Interview with Kermit Cromack, by Max Geier, February 17, 1998 at the Corvallis Forestry Science Laboratory; Transcribed by Keesje Hoekstra.

Kermit Cromack came to OSU from the powerhouse ecosystem research group at University of Georgia and the Coweeta Hydrological Laboratory, a companion Forest Service experimental forest to the Andrews Forest. A specialist in soil biology and carbon and nutrient dynamics, Cromack was an integral part of the team of post-docs working at Andrews Forest during the IBP era and then moved on to professorial positions in the Department of Forest Science in OSU.

Geier: Yeah, what we're trying to do here is establish a record that will be acceptable for not only people reading the book, but also for people who might be interested in future research.

Cromack: You bet.

Geier: What I try to get started out with here is a little bit of background information.

Cromack: Okay.

Geier: From my understanding, you started working with the Andrews group somewhere in about the beginning of the IBP, in the middle of the 1970's. Maybe you could talk about your academic and personal background until that time, to get started.

Cromack: Okay. I completed a Ph.D. at the University of Georgia in 1973. I came out here at the beginning of 1973, and had a one-year fellowship with the U.S. Forest Service. That was with Jerry Franklin and his group at that time. Then, the following year I joined Oregon State University in what had been the Forest Management Department [College of Forestry]. That was all during IBP [International Biological Program]. IBP started in earnest about a year before I got here. I was pretty early in it. I actually got a one-year, federal government internship, which were federal, government-wide. They weren't specifically forestry, but the Forest Service got a couple of them. That's how they were able to hire me. Then I came on as a research associate post-doctorate with Oregon State University for the remainder of IBP.

Geier: 1974 through '78?

Cromack: Well, that part went through about 1977. Then, we started getting some additional National Science Foundation grants. They were kind of designed to go for a term or so after IBP, but they still included some IBP-type projects. Then, years later, that led to the formation of the succession of grants that led to the formation of the EER [Experimental Ecological Reserve], and ultimately the LTER you have now. It was kind of a transition out of IBP. I got a regular position at OSU about 1980 or so**.**

Geier: So, now you're on regular appointment?

Cromack: In what's now the Forest Science Department. When I came here with the Forest Management Department, there had been a split to form Forest Management and Forest Science. [OSU College of Forestry] That includes people like Dick Waring, and people like that.

Geier: Okay. I was going to ask you about your background.

Cromack: I went to Texas Southwest Junior College in Brownsville, and I went to University of Texas at Austin. I did a Bachelor's in Zoology, and a Master's in Zoology. The master's work was in population ecology of arthropods, which are decomposer organisms. I then went to University of Georgia, and after a couple years of course work there, the IBP was just starting there, also. This was in the Deciduous Forest Biome [IBP category]. So, I did my doctoral work at a place called Coweeta Hydrologic Lab, which is now an LTER site, and I worked on nutrient-cycling and decomposition in hardwood watersheds back there. I came out here and continued similar research in the Coniferous Forest Biome of IBP. So, that was kind of a little background.

Geier: I was just looking at the chronology here. You were at U of Georgia about the time that Art McKee was out there.

Cromack: Uh-huh (affirmative)

Geier: Did you know him when you were there?

Cromack: Oh yes, I did. We overlapped. Art actually started out with Phil Johnson to pursue a degree. Phil left to go to the National Science Foundation, and Art decided to stick around that while the Andrews site manager job came up. He was kind of between professors because his original major prof had left, and he had a couple of years of coursework to get through. He just decided to come on out here and take the job. I think he eventually intended to go on for a degree again, and he took some courses here, but eventually, the way things worked out, Art just kind of evolved into what has become his kind of job.

Geier: Did that play a role at all in why you came into ecosystem science here?

Cromack: Well, there's one person, unfortunately you're not going to interview, but you'll hear about him, and that is Dick Fredriksen.

Geier: Sure, yeah.

Cromack: Dick did a lot to pioneer some of the water sampling approaches, but he came back from a trip to Coweeta to help him install one of those proportional water samplers that's a key part of his own work. I met Dick and talked to him about the work out here. So, through his contact, I had an opportunity to come here and be a post-doc. Those people played a role in getting me out here, plus Jerry Franklin secured a one-year fellowship**.**

Geier: Had you known Jerry Franklin before?

Cromack: I had not known Jerry, just his reputation as a plant ecologist. Well, the thing that was really important is that people like Dick Fredriksen, Jerry Franklin, and Ted Dyrness, who were here with the Forest Service, played a tremendously powerful role for those of us who weren't used to these particular forests. Basically, getting us started, getting us oriented. Jerry had developed a habitat-typing approach. People like he and Dick Fredriksen took me around to all the watershed research sites of the Andrews, right after I got here. That was early in the winter of '93. But, we were able to get started right away on the research, because they got us oriented and sort of laid the groundwork for us. And, we had technical help and financial support from the IBP to start that research out.

Geier: Back up just a minute here

Cromack: Sure.

Geier: On the decision to go to Georgia from Texas, what was the attraction again in Georgia?

Cromack: The ecosystem part that Georgia was pioneering at that time. And, I wanted to go on and do something more general, and there were a number of people there that were influential. Dave Coleman, who's there now, is an ecosystem scientist who had just joined there. Odum, of course, was there, Eugene Odum, and my major professor, Carl Monk, was there, who had worked on plant ecology at Rutgers

Geier: Carl?

Cromack: Carl Monk

Geier: M-o-n-k?

Cromack: M-o-n-k.

Geier: Okay.

Cromack: Another thing that influenced my decision was the opportunity I had in 1966 with a NSF fellowship to go to the University of Minnesota's Itasca Biological Station. That's the forestry site on Lake Itasca, and they teach courses there in the summer. I had a plant ecology course under Murray Buell from Rutgers, who had done all his work at Minnesota and knew a lot about Minnesota forests. I really got introduced to forest ecology, plant ecology, in that ecosystem up there. But, I didn't really have any background in forest type exposure at Texas.

Geier: Yeah.

Cromack: And Murray Buell was Carl Monk's major professor, who then became my major professor at Georgia. So, there was a connection there and I had an interest in that and in the ecosystem approach, so that's why I went to Georgia.

Geier: While you were working at Georgia and at Coweeta, were you aware of things going on at the Andrews at that time?

Cromack: A little bit, but most of us were right in the middle of our graduate work. One of the nice things about this whole IBP thing, was that they had a fair bit of money for people to travel and put on workshops, to kind of get across the biome boundaries. And I did get to take part in one at North Carolina where some people came out from the Andrews group. We knew about the other biomes. I went out to Colorado State to the short-grass prairie site. There was a site there in IBP and we worked on Pawnee Short-Grass site. So, a lot of people were meeting each other across geographic and disciplinary boundaries. This was with IBP. There was a big modeling effort there, to bring together people in plant and animal ecology and soils. It was a very great time to be in ecological ecosystems research. I wish we had similar opportunities now. We have the LTER. Still, I wish we had a similar kind of national effort to allow the current generation of graduate students and post-docs to have that kind of cross-fertilization. We do at some levels, but we had a remarkable kind of national effort behind that whole thing at that time.

