSK: Just hanging out in the hole.

FB: Then it came back into the river channel and then it went up to New London and now it's starting to drop down back again. I don't know how far down it'll go. Maybe it'll go all the way down to Poygan, but maybe it'll circle back up to New London. Because right now we're getting into the fall of the year. Weather changes, temperatures change, they might exhibit changes related to that. But there's quite a bit of stability there too. These four fish have been in Poygan now. One of the four is actually a wild fish that Ron tagged in November. He's got at least four more tags. I hope he gets some more wild fish and they tag those. Because there isn't much difference right now based on the number of fish that we can make comparisons with between wild fish and lab fish. So, you could almost say that it doesn't matter how domesticated they are, once you put them back in, they revert back to their old ways or their best ways or their good ways.

KSK: Have any of those fish been speared?

FB: No, because they haven't left the system. Oh, I see in Poygan, they could be. Some of

those could be getting close to it. That'd be a shame because their tags are probably going to go for at least another year. Ron and I – we haven't talked about this recently – but I think we're going to do another stocking at Tustin maybe next April. Because when we did that stocking in oh seven, when those fish dropped down from the west end of Tustin going down towards Winneconne, they got down as far as the Wolf River. I think 80 percent of them went up into the Wolf River. Why? Well, spawning was going on. All the spawning fish were up there.

KSK: They like, "Hey, all right."

FB: "Hey, what's going on here [laughter]?"

KSK: "[laughter] Where is the party?"

FB: "Yes, we better check this out." A lot of them went up the Shawana Dam.

KSK: They went all the way, wow. So, the main part about this telemetry project is just examining where they are going.

FB: Movement.

KSK: Yes, where they are going, when.

FB: Look at their movement over seasons, which reflects temperature. Mainly that. Well, temperature would be the main thing for seasons. Maybe to some extent the seasons also are having an influence because of the wild fish that are around at the different seasonal times too. Then these fish participate in whatever that behavior activity is. Then the other stuff would be the environment, the habitat, substrates, food, look at all that stuff. That has to be looked at. That has to be done in order to really make all these connections on why these fish move the way they move and why they stay where they stay. We probably have as good a data set on what a sturgeon would do over a couple years in its lifetime. Otherwise, you just estimate where they might be or where they might go. This might even lead to helping us find other fish of that size. Because maybe if they really like it there, that means that the other fish that are similar to that size or in that age group, they like it there too and they're there. So, the whole radio telemetry stocking thing started in 2002, 2003. Stocking radio telemetry again, 2004, that's when radio telemetry stocking, AFS symposium, and that was the beginning of a significant sonic telemetry, 2004.

KSK: Wait, radio telemetry and sonic telemetry.

FB: Sonic is more of a hydrophone signal.

KSK: In the?

FB: Under deep water and it's passive. In other words, the receiver is sitting here and the fish have to move past it. But if you have a receiver there and there's a receiver over here and it's 20 miles and they're not recording there and they're not recording there, what is it doing in these 20

miles here? With radio telemetry, you can do that. You know exactly where they are. Then from that point on, from 2004 on, it's been a combination of sonic and radio telemetry and stocking. 2007 was the last time that we did a release. Also, during this period, there's also been a long-term food habits study. Ron would fill you in more on those details.

KSK: That was a researcher who would be there during spearing, right? He was collecting stomachs.

FB: Yes. This was the stable radioisotope work. Ron can fill you in on that. This really started in 2002 but we didn't pay close attention to it until maybe oh three, is PIT tag retention which we have a lot of data on. We're very good at doing that. We have a hundred percent PIT tag retentions.

KSK: Meaning that they stay put?

FB: Yes.

KSK: Because PIT tags, that is the foundation of everything, right?

FB: Keeping track because it's a fish. It has a number which is better than a microchip tag in the nose. You can read that it has a microchip, but you have no idea what fish that is unless you take that chip out and look at it.

KSK: But that is the basis for estimating how the size of the population, everything, right?

FB: It's a tag.

KSK: If that PIT tag did not work.

FB: Yes. It'd be like putting the Monel tag on, which has a number. But now you just scan the fish and it lasts forever.

KSK: Those Monel tags did fall off, right?

