AN INTERVIEW WITH

BOB LANFORD

by

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Explanatory Notes to Accompany the Interview of Bob Lanford

by

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Historically, the Harvesting Research Project, instituted by the American Pulp and Paper Association, represented the most significant attempt by this industry to both systematically research and develop, and to subsequently encourage the mechanization of tree harvesting. As such, researchers concerned with the industrial transformation of tree harvesting systems in the American Southeast are well advised to play close attention.

Bob Lanford was employed, immediately following his education, at the Harvesting Research Project where he remained until its demise. After brief periods at International Paper and Weyerhaeuser, he joined the faculty at Auburn University where he participated in the development of their forest engineering programme. Together with his university training, his work experiences have fashioned him into an industrial engineer of tree harvesting systems, with a quantitative proficiency in the measurement of their productivity. Thus, he possesses both an intimate knowledge and a technical expertise which renders him an ideal observer.

And perhaps productivity is a good theme with which to commence. As Lanford makes clear, the problematic surrounding the question of handling small trees efficiently has been a "nemesis of forestry forever". Simply, the size of trees being harvested has an enormous effect on the productivity of the harvesting system utilized. Consider the felling of the tree. Labour time is expended in positioning the felling machine to accomplish the task. Time is expended in felling it. And more time is required to proceed to the next tree. However, the actual quantity of time taken to fell a small tree in comparison with a large tree is not at all commensurate with the volume of fibre so produced; the labour time required to produce a given quantity of fibre is much less with a large tree.[1] Or to take an example mentioned by Lanford. On the harvesting systems using cable skidders he analyzed while at HRP, he stresses the amount of time it took workers to place chokers on each of the logs to be skidded (a number of logs would be skidded on each turn). Some of these harvesting systems coped by having separate chokers. Because the procedure had to be reversed at the end of the turn, a one person task became transformed into a three person one. And this was exacerbated if the logs being skidded were relatively small – it took the same amount of labour time to place chokers on a small log as it did for a larger one while the amount of fibre skidded is greater with large logs. This problem was mitigated with the advent of grapple skidders, machines with large grapples mounted on the rear which could simultaneously grasp a bundle of logs, thereby totally eliminating the choking procedure. Of course, this presupposed a felling machine able to construct bunches of felled trees. Here the

[1] Based on the harvesting operations for which he was responsible, Jarck found that the cost to produce a cord of pulpwood by the same type of harvesting system decreased by 37.4% when the diameter of the butt head of the tree increased from 6" to 8". See Walter Jarck, "The Case for Short Wood", *Pulpwood Production and Saw Mill Logging* 15 (July 1967), 12-18.

description provided by Lanford of HRP developing the first such machine is apropos. Certainly this was one of HRP's singular accomplishments, given that the modern drive-to-tree feller buncher perhaps more than any other machine captures the specificity of Southeastern tree harvesting.

Lanford's view that the feller forwarder – especially in small tree forests – is the most productive machine ever acquires import in this context of the productivity problematic Invented in Canada by John Kurelek while at Koehring,[2] this machine was the sole example of its genre. As suggested by its name, it felled trees and deposited them in its dump bay. When full, it forwarded the load to roadside (or to the deck, or the landing, or the brow) where the load was dumped for future delimbing and slashing into the desired lengths.

"And he came back and he told me he says I have never seen such a big machine cut such a small tree." This certainly was one secret to its productivity for it was capable of forwarding immense loads.[3] Another is that it is working continuously; there is no "wasted" time. Though it appears to be slow, it possesses a multi-stem cutter; when one tree is felled it is gripped by accumulator arms while the next stem is felled. When full, the accumulation of felled trees is located in the dump bay. While one tree is being felled, the machine is moving to the next one; it is constantly in motion. In short, it does not fell one tree, stop, put that tree into the bump bay, then move to the next tree. That it was not the complete answer to the small tree problem in the Southeast is explained by Lanford when he talks about how different Canadian harvesting conditions are.