Geier: You don't see the IBP showing up in LTER?

Cromack: Well, they do. There's is an outstanding network, okay. I think what we need is also some educational funds to allow people to move a little bit more between them.

Geier: To promote cross-fertilization?

Cromack: Yeah, to promote more inter-site work. I think we'd all benefit from that. We had the basics there by just kind of adding some things that strengthen the inner ties. And it sounds like there will be some additional inter-site funds for the next year or two to promote them. But, the other part was the strength of the foresters. The foresters had an inspiration at Coweeta, and out here, having been all the years of work in watershed studies and laying out all the stuff, we knew about vegetation, all the basics that you would need to go in and start a new study, had already been done. Ted Dyrness has done a lot of work on soils. Dick Waring was Jerry's physiological ecologist, and he was ready to get into ecosystems-style research. There were a really good combination of folks. You could say IBP itself, but you have to add all the institutional support. For me, the Forest Service was very important, as well as the National Science Foundation, and Oregon State University was willing, too. We had people working at the University of Oregon, and we had interchange with the University of Washington, which made this whole effort possible.

Geier: If you can think back to when you first started working there. What did you perceive as being the opportunities or your career goals at that time? In relation to working with the IBP group at the Andrews, where did you see that taking you?

Cromack: I wanted to do good basic research in soil ecosystems, related to how different water systems work, components decompose, and how nutrients cycle. This was an excellent place to do that. So I felt that I had time, if I could get several good years of work done and out in publications, whether I stay here or end up going somewhere else, that would lay a real good groundwork for future work I wanted to do, and teaching that I would eventually want to do, and students that I would eventually want to have.

Geier: So, you were looking at about a three or four-year investment of your time?

Cromack: That was the initial outlook, sure, for I think the majority of the years. Also, many of us thought that there would be a career opportunities for people who were trained from the ecosystem perspective. We had a group of senior leaders, like Dick Waring and Jerry Franklin, Stan Gessel and Carl Monk, and the people at Georgia. They had come out of pretty classical disciplinary areas, but they were leading this effort to do the ecosystem research. They gave a large number of post-docs and graduate students a chance to really get in on the ground floor of a new era in ecology. I think it basically has worked out for many of us in that program, who have had excellent career opportunities to do ecosystem-oriented research ever since.

Geier: So, you see a lot of people going off from the IBP into other leadership areas then or with different organizations?

Cromack: Oh, sure, in other areas. I think it has strengthened nationally, the programs in a number of universities. Cornell is one example among many.

Geier: But do you see people from the Andrews from the Coniferous [Forest] Biome taking those kinds of leadership roles on a national level, or people that you worked with?

Cromack: People from the Andrews have served in leadership positions at NSF, for example, and at NASA, as program directors. Jerry was a program director at NSF, Dick Waring is at NASA. That's one type of example. Our better achieving students have done well getting jobs. That to me, is one of the ways you're going to train people and move them out, and I think they have. There's a book coming out any day now, by Dick Waring and Steve Running, and Steve Running was a master's student here at the time of the IBP, Dick Waring's student. He was doing physiological modeling of trees and plant-water relations, which lead to the development of one of the first plant-oriented part of the structure of the hydrological model Waring started working on. Steve is at Montana. He's just one example. I had a student, Dan Binkley, who's now a professor in Forest Sciences at Colorado State. He's done a lot of ecosystems research.

Geier: What was his name?

Cromack: Dan Binkley.

Geier: Dan Binkley?

Cromack: And I have another student who did a masters with me, Richard Boone, who's at the University of Alaska, at the LTER up there.

Geier: Working with Keith Van Cleve?

Cromack: No, Keith retired. Unfortunately, a little too soon. I wish he had not retired quite yet, but Rich is doing forest soils research up there.

Geier: Maybe you could talk a little bit about your first impressions of the place and people at the Andrews when you came here to start working with the IBP. What's your recollection of how the place struck you at the outset?

Cromack: Well, I thought it was well-organized and well-structured, considering we didn't have very much in the way of actual facilities at the Andrews. But, we had the watershed installations. We had a little office down there at what was then the Blue River Ranger Station, and we had a couple of trailers to stay in. If you're familiar with the whole layout of the Andrews now, none of that was there. You can see that we needed a good organization of the research and support of that research down there. That had all been pioneered. It was starting in the early '60's with the watershed-level research. It was then kind of a remote area, but because all that structure there, people knew their way around. The senior people did, and people like Al Levno or one of the main field technicians or the foresters, kept all that stuff running. Even with the handicap of not having much in the way of facilities there, it did not, except for the inconvenience of having to go back-and-forth, it didn't inhibit getting started right away on stuff. It's the same thing in Coweeta, although Coweeta has a little bit better facilities, I guess you'd say. It had a little better lab and office facilities, because it was a hydrologic station since the 1920's. It didn't have a really good lab and research station until a number of years later. But it had the organization. It had the background. When you're going into a new place, unless you're clearly pioneering something there like a survey or maps, you need that. And we had the support here at OSU. With this building, although partly-completed, we had excellent labs and OSU gave us the support we needed for, in my case, chemical analyses, because we already had been doing that, and we had a water lab here with the Forest Service group. By today's standards it was not much, but we had a pretty good computer system, and started early to try to manage data. Like everybody else, we've had to learn a lot about that. You've probably seen or heard something about that history down there.

Geier: You come here from a, like you say, fairly well-established site like at Coweeta, to one that is on the rise. A major investment from IBP coming in and a lot of new people arriving. What was your impression of the working group, the people that were coming in?

Cromack: Tremendous amount of enthusiasm and cross-disciplinary discussions. We really had an interest in ecosystem philosophies. Not only on the land, but in the streams, also. We had a very good stream group evolving and we were trying to get ideas about how the forest and stream interacted, because we did focus on a key watershed down there, which was Watershed 10. That integrated a large part of the group effort. Although in my case, I utilized habitat types spread across several locations in addition to the Watershed 10, because it was starting to be cut. So, then we hired Fred Swanson to look at erosion processes. We were beginning work on modeling, at least conceptual modeling, how the system tied together. So, I think it enabled people to get some very good ideas. We did have a watershed base to work upon, but the idea was to put together integrated model structures for how these forests work, how forests and stream might interact, what would be the short-term and long-term erosion processes. And it was amazing just to think about it. Fred Swanson, for example, was trained originally as a volcanologist. He actually wanted to study volcanoes, but he also wanted to study near-term erosion processes, and he kind of made a career choice, kind of with the Forest Service. He said, "Well, I kind of have to give up volcanoes, because it's never going to happen." So, what happened a few years later? He was the main expert they had already hired. Fred could turn right around and point north, and be ready to lead on Mount St. Helens. That's kind of a fortuitous coincidence. People like Jim Sedell, who got interested in what happened to Spirit Lake. So, I mean, that was a really unanticipated opportunity. Nobody could have foreseen that. But I do think the leadership here promoted a very good atmosphere for integration of ecosystem processes. We were encouraged just to work hard on our specialties, but we were not isolated specialties, as we worked in integrated groups. And I think that made a tremendous difference.