FB: Oh, yes. Sure, they would. They could lose these too. But our work with PIT tag retention has been pretty solid. We also did a fin-clip experiment here at the lab where we looked at fin clipping and tried to use that as a means of maybe marking fish of a year class. They wouldn't be individually marked, but it'd be very cost effective in terms of managing a population and not having a lot of money to mark fish. Because PIT tags cost maybe four bucks each. Fin clipping costs time, people are fin clipping. But we have good data that was presented as a paper. Moose gave that paper at the AFS meeting last September in San Francisco. We're in the process now of getting that thing written up and published. The results from it clearly show that you can do fin clipping and they won't regenerate enough where you wouldn't recognize that it was clipped. So, that's good. 2005, there was the Iranian symposium. The highlight of that is that Ron got sick for three days on food poisoning.

KSK: [laughter]

FB: That's what you get for trying to be a glutton.

KSK: In Iran.

FB: Gluttony is one of the seven sins. Or trying to eat food on Thursday that they were serving to you on Tuesday and it's not refrigerated [laughter]. We should send that tape to the Iranians.

KSK: [laughter]

FB: Then the sonic telemetry went on through 2007 and the radio telemetry has been going on and the stocking. There will be no stocking in [20]08. There might be some radio telemetry in [20]09. Well, there is in [20]08. It's the fish that I'm tracking right now. But there might be some new stuff that we set up in [20]09. Then Ron also said that possibly some new sonic implants will be part of that too. So, that covers it. Some of this is missing some detail, but I think what we need to do is –

KSK: This is pretty good. This is what I need. Can I ask you, so Fred, you have been researching sturgeon. Next year is going to be your 30th anniversary, I think [laughter], the publication year of the book, which is very fitting, 2009. So, how would you describe your thirty years of working with sturgeon? Are you glad that you happened to stumble across working in sturgeon? How has it affected you?

FB: Well, I guess I would go back to the beginning and saying that having the opportunity to work with that animal – as Bob Stevens so eloquently put it in 1980 at Lee Town – not many people have had that opportunity to work with that animal, and to have had the opportunity to work with that animal for as many years as I have had, and to be able to do as many different things with it. Having the latitude and flexibility to do something different whenever I wanted to do it. Everything from feeding behavior, to field radio telemetry, sonic telemetry. So, the flexibility, the uniqueness of the animal, the fact that it's a Wisconsin treasure. So, you can be proud just by saying that you're working on something that is in Wisconsin and it's not in any of the other states and it's not even in North America anywhere at this level. When you compare Wisconsin to number two, well, number two is not even on the board. It's so far down on the list. The challenges associated with that, the scientific challenges because, again, it's an animal and it has all these unique characteristics and unique behavior patterns. It's fussy and it's sensitive and at the same time, it's strong and majestic. If you wanted to replace the bald eagle with the next symbol, maybe it should be a sturgeon or a lake sturgeon even. The opportunity to meet and work with Serge Doroshov. As you said, to almost treat it like a mentor kind of relationship. I think more importantly, even though, is the friendship with him too. The friendship is just so solid and outstanding that I can rely on him for almost anything. That's pretty valuable. Getting the chance to work with Tom Thuemler on the Menominee, that was pretty rewarding. Then working with Ron. You know Ron well enough now, that he's a unique individual. We haven't traveled the globe, I would say, but we've traveled North America pretty well and most of it's been with regards to lake sturgeon.

KSK: Do you still get excited when you see them in the field?

FB: I think the best way to describe excitement right now is the talk that Ron and I had last night. Ron said to me, "So, should we take lake sturgeon eggs in 2009 [laughter]?"

KSK: [laughter]

FB: Because this was the first year we didn't do it. He was serious, too. So, it was like he's pumped up and excited about it and he wants to know if I'm going to ride that horse with him [laughter]. Or are we going to go into that gunfight together?

KSK: [laughter] Have you had lake sturgeon in your lab continuously then for the –

FB: Yes.

KSK: You have always had lake sturgeon.

FB: Yes, I would say there's always been lake sturgeon here. There's always been a real high visibility of show-me type exhibit displays from the big exhibit tank that we had, to sturgeon in the tanks. All that stuff was very, very visible. Why isn't it there today?

KSK: Yes, why is it not?

FB: In 173 because of the addition of the USDA-ARS program with Brian Shepherd, Rick Getz. I could beg off just by saying we needed the space. The space had to be used and it is being used for that. The other thing is that it wasn't that big of a deal to take care of those, but someone had to do it. You have to do it every day, 365 days a year. So, my people were responsible for doing it. So, that took a little bit of pressure off. We used to have more fish in the lab, but now we have one tank. But we have fish in there that I know that I want to use for specific research projects. We don't have any money from Sturgeon for Tomorrow. We didn't ask them for money for [20]08. We didn't get the $17,000. We didn't ask him for it. But we probably will go back to it now. If Ron's question last night is going to play out to where we do this, then we'll probably ask Sturgeon for Tomorrow.