Another harvesting system – also marked by continuous operation and also based on forwarders – is the cut-to-length system. Lanford is a strong advocate for these technologically sophisticated Scandinavian invented systems. These machines fell, delimb, and slash the tree at the stump in a single, continuous operation. Equipped with advanced computerized measuring devices, they are capable of producing the maximum length of saw logs a given tree contains, utilizing the remainder for pulpwood. The length is determined by the diameter of the tree and its taper from the butt end. Because this varies with individual trees, the harvester produces

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[2]Lanford's respect for Kurelek is evident. He mentions an article dealing with Kurelek's achievements; it is by Duane Barlow and is entitled "Iron Innovator", in the December 2003 issue of *Southern Loggin' Times*.

[3]Once a tree has been processed where it was standing, the product (whether it be only the felled tree, or a felled and delimbed tree, or a tree reduced to pulpwood and saw logs) had to be relocated to roadside for shipment to the mill. There are two methods of doing so: one is to drag it over the ground – skidding; the other is to carry it – forwarding (or prehauling to use the Southern designation).

"random lengths" thereby giving rise to its title "cut-to-length". The material so produced is transferred from the stump to the roadside with a forwarder.

Lanford favours this system because of its ability to effectively merchandise, to produce the maximum number of high value saw logs from the tree being harvested. Here he discusses whether this merchandising should occur at the stump using a forwarder-based harvesting system or in the mill yard, which means a harvesting system delivering tree lengths (i.e. trees that have been felled and delimbed) to that yard. In making his case, Lanford characterizes tree length systems as "a brute force kind of system" while cut-to-length systems he considers "a finesse system".

Finally, some terminological issues. Forest engineers classify harvesting systems according to the product produced at the stump, to be transferred to roadside. Historically, pulpwood systems produced approximately five foot lengths of wood at the stump which were carried (forwarded or prehauled) to roadside. Labelled shortwood systems, their modern iteration is the cut-to-length system. Historically, harvesting systems producing saw logs did so by felling and delimbing the tree at the stump which was then dragged (skidded) to roadside. This product is designated a tree length. With the advent of more powerful skidders, it became possible to transfer a felled tree with its limbs still present to roadside; this is termed a full tree system.[4] With the increasing importance of merchandising, harvesting systems were required to produce both pulpwood and saw logs; the question became whether to do this at the stump (cut-to-length) or at the landing or mill yard (tree length or full tree).

On to an array of terms which discriminate among the types of feller bunchers. A drive-to-tree feller buncher is typically a wheeled machine which drives to each of the trees it is to fell. This type of feller buncher is simultaneously peculiar to and very common in the Southeast. A swing-to-tree feller buncher is typically a tracked, excavator style machine which remains in one location, rotating on its turntable and extending its boom to fell all of the trees within its reach. Because it stays in one place while doing this, it is also called a limited-area feller buncher. And while on the topic of felling trees, the term motor-manual designates a worker operating a chainsaw.

Like many of these interviews, Lanford provides a fertile historical account of tree harvesting in the Southeast. Unlike most, though, he conveys his case for a particular kind of harvesting system – a case acquiring even greater interest in that this system has found less than ready acceptance thus far in the Southeast. Finally, in light of his experience, his point that HRP's most important contribution was the development of a felling machine that could also bunch is worthy of careful consideration.

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[4]Lanford also uses the term "whole tree". This refers to the entire tree, roots and all. And machines have been built to produce whole trees.

Peter MacDonald (PM): Today is the 24th of May, Monday, and we're interviewing Bob Lanford and the two interviewers are Peter MacDonald and Michael Clow. Bob, for the purposes of the Forest History Society oral history we'd like to have a little bit of personal biographical kind of information. So if it's not too intrusive if we could know when you were born and where, you know, and how you got into the industry and, you know, the companies you worked for and what you did, in kind of a general context.