Geier: Would you see it as a function of the university, or with your group in particular?

Cromack: Well, I would say, the overall group here, which included the university [OSU] and Forest Service. I mean, some of the people in the Forest Service were adjuncts of the university, but I think of it as sort of a unified whole, personally.

Geier: As you pointed out, you have a similar structure as at Coweeta with the cooperation of a university and the Forest Service. Was there a distinct difference here in terms of the climate for that kind of disciplinary involvement?

Cromack: I think they were both very good. I was quite early in the Coweeta group. They didn't have much stream research. When I first came, they were just starting it. So, more of their integration came a little bit after I left there, whereas I finished my doctorate and came out here, during the formation of some of that. So, it's not that one necessarily had it better, truly, than the other, it's just they were about a year or so out of phase. If I had stayed on as a post-doc there at Coweeta, for example, which could have been a possibility, I would have probably worked with that group for a while. We had a goal to try to really understand ecosystems. To try to get a really good understanding of ecosystem functions, given the structure of these forests that we had, and their complexity. So, it was things like that that enabled people to start thinking about the roles of some of the trees that make coarse woody

debris. As an organic matter component in these forests, and ultimately as a nutrient-cycling component and as a wildlife component, and all the other things that have been done since then. I think we've been able to open up a remarkable number of doors, you know, into the future.

Geier: I'm curious. You mentioned working with Al Levno when you first got here. Maybe you could talk a little bit about the kinds of interaction you had with different groups like technicians at the Andrews, or other people at the district [Blue River RD] down there. You mentioned using the facilities there. What was the degree of interaction with people?

Cromack: Well, they helped us put out and set things up, helped find places. It was kind of an efficiency process. You can do it all yourself, or you go out and have somebody help you for a couple days and get ahead by a factor of several days. Al would go down there to service the samplers. Dick [Fredriksen] would also go along. But, they took time out to take me around, as did other people. Because I wanted to look at litter decomposition, and on a habitat gradient, which is basically a micro-environment gradient from the dryer to the wetter side. We could look at gradients, which will allow us then to integrate across types of habitats that occur on the watersheds, like Watershed 10. But I didn't know where all those [places] were, but they had mapped all this stuff out.

Geier: So**,** there was a good infrastructure there of information for locating your plots?
Cromack: Getting all that was done very, very efficiently on the Andrews. Well, just kind of bringing me up to speed on the plant communities and so forth out here. Because up to that point in time, I'd had plant ecology in Minnesota and worked at Coweeta, but I had not been exposed to western forests. I mean they're so different, because they're big and old and evergreen. At least, there's this old-growth hemlock at Coweeta, but you don't get much feel of the old growth here. Coweeta had another big interesting phenomenon in that there had been the chestnut blight there in the 1930's, which wiped out about half of the trees in that entire basin, of "old-growth" chestnuts, well, "mature" chestnuts. Some of which were over 200 years in age. I looked at some of the rings in a few of the downed trunks. Even though it had not been logged since the 1920's when they did selective logging, it was not pristine or as undisturbed as the Andrews.

Geier: Did you see that as offering unique research opportunities?

Cromack: What?

Geier: The different kind of a forest you're concerned with here [research opportunities]?

Cromack: Well, I wanted to look at the role of chemical substrate quality of litter, and that includes things such as different as Douglas-fir and dogwoods and some of the [understory] plants, because of their soil-building qualities. And the other nice thing that I got to do out here, kind of just immediately post-IBP on the Andrews, was to look at post-fire succession. So, I got to do two very interesting projects on that, one with my student Dan Binkley, and another

with Dave McNabb, who was here. I thought that would be something that would be important for management, given that these are fire-prone ecosystems, given that, maybe we're thinking of going back to use of fire in management. So, we need to know more about the understory plants. And knowing more about the understory plants, you need to know what they contribute to the nutrient cycle process. Even though their productivity may not always be very great, they're there for a long period of time. And in older succession, they dominate the sites. I did have a chance to do some interesting new work that I really am very interested in. And another thing I got started on in Coweeta and pursued here was work on the role of fungi in nutrient cycling.

Geier: Was that affected by the difference among species?

Cromack: I was interested in the role of fungi in the ability to network in the soil and litter, both as decomposers and as mychorrizae, to intercept and recycle nutrients. So, they're critically important in sort of helping tie the rhizosphere, the root zone, the litter zone and rotting wood and all that; all those things together. The dominant sort of microorganisms do about 90% of the decomposition, and fungi do a big part of that. Bacterials are important, but we've had some really nice chances to try to look at how mychorrizae functions in these forests. Which ties back into what I call all the "belowground." So that's some of the research I've been doing.

Geier: So, you started that as a post-doc. You're mentioning several of these students that you're working with. Do you take on students?

Cromack: Well, I also had a student here who worked with me. His name was Robert Fogel, Bob Fogel. He was a Ph.D. student with Jim Trappe. But he worked as my research assistant for the first three years that I was out here. He helped me do the litter decomposition research while finishing his own Ph.D., which was in mycology. He was looking at the taxonomy of micro-active fungi. He and Jim Trappe helped me get started doing research in my garage. Bob finished his Ph.D. here, and he stayed and got his own post-doctoral funds to do some work on mycorrizhae studies. Then he got a job at the University of Michigan in Ann Arbor, and is now a professor. Again, it was because of the entire group that's here, there was a lot of interesting times. But there was a person here by the name of Chet Youngberg, who had actually been Ted Dyrness' major professor, who had done research on soils and had done some very nice work on it, as had some of Chet's students. One of his students, Dave McNabb, came over and worked with me on a project at the Andrews. Chet had a small but important part in the IBP program, too. He did soils work on the Andrews, and some of his students did some projects on the Andrews. And then, of course, Ted had been his Ph.D. student, so he had an interaction in that. He just died here this last fall, I guess. Both Jim and Jerry had appointments in botany, and Jerry I guess had appointments both in botany and forestry.

Geier: I'm curious to know about interactions with people in the district, staff at the Blue River station. Was there much interaction with them in terms of locating sites on or off the Andrews?

Cromack: Well, I didn't have much interaction with the actual district staff at that time. It was really only later when we evolved a much broader working relationship with what became the EER and the LTER, that we had silviculturists dedicated to the Andrews program. I mean, more of that staff was dedicated to specific project ties with the LTER. They gave us access, but I think it was the PNW Station folks who really facilitated things at that time when I was first here. The district folks were just kind of doing the district things, I mean, I don't think they were terribly interested in ecosystem studies.

Geier: So, the PNW Station was really the more involved ones?