KSK: So, is that why you got rid of Pork Chop, too? Because there just was not any room for him anymore?

FB: Yes.

KSK: Is it expensive to feed?

FB: Well, I don't think it was that so much. He's 24 years old. He has at least fifty more years to live. Let him go and experience the wildlife.

KSK: [laughter] So, he was 24 when you let him go?

FB: Yes.

KSK: Why did you decide to keep him around?

FB: At one time, there were probably about eight of them in there. It just got too crowded and we had to get rid of some of the others. A bunch of fish went to the lab in Massachusetts. It's a USGS or U.S. Fish and Wildlife Service Lab, Turners Falls, which is a big lab. U.S. Fish and Wildlife Service, I think it is. So, some fish went there.

KSK: Are they still alive there?

FB: That I don't know. Boyd Kynard is the guy who's there and he was the one that was using them. The state of Vermont took some fish for their Burlington Aquarium.

KSK: Oh, really?

FB: Yes, they drove a truck out here and picked up. Everyone knew that we had fish, so we could give fish for that.

KSK: Did any of them go to the shed?

FB: In the early years they did. But then they had so many, they don't need anymore. Sturgeons live for a hundred years, so you don't need to be replacing them every three years.

KSK: So, there was just Pork Chop and two other fish, right?

FB: Then there was just Pork Chop and two other fish. Initially, we thought that there were three amigos in there. Then when we sampled the gonads, there was one girl in there.

KSK: She was almost –

FB: She was grabbing. Pork Chop and his other buddy, they had their little harem of one female [laughter].

KSK: [laughter]

FB: Now, it could have been that they were gay, so it didn't matter to them. What was that one TV show? *Three's Company*.

KSK: Oh, *Three's Company*. Yes, exactly. When did you name him Pork Chop, just when he started getting really big?

FB: I didn't name him.

KSK: Oh, who named him?

FB: I think that Haney's girlfriend named him, Martha. I think she named him and that's fine.

KSK: He was the only one who really porked out like that?

FB: Yes.

KSK: Well, that will be interesting to see what happens with Pork Chop [laughter].

FB: Pork Chop in the wild environment like that, he could almost be viewed as like you join a conservative motorcycle gang, but you come from the outlaws [laughter].

KSK: [laughter]

FB: He's just in there wild and bigger than anyone else and doing whatever he wants to do, having his way with anyone [laughter].

KSK: Yes, I bet. When he goes up to spawn, he might really start beating up some of the other males.

FB: He's big. He's way out of proportion [laughter].

KSK: There was one more thing I was going to ask you. I just lost it. I just saw a couple newspaper. I have been going through all these old newspapers and I found a couple references that they would have. I think this might have been the [19]20s or something. That they were using sturgeon. They would stick sturgeon in the bottom of their aquaculture ponds at the fish hatcheries if they want to grow things.

FB: The idea behind that was that because they have a ventral mouth, they thought that they would feed on debris.

KSK: They would just clean out?

FB: Yes. They'd be like a fish that you put in your aquarium that has a ventral mouth and picks up algae and stuff like that. But sturgeon don't do it.

KSK: They do not really do that.

FB: No. They feed on high-quality protein type diet. They feed on crayfish. They feed on Chironomidae larvae. They're not bottom feeders.

KSK: So, I wonder if they did not do very well there then [laughter].

FB: Historically – and there's not any scientific evidence to prove this – but apparently, sturgeon, every attempt to stock them in ponds has never worked out well. So, they don't like living in ponds.

KSK: Stocking out wild fish, yes.

FB: I think (Saskebo?) also stocked some of his hatchery-raised fish and ponds. When they went into the pond to get everything out, there wasn't anything there.

KSK: That is right. That was the last thing.

FB: That would be an interesting thing to study, to find out why that is. It might just be because they probably have to have a huge territory. Like these four fish in Poygan, they move all over the place.

KSK: They want to be free.

FB: Yes, they're like wolves or bears. They have to have a large ranging area to move around in. But then on the other hand, the ones that are in the river, they hunker down and settle in and set up house and stock the refrigerator and that's it, they aren't going anywhere.

KSK: River fish.

FB: Yes, there's a difference. Habitat wise, there's a big difference.

[end of transcript]