Bob Lanford (BL): Okay, that sounds fine. I was born in 1943 in a small town in South Carolina named Woodruff. And I grew up there, went to Clemson University where I studied in the department of forestry and received a bachelor of science degree in forestry there at Clemson. I did, I was active in doing, working in the summers and these types of things and I also received a commission through ROTC there at Clemson, Army ROTC so that influenced my time at the university. But after I graduated I went to and worked for a company in Florida, Hudson Pulp and Paper Company in the northern part of Florida, where I did stand mapping and general inventory type work for them until the Army decided they need me to come and join them as soon as possible so I went and fulfilled my Army obligation as an officer in the Corps of Engineers in the Army. That was a very good experience and it had a lot to do with my future activities and my future profession because it introduced me more to engineering and I always had an inclination toward engineering. In fact, when I went to Clemson it was a sort of a toss up whether to go into forestry or civil engineering and I went into forestry and I never regretted that but I always had an engineering interest and aptitude. And when I left, as I was leaving Clemson after my bachelor's degree I seriously considered getting a wildlife degree because I also was very much interested in wildlife management and actually applied and was accepted to graduate school here at the University of Georgia. But I couldn't, I didn't get the scholarship arrangements that I thought that I wanted and so instead of coming on to graduate school, which would have deferred my Army commitment, I went on and did a little bit of work and then like I say, the Army called me up. I spent most of the year, part in initial officer training program and then also taught, we started up a OCS, Officer Candidates School at Port Belvoir, Virginia, in the Corps of Engineers because that was the buildup of the Vietnam era and they needed more officers and they needed engineering officers so we put this program together and my area of specialty there was in map reading and aerial photography and that type stuff. I put the course together but just as we started cranking up the OCS my orders were changed to they sent me to Okinawa and then over to Vietnam. I spent the remainder of my two-year commitment in Vietnam where I worked with a construction, engineering construction battalion and ran a rock quarry for a portion of the time. That was a good program. I was awarded the bronze star for my service there in Vietnam. Came back to the states and it was a question of what to do. As I was coming back I contacted my old major professor at Clemson and said I was still interested in graduate school. He said why don't you come on back to Clemson and we'll do a program in the area of forest engineering. And so I did even though he was more of a mensurationist than an engineer. I came back and I did my master's and it was pretty much a quantitative methods type of a masters program with statistics and these things. But I took a minor in ag engineering, agricultural engineering and I did my thesis doing time study of logging operations here in South Carolina.

PM: It's really industrial engineering.

BL: In many ways it was. But you know at that time there were really not many universities that offered any kind of a program in these areas. In fact, as I went on later for a doctorate I was, you know, it was hard pressed to find universities that would, that had anything pertaining to forest engineering. In fact, I even contacted Laval University in Canada because there was a guy named Lucia up there at Laval who had done some papers on that. University of West Virginia had sort of a program in it and so I, you know I contacted what was available at least in the east. I did not go to, there was a good program at Oregon State University but I didn't contact them but I did contact around in the east and on up into Canada. Fredericton, the program at University of New Brunswick was not in existence at that time.

PM: I think it started in '67, '68 as an undergraduate program.

BL: Right.

PM: And I think it was one of the first in Canada.

BL: It was, it was and Tom Corcoran who was there, Dr. Tom Corcoran, I did get in touch with him later but nothing seemed to be available so. But anyhow actually before I actually finished my thesis I took a job in Atlanta with the American Pulpwood Association's Harvesting Research Project. Dr. Tom Walbridge was the director of that project and I worked there for about three years where I was in charge of doing time and production studies all over the southeast. We studied. I had six time study teams that were donated by the sponsoring companies. They took eighteen, there was eighteen months of time study. We studied I think almost two hundred and seventy different logging contractors all the way from Texas to Virginia. And we had a massive amount of data and came in and this data in and then I was involved in the analysis of that data developing regression production estimations of the productivity associated with all the, we essentially time studied all the different equipment and systems that were available in the south at that time. And I was fortunate. The HRP, Harvesting and Research Project, had one of its board of directors was a guy named Ken Patterson from Canada with Canadian International Paper Company, who knew of a gentleman named Tiberius Cunia, Mike Cunia, who had been with CIP and had analyzed data and developed production rates for Canadian International Paper Company, which was really the leader in establishing some of the labor rates that were used in Canada for loggers. And Mike had come in and he had developed the system and taken the data and analyzed it and developed these production standards, which were used throughout eastern Canada. I don't know about western Canada but eastern Canada for sure. And Mike had left CIP. He had been hired by Syracuse University, the college of forestry there at Syracuse, to be on the faculty. And when we started this project in Atlanta with Harvesting Research Project, Ken suggested that HRP contract with Mike to help analyze the data. And that started my friendship and relationship with Mike Cunia. Mike is an extremely brilliant person. He's an applied mathematician but he had a background in forestry. He had forestry degree from Europe and a master's from Laval and he and I worked together on the Harvesting Research Project data. And then as we were getting that sort of wrapped up or getting the program out then I moved on and I worked on a Ph.D. under him at Syracuse. And so that's the way I ended up at Syracuse to get my doctorate there. So I got my doctorate from Syracuse and it really wasn't so much forest engineering as it was quantitative methods. It was operations research and more in statistics but it was a very good, I enjoyed the program there.