Cromack: Yeah, they were the leaders on that. Now, we've evolved I think to what once was described as a pretty good partnership with the Blue River Ranger District. You know, district rangers back in those days were still kind of in charge of timber operations and that kind of thing, and I don't think they and the research community were interacting very well. There was hope that would happen, and I think it has happened, more as time has gone by. Do you see what I'm saying? I don't think it's unique to the Blue River Ranger District. Now you're with the Forest Service?

Geier: No. Right now I'm on appointment at OSU. I'm actually a historian with Western Oregon University [in Monmouth, Oregon].

Cromack: You'd get a better appraisal of that from people like Jerry Franklin, depending on who was district ranger. Some were interested, some were not very interested, and some couldn't care one way or the other, in the early days. The critical thing, was that places like the Andrews, Coweeta, and several of these places around the country got set up as experimental forests. Not all of them succeeded, but out of that entire matrix, some did succeed, and it allowed the research contingent of the Forest Service to develop and do some meaningful long-term studies.

Geier: I'm curious about knowing how the relationship changed over time. One of the factors there is the management of the growing number of scientists on the Andrews in this period. Was there a regular check-in procedure, or people you advised where your study sites were, so you didn't overlap those people?

Cromack: In the beginning, it was quite informal because there were so few of us, and we had Watershed 10. We did have information, but there wasn't a lot of formal structure. There weren't many people, as it was a fairly small number of people, and people like Art McKee in key positions. I think his role was at that time more facilitation and support, what became the evolution of the Quantitative Services Group and data bank [Forest Science Data Bank/FSDB], and the need to manage data and document studies better. Then, came a much better appreciation of where things might overlap. Now we have GIS: geographic information systems. We just didn't have all of that infrastructure. I guess there was some chance that people could accidentally step on each other's toes, but we had very little of that.

Geier: You just worked through Art mainly?

Cromack: We worked through Art, and people knew each other, and people knew where things were going on. They kind of knew where each other's sites were. So, we didn't have any problems. Now it's a much bigger organization with lots more people in it to manage. There's a lot more people-managing going on.

Geier: Sure.

Cromack: But there's also a lot better documentation work by far being done.

Geier: I was curious how those kinds of processes changed during the time you were involved there. How would you characterize your level of involvement in decision-making about how to run things at the Andrews?

Cromack: I had really no involvement in that. I think that was true mostly with the age class of researchers that came in here. We were given a lot of latitude to concentrate on the problem. We didn't worry much about management. I wasn't told to go down and manage Art McKee for the next three months or something like that. They interfaced directly with people like Waring and Franklin. Number one, we didn't really need to do that. Number two, I think it worked a lot better to have pretty much senior leadership for this stuff. Do you see what I'm getting at?

Geier: Yeah.

Cromack: So, that left us a lot more time to work with each other, a lot less red tape. There are many senses of that term, but we didn't have to worry about management.

Geier: Like now with the LTER meetings each month, there wasn't anything formally-structured like that at the time?

Cromack: We had meetings, but they were more science and integration-oriented. We did have organizational ones, periodically, particularly at the beginning of the field season each year. But with a much smaller organization, you really only needed a couple of those per year to kind of keep things on track. Now they have monthly meetings. If you've been to a couple of them, you see how structured they are. We had some definite structure, but you could basically organize things for the field season in late May or early June, get together and kind of plan what was going to happen. And if there was going to be logging somewhere, and then we had to be aware of the logging stuff, things like that. Safety concerns they were quite good at calling our attention to it.

Geier: I'm also curious where you stayed while you were working there. Did you tend to drive down to the Blue River to work each day, or did you stay overnight?

Cromack: We had a couple of trailers and somebody could camp out. Often, we'd go down for two or three days, just because of logistics. I did a fair number of one-day runs, especially in the summer when you could get in long hours. But, we had enough, just enough. We were a small group with a couple of trailers, so we were able to make it work. We got by with that for I don't know how many years. When we got the beginnings of funding for the full site together, we built a garage. There's still part of that thing left. Other than the two trailers and that one garage when you first come into the Andrews site, which was a good storage depot for stuff, that's all we had. And then, a couple of small trailers put out up on Mack Creek for overnight stays, because some of the stream group would go up there doing storm watches, and they needed to stay overnight in inclement weather and for safety reasons. If somebody got hurt or a road got closed, you want to have a place for people to stay out of the weather. They also built this log cabin on Mack Creek. The other thing was when the full IBP came in, at sort of an end of an era when NSF had been supporting building a lot of field station facilities. They were supporting this big national research effort, and they were just kind of finishing a big building stage. It was still going on, and we got around to wanting to put a major installation in, but it was kind of hard going, because they weren't wanting to do that much anymore. Art and Jerry had to work years and years, numerous grants, to get all the pieces of that together. I think they can be credited, along with people helping them, with a major effort in getting that whole facility thing together.

Geier: I guess this was so that the NSF could move to a different emphasis?

Cromack: Well, they had put a lot of work into building up field stations, and they felt that, I think, they had done that. There were excellent ones in existence, and in some ways I think they were kind of hoping that the Forest Service, for example, might want to do that, but it was encountering some budget considerations. It wasn't ready to build a field station itself, either. Kind of like, each party would say, "Why don't you do it?" No, "Why don't you do it?" So for several years, we went back-and-forth, and not much got done. It was kind of critical because we were evolving along the way towards the EER, which was the predecessor to the LTER, with only minimal facilities, and now we're up to nearly full facilities. If we get a bit more laboratory and classroom space down there, we'll be able to really do both the research and teach down there. See, the other thing was that a lot of people wanted to do some teaching at the Andrews, but they had to take classes down for a day or overnight, or we'd have these short courses in the summer where people would camp out. We didn't have the facilities for doing that kind of thing either. So, there's a lot that, probably more of that [teaching] would have been done if we'd had the facilities earlier. But, at the same time, I would say the lack of facilities didn't really inhibit us from getting a lot of stuff done in the beginning. It did make it less efficient, though.

Geier: Were there ways you had to compensate for that?

Cromack: Well, I don't know that you compensate for low efficiency. You just don't get as much done, if you had to drive down and have to bring all your gear and stay a couple days and

come back. That's less efficient than having your stuff down there, when you can go down and work for several days and come back. That's what people did.

Geier: But it didn't affect the kinds of studies that you put in?

Cromack: No, it didn't. It just meant that we had a little bit more extended travel time back-and-forth.

Geier: Was there any impact on the kinds of people you could recruit to help you work down there?

Cromack: We had good support for the task force people. We had started those who worked through the whole organization. And the counterpoints in the Forest Service like Al Levno and Ross Mersereau. I had Bob Fogel. They hired a guy by the name of Mike McCorison, who helped set up the entire Watershed 10 sediment sampling network.

Geier: Mike who?

Cromack: Mike McCorison, M-c-C-o-r-i-s-o-n. I think just one "r". We had a small, but critical group of field-technical people that went back-and-forth, and helped keep everything running for us.

Geier: These were the people on-site there, when you were up here trying to do studies?

Cromack: And then, there were individual professors who had graduate students working, so all that made a pretty good network. Looking back, it's kind of remarkable to me how much we could do and did get done, considering we didn't have the facilities down there that we do now.