PM: What year was that?

BL: I left Syracuse in I believe it was 1973. I was hired by International Paper Company from Syracuse and they had a problem with their forest inventory. They had a program going on in forest engineering but they really their big problem was with their inventory system. And so I went to, I joined the International Paper Company in Mobile, Alabama. I was responsible for all their inventory methods for the whole south and then before I left I was in charge of all the inventory for the entire United States. We had seven and a half million acres in the south and then eventually, no, I guess five and a half million and the total across the country was something like seven and a half million acres. And it was my responsibility for the methodology used for all of that and I was responsible for any acquisition cruises that we did that IP might be going to consider purchasing some property or something like that, you know, I was the one that came in and gave the blessing to the sampling design and analyzing the data and all that stuff.

PM: By inventory you mean, trees standing in the forest?

BL: Standing trees.

PM: As opposed to product at the mill yard?

BL: Correct, correct, this is standing timber, right. So it was more of a land management task than anything to do with harvesting or those things.

PM: Would this be their own land?

BL: Yes, this was all their own property.

PM: I guess it wouldn't make much sense if it wasn't, would it?

BL: Well, we had some land like maybe long term timber leases but in essence, it was land owned by IP, right. And so that went along fine. I was able to, I actually implemented a new sampling design, which was more efficient for sampling the timber, again using my regression analysis tools to come up with a methodology for sampling the data more efficiently. But then Weyerhaeuser was expanding their timber harvesting research and they came to me and wanted me to help them as a manager of their harvesting research activities out in the Arkansas Oklahoma area.

PM: So this would be involvement with HRP I guess?

BL: No, this is strictly for Weyerhaeuser. Weyerhaeuser had expanded their total R&D activities and one part of it was harvesting, timber harvesting research and development.

PM: What year?

BL: This would have been in 1977. And so I moved. I left IP and moved to Oklahoma to work for Weyerhaeuser and we got heavily involved in analysis of different harvesting systems, with particular interest in trying to efficiently handle very small trees. That was the biggest goal at that point. I had a team of guys that worked for me and we did a lot of the same kind of time and production studies that we had done back at HRP but, you know, incorporating new features because we were, the time at HRP it was really a motor manual type of operation. I mean you had to still know a lot of manual chainsaw felling and cable skidding and this type of operation, whereas, as I got to Weyerhaeuser then we were starting to pick up some mechanization. We had small, we had machines with shears. This was before any saws on the felling machines. It was shear heads and more sophisticated mechanization. I worked, we went and researched and analyzed use of the Koehring feller forwarder, which was being used in Canada.

PM: Believe it or not we've seen them in operation.

BL: Right.

PM: It must be the last of the breed because it would have been what 1996, '97?

BL: It wouldn't surprise me if they are still working because it's still the most efficient way of handling small trees. And I got to become good friends with John Kurelek who was the engineer that.

PM: At Koehring.

BL: At Koehring, yep. Kurelek was the, he perfected the short wood harvester, the Koehring short wood harvester and he was the author of the feller forwarder. I also got a chance to work with a young engineer who was with him, Ted Pierce, who I've had association with from time on. Now do you know the John Kurelek story?

PM: No, I'd like to hear it.

Michael Clow (MC): Well, we know he's associated with Shortwood Harvester.