Geier: Was there much interaction with local residents in Blue River? Were people hired from the community to work?

Cromack: There was some hiring in Bend, as I recall. We didn't have what we now have, which is that the Forest Service has evolved a much better structure to educate the public about its activities. There at the ranger station [Blue River RD], you could stop and get a map or some information, but couldn't stop in and learn about ecosystem research. In other words, whether it was a local resident or a traveler, there wasn't much there to inform people. And we didn't have a headquarters to set up anything like that. I don't know if that meant some foregone opportunities to get the residents a little more educated about what we were doing. There's a small number of local people.

Geier: So, they didn't come beating down your door looking for work?

Cromack: No, they didn't. And we didn't go beating down their doors and seeing if they heard about it, but they didn't know a lot about what we were doing. I think now we're in a much

better position to educate all levels of people who come there. We're obviously geared to disseminate information here at the university, for students. We might as well be in a position to educate the general public. Also, it's the general public that was paying the tax bill for IBP.

Geier: You keep talking about how you would identify as your primary audience. Who do you think you should be communicating your results of research to?

Cromack: Well, I think my primary audience was and is the research community, primarily, and secondly, management, of course, to the degree that we can learn from the basic science studies of how to manage forests. That's what I've been trained to do. But, I also feel that there should be people who can take this information and bring it down to primary and secondary education levels in this country, and to the public-at-large.

Geier: In terms of what your particular responsibilities are concerning writing for other researchers and managers, who have helped you reach other audiences?

Cromack: I've taken part in some educational programs and extension workshops to work with training Forest Service professionals, such as silviculturists, about ecosystem studies. We have a thing here called the "Silviculture Institute," which was active until just the last year or so. It was active for almost 15 years. And there was a short course designed to bring people back for two week modules, and we did an ecosystem module here. So, we had some training, because many of the folks that had gone through and gotten degrees in forestry, had not been exposed to what was going on in ecosystems research. They had a basic degree in forestry maybe ten, twenty years ago. Some of them got their degrees at or before we were just cranking up this kind of work. It wasn't in the textbooks; it wasn't in the courses. So, we had that kind of educational effort. We've had to continue a lot of extension activities. We're doing less of that at the moment only because the funding is down in the Forest Service.

Geier: Forest Service managers that were cycled in here for training?

Cromack: Also forest scientists, wildlife biologists, and a lot of professionals.

Geier: I'm not sure, I think, Lynn Burditt was one of the people that cycled in for that.

Cromack: I don't know whether she did. If she didn't do it here, she may well have done it somewhere else.

Geier: She did something at OSU. I can't remember if it was this particular program or not.

Cromack: Well, there are now a number of people who went through that program and went on to become district rangers. I don't have the full list, but it'd be interesting. You could probably get a list. Anyway, that certainly helped a lot. The one area I see needing more work, is to get it down to primary and secondary education and more into the general public.

Geier: That's a current need?

Cromack: I think it's a continuing need because we are trying to involve public in a lot of decisions about the management of our public lands. So, an informed public would be nice to have. It's a complex issue.

Geier: Just to clarify things for me. The Silviculture Institute was offered by Oregon State University, or by the Andrews Group?

Cromack: That was operated by Oregon State University.

Geier: Okay. Then, people would need to know, what is Andrews, and what is not.

Cromack: We have had short term extension courses that were done on the Andrews. This one had some field trips to Andrews, but it was headquartered here. There had been, I don't know if people like Jerry Franklin talked about it, but he originated some programs to bring in folks just to the Andrews like for a week, and to do a grand tour of the studies there, and then, different people would talk about their studies in the field. And they still are doing some of that.

Geier: I've got some copies of the early draft from the first program.

Cromack: I think one of the earliest that would have been done is probably the early 80's.

Geier: Yeah, that seems about right.

Cromack: Seems about right. Maybe as early as '79 or so, I don't know. Silviculture Institute didn't get going until … wish I could tell you the date on that, certainly by 1980, it was started. And actually, Dick Waring was one of the first leaders of it.

Geier: Maybe you could talk a little about your perception of how the decision-making process of the Andrews group has changed in the time you've been associated with it. Initially, there was not much involvement by people below the level of Jerry Franklin and Dick Waring, I think.

Cromack: We were allowed to make our own decisions about our own research, once we were recruited to do work in a particular area. All the day-to-day decisions about my own work with Chris and Bob Fogel, and with help I got from people like Dick Fredriksen and Al Levno, I got to make my own decisions, so I could carry on my own research. But I wasn't making the major decisions, about let's say hiring post-docs or managing research funds. We did get to help with some of the NSF reports, writing some of them. We got to help work on some of the budgets, stuff like that. It was just such smaller, sort of close-knit group that we didn't need a real formal sort of hierarchical structure to make it work. It worked quite well with people like Dick and Jerry and me at the main institutions. Plus, you know they kept up with what we were doing.

Geier: How would you view that change in your career since you've been associated with the group since then. What would you identify as some of the more important changes?

Cromack: Well, some of it is organizational. People like Jerry eventually left here, and went to the University of Washington. Dick Waring stayed here, and did other things. Ten or twelve years ago, Dick Waring decided to get involved with NASA, because they were starting to do surveys of planet Earth in conjunction with their planetary exploration program. They showed that they didn't really know a lot about planet Earth. Ironically, because they didn't. And this was one of the first efforts at use of remote sensing imagery, and everything began to evolve as remote sensing and GIS and all that technology came into being. So, Dick got involved with NASA to try to educate them more so that they could address landscape, regional, and even global sort of questions. He sort of got out of the Andrews thing in order to get into the NASA work. He still is very interested in ecosystem level applications, but he went off in that direction and he gave up some leadership. And then Jerry eventually left here, so other leaders came into being. Jerry went to Washington and got a whole new set of things going, and eventually got the funding together for the Wind River Canopy Crane set up, all that sort of thing.

Geier: So, this was a fairly smooth transition then from Waring and Franklin?

Cromack: Well, I don't know how to describe it. It was kind of a natural change in career direction and interest for them. Whether it was smooth or not, I'm not going to judge. But nationally, the program for what became the LTER system was evolving. I believe Jerry and Dick were still here working with this group, maybe not full-time, but were here when the first LTER proposal was put together. So, they did take us through the IBP and several years post IBP, up to kind of the doorstep of LTER, if you will. Parts of what was called the EER. So, once the LTER was started, it was kind of a natural transition [point for them]. Dick got involved in that and then Jerry left for University of Washington. So, their own interests diverged from here and from each other's interests.

Geier: Could you talk about how your own career goals and your perceptions of your area of specialization, changed in that time, and different models or paradigms of research that might have paralleled that transition?

Cromack: The IBP in immediate post-doc years, certainly did make it possible for us to put together some of the first pretty-detailed ecosystem level budgets, for not only the structure of system, but also dynamics of the system. That was a major synthetic effort of the group. What I think many of us have been doing since, depends on people's interests. They have diverged. For myself, I've been very much interested in focusing on below-ground ecosystem processes. There's a lot we didn't know then and we still don't know now, there's a lot to do there.

End Side A, Tape 1 (of 1)
Begin Side B, Tape 1 (of 1)

Cromack: So that has been a pretty good pick up?

Geier: It's pretty good.

Cromack: We had the opportunity to put together major ecosystem models. I've been interested in looking at below-ground ecosystems functions, gotten off a lot of into work on mycorrhizal fungi. Some of it continues on the Andrews, some of it continues elsewhere in the Northwest. Usually I've been involved in fires and fire ecosystems. I got that interest from a project on the Andrews, but I've been interested in fire in east side forests and its impact on nitrogen-cycling, wood decomposition, and ecosystem recovery, from fire. We're faced now with having to deal with the consequences of many decades of fire suppression in the forest, how we're going to get that back in there, and avoid big, big, total landscape fires. People are learning how to do it, experimenting with or doing it on a smaller scale, but they're not really able to do it on a big scale, on a scale of many, many thousands of acres, but they're trying to get there. We've got literally millions of acres to deal with. So, it seems different, but it is ecosystem application, because one of the things the Andrews taught us is that you have to look at disturbance as being part of the system; they're not undisturbed entities. Fire is rare over here. Windstorms may be more common. Insects and diseases are in all these forests. Another important area is to look at is the effects that pests and pathogens have. I've been working on that. People were going to have a project up there to look at the impact of forest diseases on ecosystem processes. Since it's a very nutrient-limited forest, we're going to have very large disease centers. What we've done is to use some of the other forests around here, as sort of satellite places to do selected components. You can see we do all these things on the Andrews, but on the other hand, you can take advantage to satellite areas. At least that's what I've been doing for mine.

Geier: As the IBP began to wind down, you participated in jobs in other regions. You stayed here, but your work began to spread out a little. Is that because of changes in the policy concerns or more just in your research interests and [funding] opportunities?

Cromack: I would say more my research interests and opportunities. But, I managed to be in policy management [related arena], trying to improve management, that's what I would say.

Geier: You're suggesting though, that your lessons learned from the Andrews, some of that informed your choice of the kind of research you did?

Cromack: Right.

Geier: How would you characterize your current involvement with the LTER group and the Andrews group?

Cromack: One major research project I've had going on down there looks at the effects of water chemistry on decomposition. I had several years before that from about '86 to '94, when we had a period of research on mycorrihizae, and some of that was done at the Andrews.

Then, since about '94 to now, we've been focusing on water quality stuff. Some of our main research sites are at the Andrews, so we're still using it.

Geier: And who would you identify as kind of your leading collaborators?

Cromack: Well, Robert Griffiths here at OSU. Bruce Caldwell. I have a master's student, Illyana Balachovic, B-a-l-a-c-h-o-v-i-c, who's completing her master's research on that project, which should be done by this spring.

Geier: What about your current involvement with decision-making on the Andrews or with the LTER group here?

Cromack: I have no involvement with that.

Geier: You don't get involved with the LTER meetings?

Cromack: I go to them occasionally, but I'm not involved with the main group, you know, the main decision-makers.

Geier: I'm curious about the connections of the IBP people after you've left here. Would you identify yourself as being fairly typical in that regard?

Cromack: I think so. I think we retain a lot of our original interest in the big picture of the ecosystem. But, we've had our own career paths, and we have a remarkable amount of freedom and opportunity to work together. As a young, evolving group, we've developed our specialties. I'd assume nearly all the people who've stayed in the research arena have continued to do some type of ecosystems research. Whether they stay working here or elsewhere or with each other in the original group. People like Jim Sedell about stream ecosystem research. Fred in erosion and geomorphology research. Both he and Jim are more into a little more administrative stuff, so they don't have as much time for that. I don't have administrative work, so that's why I have more time for research than they do.

Geier: You've mentioned quite a few students that you've worked with and my impression is that you tend to work with graduate students more than with post-docs.

Cromack: That's right.

Geier: Students. Is that a choice?

Cromack: Well, that was mainly an opportunity I had with monies for people like that. I've had some outstanding graduate students. I haven't had, personally, hardly any money for post-doc people. That's just the way it worked out. Given the best of all situations, I would probably have liked to have had a couple of post-doctoral folks, doing some things and following up on some things that they do on the Andrews. I might well be a little more formally involved with

the Andrews there. But I haven't had the financial wherewithal to do, that plus keep certain students going. I think some choices in life are a little more opportunistic. The IBP gave them then leaders of that work here during the main years I was here, about a million dollars a year. In 1974, 75, and 76, dollars. That would be a markup of at least three-fold, today. So, envision three million dollars today, in today's money, as guaranteed. You know, definitely available for foreseeably three to five years, or whatever it's going to be. That was a tremendous window of opportunity. I would like to see us get, not necessarily me, personally, but just to continue to create some of that kind of opportunity for the next generation of researchers. And it wouldn't have to necessarily be here. The LTER infrastructure allowed you some opportunity to do that.

I'm just trying to say that I think that the framework for the opportunity is even greater than it was when I started here, but it takes a certain amount of funding. The infrastructure is well funded, but I think it takes a certain amount of money to fund students and post-docs on top of that. And keeping the infrastructure going, is quite a bit more expensive now than it was when first we had no infrastructure to keep going. And the Forest Service supplied more of that support, they had more money for supporting that.

Geier: Now about the time the IBP dissipated, about the time you started to get leads on an appointment at OSU, if I'm looking at the time frame here. Did that have a bearing also on the kinds of research that you began to do?

Cromack: Well, Oregon State University has an area of research in forest productivity and culture and management. Both of those are relating to management. So, the kinds of work I did in soil ecosystem studies fit right into that, so that was a niche that was here. I did apply for and competed for a position here.

Geier: In terms of potential research sites and the kinds of work in Coweeta you started, as I understand it, your focus diffused out from the Andrews and you began work in Eastern Oregon.

Cromack: Well, actually, that came quite a bit later, but I would say we continued to do some research on the Andrews. Then, we worked on the effect of pathogens on the forest ecosystem at Waldo Lake. That was done in, what, '81 through about '83? Then, we had another opportunity in the mid '80's to go on the east side to look at three big insect outbreaks. I don't know how long you've been out here yourself, but in the '80's there were big insect outbreaks in the east side, bark beetles and spruce budworms. We had a project over there. Then, toward the end of the '80's, early '90's, I had this fire project. I just finished that up. Actually, we got the last paper out last year. Then, I started some research on mycorrihizae in the mid '80's, some of which was at the Andrews, some of which was nearby Coast Range forests, just because they're handy, you know, easy to get to. In fact, that's how we would gain some credibility, and still do, any of these things. It's good to have sites that are satellites of the Andrews, so that you could broaden the applications of those. As good as the Andrews is, I've always felt that you should try to demonstrate relevance elsewhere, because we're demonstrating ecosystem principles, and try to take it outside that. Other people have gone

on, they're interested in landscape applications and that sort of thing. I haven't gotten into that, but clearly you have to build bridges outward.