BL: Okay, do you know where he is now?

MC: No.

BL: Okay, he's with Tigercat. A lot of the old Koehring, see Koehring got, that part of Koehring got bought out by TimberJack I believe it was and then, the woods part of it. And when Koehring was divesting themselves of their woods machinery operation, John retired because he was up, you know, able where he could. Some other people left the old Koehring group and they formed a company called Tigercat. What's interesting about it is I started getting these reports from logging contractors when I was in Alabama about that these new Tigercat machines sure are good machines. To me I was thinking well, it's another feller buncher. Why are they any better? It just had been introduced but I kept hearing these things from different sources and I said there must be something to this Tigercat. Well, I found out what it was. They were, the daddy designer on it is John Kurelek. John's in his seventies now. I believe he was written up in Pulpwood Production and Timber Harvesting magazine back sometime, I think within the last year, about his contribution. But John Kurelek is an engineer's engineer. He's just an exceptional individual and you really, in your interview process you should interview John Kurelek because you take him, you take Pat Crawford who's the designer and the founder of the TIMCO machines, and two or three others, they have made major contributions to the mechanization of forestry. But Kurelek is just an extremely fine person, very low key. Like I say, he's an engineer's engineer but extremely talented. And that's why Tigercat is now one of the major players. They've added a lot more machines than that first one and they're a major player in the woods machinery business.

MC: Where are they operating out of?

BL: Canada, Ontario I believe but you can check anywhere on Google or whatever on the internet and you can get the address on it. But Tigercat you won't hear much from us old guys about Tigercat because they're sort of new kids on the block but they are a major player and have been a major player since they were introduced and came on the market. They've only been on the market probably I'd say less than eight years, something like that. And for them to step in and be as successful as they are they had to have some really good stuff. But John Kurelek paid a lot of attention to detail and he's, the president of Tigercat I believe is Tony LaRocha. I think that's right. But he's an old Koehring person but he's smart enough to get John Kurelek to help him with that. But anyway, that was some of the contributions I made you know to the Weyerhaeuser program. I didn't, I like, I think Weyerhaeuser's probably one of the very best wood products companies in the business, then and now. But it wasn't necessarily what I like for me personally. I worked for them for a year and I just, I didn't, for me personally it wasn't exactly the way I wanted to go. Weyerhaeuser sort of wants their people to be completely company types sort of like IBM and their blue suits and white shirts and red ties. Okay, Weyerhaeuser you say you can always open your shirt up and it's got a big W on your chest. That's not all bad but for me personally it was not that terribly good. So I started looking around and I knew that Auburn University had gotten a new department head. At that time forestry was a department of forestry under the college of agriculture at Auburn University in Alabama. And they had hired a fella named Emmett Thompson as the department head and I knew Emmett's background. He had been I guess department head at Mississippi State. He had worked at VPI and he had a good reputation. He's an economist by, forest economist by professional training. But I knew he was, I felt like he was a good person to work with. He had come to Auburn and Auburn's faculty were at a point of everyone was close to retirement age except for just a handful and so he was completely rebuilding that forestry program. And so that seemed like a pretty good deal so I, actually I visited Mississippi State too but I really, I stopped by Auburn and sort of introduced myself and said Emmett, I'm looking for a job, you got one, kind of thing. And he says, we'll make one. And so he did. [laughter] And so twenty-five years later I retired from Auburn.

PM: Great. Was it forestry engineering at that time?

BL: No, there was no forestry engineering at Auburn but what happened was that I came in and Emmett and the dean of the college of agriculture I guess put out some kind of a blurb about that I had been hired and I'd be working in the area of timber harvesting. And one of the trustees, a guy named Bill Nichols, a board of trustees for Auburn, sent a memo down to the dean of the college of agriculture and said I see that you've hired somebody in forest engineering or forest harvesting. When is Auburn going to put in a forest engineering program, and right, they wanted me. [laughter] And how Bill Nichols knew that I don't ever know but anyhow we had a lot of support from the top needless to say. And so what we did, Emmett was new in forestry but there also was a guy, Paul Turnquist, who was the new department head in ag engineering. And so we joined forces with Paul and Paul and I pretty much wrote the forest engineering program that was established at Auburn. And we were able within a year to get it approved and Paul and I went to the first council on forest engineering COFE meeting, which was held in Oregon in Corvallis.