Geier: Once you get on a tenure-track appointment at OSU, does it then become easier to work with graduate students, or are you more willing to take on a graduate student than you might be otherwise.

Cromack: Both, because you have the time. I would have liked to have had students very early, but when you're a post-doc, you're not in a position to be an advisor. You could help students and work with-them, but you can't be a major professor until you get a real faculty position.

Geier: So, in that situation you would tend to work more with technicians?

Cromack: And other fellow post- docs, is what I did.

Geier: So, your circle of collaborators would change?

Cromack: Right, definitely. Well, and I very much wanted to take what I learned and to help train a new generation of students. So, if I was given an opportunity, I'd like to turn around and do it for as many more as I could in my career.

Geier: Sure, sure.

Cromack: Still doing that, I hope. (Chuckle) A few more grey hairs.

Geier: One more thing I wanted to ask you though.

Cromack: Did you get to talk to Jim Sedell today?

Geier: Yeah, I did. I got to this morning. It was a long haul to get on his calendar.

Cromack: Get him tied down and disciplined and not fidgeting in his chair? (Chuckle) He's a great guy.

Geier: Mainly just because he --

Cromack: -- Going in a million directions, though.

Geier: Yeah. Just getting in on his schedule was the problem most of the time.

Cromack: Yeah, I understand. Off-the-record, how long have you been involved in this project?

Geier: Oh, I've been with the Andrews project since '96. But I've been working with the PNW Station here on these history projects since about '91, actually.

Cromack: So, you've gotten to know the LTER group fairly well.

Geier: Fairly good, yeah.

Cromack: Been down there in the summer and you've seen some of what they do.

Geier: Yeah.

Cromack: You have a feeling for what they're doing now?

Geier: Yeah, in general. I tend to go to most of the meetings when I'm in town here so, yeah.

Cromack: Okay, alright. So, you really do know people pretty well. If you didn't really know folks like Jerry Franklin and Dick Waring, who weren't directly working with it, you should.

Geier: Yeah. They, I only know through interviews I've done with them. You know because they haven't really been involved with the group very much since I've been here.

Cromack: People like Ted, who was here at that time, he went off to Alaska for a major period, but came back as a retired guy helping us put the soil database together. He started out on it and then we finished.

Geier: Yeah.

Cromack: You know, it's interesting how they circle back.

Geier: Ted, I've really enjoyed working with him, because before I did this, I was working on the Alaska history.

Cromack: That's right, you've got two bangs for [him], right?

Geier: He was up there for 15 years.

Cromack: Okay. Because I just was curious. It just helps me to ask you a couple of questions**.**

Geier: I've been asking everybody I interviewed just to get a sense of changes over time. Maybe you could tell me how you might characterize the difference between basic and applied science, as you understand it.

Cromack: In forestry, I think it's more difficult to do, because you could see the applications easily. In other words, understanding the basis of things like forest productivity or soil fertility or how mycorrihizae work or how a log decays. These are all good, basic science questions, but we urge that we need to know them because of the tremendous resource use in forestry. I

don't see there being real hard and fast lines between those. That's what I enjoy about being in forestry. You can concentrate very hard on those basic science questions, and you can sit back and turn it around and sort of think about the adaptation. Maybe, I wouldn't directly do that, but try to write stuff out, and try to cast our findings so that others can incorporate that into management.

Geier: Given what you've said there, in forestry, is it likely that all findings will drive the kinds of basic questions that are being asked in research as kind of a demonstration of the value of the discipline?

Cromack: I don't know that it drives it. Some people might think that that's true. But I've felt that good research should be somewhat policy-independent. Because you're trying to formulate what one would think are important questions about how an ecosystem might function, might be sustained or managed. There's a lot we have to learn about that. It's inevitable that policy will come into play, but I would rather see good research and management guide policy rather than policy simply driving research. On the other hand, where do you get your directions for ideas and creativity, and trying really new things? The public has a lot of interest in managing the resources of the country, so that translates itself into policy. That's why we ended up with things like an EPA, because we were very concerned about the environment. So that's there, but they're also kind of expecting people who have had training and research and education, to come back to them with a better knowledge base upon which to base management. I think at a university, we have a chance to interact with policy, but I don't feel we should be driven by it. We can contribute to it, but it is dialogue. I don't think we should just formulate policy either. We contribute to the ideas of how to formulate policy. I think we have to be careful how we do that so that we don't try to impose our values, because there are difficult issues to deal with here. They're interesting issues, they're challenging issues, but they're sometimes difficult issues in relation to the resource base of this planet. So that puts a lot of responsibility on people to try to handle them in a responsible manner, so that the different sides of these questions get explored. Some are popular and easy, some are not easy, and they may not be popular, but maybe they'll be important. That's the way I feel about it.

Geier: Do you have a sense of the relative success of the Andrews in particular, in achieving that kind of balance in comparison with other places like, for example, Coweeta?

Cromack: I think they have certainly contributed to our knowledge base of how ecosystems function. I certainly think that that's going to have a bearing on future management. For me, being sort of in the middle of it, it's a little more difficult to say how much they've really contributed to policy. They certainly contributed to the national discussions about ecosystems, ecosystem management. I think that's fair to say. We're right in the middle of that now, so, it's an ongoing conversation.

Geier: One other thing here that's kind of a corollary to what we were talking about earlier in terms of what you view as your audience for the work that you do; how successful or

consciously do you think the Andrews group has targeted an audience or audiences? In other words, how well are they known for what they do?

Cromack: They're known, I think in professional audiences, they're known very well, nationally and internationally. I think they're also known quite well in management circles, and they certainly have had some impact on policy. When we talked earlier about this whole, levels of education, I don't know how much the general public knows about them. People in Oregon have certainly heard about them, but I don't think somebody in New York has heard about the Andrews or Coweeta or Hubbard Brook. It would be an interesting question to ask. But, nationally, many people, have heard of ecosystem management. I think a bit of an educational sort of job still to do there yet.

Geier: So, the legacy of ecosystem management has become well-known?

Cromack: I think so.

Geier: But the links between that and what people are doing, and from what I hear and from what you're saying, I'm gathering the Andrews has been a leader in ecosystem management.

Cromack: Look at the recent Mars lander and the tremendous focus that that got all over the world. I think the involvement of things like NASA is going to help to educate about global ecosystems, and integrate up. So, there are various levels on which this educational process will occur. I think we need more of it. I'm not gifted at working with, say, elementary school kids, personally. But I think people who can do that, need to be trained in some of that information base, so they can incorporate it, because there's a lot happening in science and medicine and everything else. There's a lot of information to teach people today. Our policy-makers, our governmental leaders need education as well. We don't have that many scientists in Congress. Look at the impact on Congress of the astronauts who became Congress-people. You know that a relative handful were primarily flight engineers. They were not even basic researchers, but, as a group, they certainly have had a big impact in Congress, because of their expertise in science. That's just one illustration of what I'm getting at here. We need more of those kinds of people.

Geier: I wonder if you could tell me, from your perceptions of having worked with this group for a while, what would you consider to be the more enduring legacy of this research group at the Andrews, from 1971 up to the present?

Cromack: I think we will have an enduring legacy of a really good foundation level of coniferous forest ecosystem research. That includes the watershed studies, it includes model development, includes all of the vegetation and plant ecological applications. It includes physiological ecology that was done, soils work, little things like coarse woody debris, the role of the crowns of tall trees, the epiphytes, because we have a clean atmosphere out here, things like lichens, where some of the findings canopy research pioneered. There are many facets to it. The stream research. You know there's erosion research. You can go back to the major sub-

themes of that work, I think are all going to have a very good legacy, both scientifically and in policy and management. Now, we're not just at the Andrews but are trying to interact with countries in Eastern Europe to deal with all the pollution problems in the countries of the former Soviet Union. I don't know if you're going to interview Mark Harmon, but he's doing a lot of work, and has done a lot of work in Russia.

Geier: Yeah, I did, but I'm trying to remember if we talked about it. I can't recall.
Cromack: Okay. But that's an example where it's going out onto the planet. Jerry Franklin had some very good ties with Japanese forest ecologists. Some of them came here during the IBP. We now have several Japanese graduate students here doing ecosystems research, and we've certainly had very good interactions with China. Those are just select examples. The International Biological Program didn't only occur here; it occurred in Canada, it occurred in Western Europe, they were counterpart programs. I think some of those international ones never had quite the funding levels, duration, or widespread scope we had here, partly because they didn't have the money, even in places like Britain, but they did get ecosystem groups together. Dick Waring's done a sabbatical there, and he could tell you about that. So, if you're looking for how it's gone out from here, it's gone out from here in a lot of very interesting ways. We had the Swedish ecology team over here, and we had Japanese ecologists. In other words, all through the years it's been a very large international contingent of folks who've come through here. Some of them on sabbatical some of them, short stays, so, there are a lot of threads.

It will be interesting to figure out, I know some of them, but you've been a little more focused in this discussion with how we interacted with places like Coweeta and University of Washington, but there's been all this international interaction. And we're probably sort of starting to have impacts in Third World countries, too, 'cause of the issues of reforestation and land degradation and all those sorts of things. But, I tell my students that an education in forestry will give them the chance to not only apply things in U.S. forest management, but they, if they want to do international work, there's going to be really good opportunities. If you have a good, stable economic environment, we don't have wars going on. In other words, if you look at the 20th century, it's been pretty disrupting. And, if you've got a country like Sweden, you see where you didn't have two world wars, you look at the infrastructure. You go down to Germany, and they have a lot of excellent science and a lot of things that have been rebuilt after two world wars, but they don't have a lot of forest that hasn't been pretty seriously impacted by it. Sweden has old growth, some of the old-growth forest left. You get that sense when you get in Europe, of the different impacts that have occurred. It's something that if you try to look at this internationally, do get to go to some of these places, as there's a story you're going to be interested in seeing. Sweden's very environmentally conscious, Germany is becoming more so.

Geier: So, what you're saying is one of the important legacies, is in the people?

Cromack: Well, you know another country that's really blossomed, is Spain. Because Spain after Franco has really trained an outstanding young group of scientists who are doing excellent

things, but are not having nearly the financing some other countries do. They're doing some excellent work. They care about their ecosystems. They've been doing things since the time of the Romans, so they're not exactly pristine. (Chuckle)

Geier: I'm following what you're saying.

Cromack: To give you an example, in Spain, the local jurisdiction of grazing cattle on land have been in business for hundreds and hundreds of years. And they take precedence over, say a U.S. Forest Service. It'd be like the county regulations having been in existence for 500 years, the United States came into being, and now we have the Forest Service. Guess whose regulations would sort of be the prime for local land management? It's reverse to what you'd think of in this country. So, that makes it challenging for people in Spain to govern. They are forced to work with local people, and almost first to educate them in what they're trying to do. To deal with local jurisdictions and then bring in the national system, makes it a little harder. Something I learned from my Spanish students.

Geier: Trying to extrapolate?

Cromack: I know we've progressed, but I just see a lot of ways in which something like the Andrews and these other ecosystem study groups are potentially interacting nationally and internationally.

Geier: So, what you're talking about is a model of interdisciplinary exchange that's been extrapolated into international arenas.

Cromack: Right. People like Dick Waring are developing short courses. He's done it in Austria and I think he's going to go to Eastern Europe with it, because those students need to be able to catch up with us and not duplicate all the intermediate steps. They need to be brought up to speed in terms of computers, methods, and where we are in our science, so that they can catch up and start doing work that's comparable to ours. They're going to have to go through some of the same experiences in terms of developing organizational structure and all that. You just have to kind of go through some of that, but at the same time, they shouldn't have to go back and do all of the 1970's type research we did, or the '80's. Some things, yes, but we should enable them to catch up a lot easier. They've got a huge job to do and in many cases not nearly the funds we had. All of these countries are still dealing with both the aftermath of wars and real resource pressures on their forests. So, they're challenged.

Geier: Well, I probably should let you get back to work. Phil Sollins is talking just along the same lines about the Canadians as part of the IBP, and the history of how people have moved from the IBP into national leadership positions.

Cromack: Right. Well, one way to think of it, is Canada's a huge country, but it's not a large population, it's about like California. They did some very nice stuff, but they didn't have all the

funding and all the groups behind it that we had. But, we had some very good interaction with some of the Canadians, some of the British and Canadian specialists.

Geier: There's a doctoral student from the UBC [University of British Columbia] research scene I've been trying to steer in that direction.

Cromack: Well, one person that you need to talk to [would be Hamish Kimmins], because he has been one of the outstanding ecosystem research. He's written a major textbook on forest ecology. He's been working on forest ecosystem models for nearly 20 years now. He's a Yale-trained ecologist. In fact, Dan Binkley, who's my student, did a masters with him and then came down to work with me. But there are people like that that would be well worth talking to sometime or knowing about.

Geier: I shouldn't take up all of your afternoon here. You've been generous enough, but I've got to get my daughter from daycare, too. Did you have anything that you wanted to zero in on, because I kind of actually jumped around?

Cromack: Well, I appreciate the opportunity to try to provide you, hopefully, some useful information about my experience. It was very positive for me, all the way.

Geier: Yeah, good. Well, it's been helpful.

Cromack: I feel I could have done more, sometimes, with maybe more resources, post-IBP, but I've been very blessed to get a lot of good things done. Now Phil's done some really nice work in the tropics, too. I don't know if he's brought that out, but he's done a lot of work in Costa Rica.

Geier: Yeah, we talked about that, a little bit of the transition.

Cromack: He had originally lived down there in Puerto Rico and moved, I think, during his high school years or something. You already had that, that he had several interesting projects down there. He's gone out and done some nice stuff for the classes.

Geier: Well I better-

Cromack: Gotta go.

End of Side B, Tape 1 (of 1)