PM: When would that be?

BL: That would have been in 1978. I left Weyerhaeuser at the end of '77 and beginning of '78 we went to the coffee meeting and Paul and I started putting our heads together on how we wrote the curriculum. The topic of the council on forest engineering COFE meeting was well, what is a forest engineer. You know, what credentials should that person have and we came back saying, okay. I mean some places says well, he needs to be an engineer with some forestry training. Other people say well, he's got to be a forester and we'll give him a little engineering. And we came back saying no, it's got to be fifty-fifty. You've got to have forestry and you've got to have engineering. And really we modeled our program probably more after the one at the University of Maine than any others because it was in effect at that time. And in my looking for a school to learn forest engineering, you know, made me aware of, you know, of the pros and cons of the different things. But we took and we took all the basic engineering courses and we took all the absolutely essential forestry courses and it made it probably one of the toughest programs at Auburn. Maybe only chemical engineering was any tougher because there were no slack courses in the whole program. And we started with it and.

PM: So this is late >70s then?

BL: Yes, we put this into place in '79. Yeah, it would have been '79 that we actually got it in place and we had our first two graduates at the end of 1980. They happened to be ag engineering students who went and took the extra courses in forestry so that they could become forest engineers. And those two guys have done extremely well, especially one. I don't know, you may have heard the name Frank Corley. He was our first graduate. He's got a very big company in Alabama and he's a history unto himself. I guess you probably hadn't gotten his name because he's a young guy but still he's made some pretty major contributions even in his young time. But that's the way we got started with it. At Auburn we've always had a joint program between ag engineering and forestry. Forestry now is no longer under agriculture. It's a school of forestry and the wildlife program has been brought into it and so it's a school for forestry and wildlife. So it's grown along with time.

PM: Graduate programs there?

BL: Oh yeah, oh yeah. Well, we had graduate programs then.

PM: In forest engineering?

BL: Yes, un-huh, right. Well, the program is actually, the graduate program is actually administered by the graduate school but we have, and so really the master's would be called master of forestry or the master's of ag engineering. We never tried to get a master's of science of forest engineering but we had forest engineers that went through both. So I don't know how many graduates there are now. There's, you know, well over a hundred forest engineering graduates and they've gone various, all over the United

States and the world I guess now. And we're very proud of the engineers. That's probably my proudest contribution is the students because I feel like they've made some extremely fine commitments to the industry. And they've gone on to do some really good stuff. In fact, and of course you probably already realize it that Dale was one of my graduate students too, Dale Greene, Dr. Dale Greene.

PM: Well, I knew he was a graduate of Auburn. Is that where he did his doctorate?

BL: That's correct.

PM: I knew he went to Louisiana.

BL: Yeah, he started at LSU and he went to VPI, got a master's there and then he got a Ph.D. with me at Auburn.

PM: I didn't know it was with you. He didn't tell us that.

BL: [laughter] Well, he was probably ashamed of it, you know. No, we're very proud of Dale because he's just done an extremely fine job here at Georgia.

PM: So would that be one of the earlier programs in the region of forest engineering?

BL: Correct, it's the only one. Again, it's how you define forest engineering. If you define it as an ag engineering program with a little bit of forestry, they had one of those over at Mississippi State. If you take it as being an industrial forestry program, they have that at VPI. And they also had an ag engineering program at VPI with a little bit of forestry in it.

PM: What is VPI?

BL: Virginia Polytechnic Institute.

PM: Okay, so it's not Virginia Tech?

BL: It is Virginia Tech, same thing. Virginia Tech, yeah, right.

PM: I have to work on my locals here. [laughter]

BL: Right, right, correct. Ask me if it doesn't sound right on it. That's Virginia Tech at Blacksburg. And then there was the ag engineering program at N.C. State, North Carolina State had an ag engineering with a little bit of forestry attached to it. But of the programs in the United States that equally had equal programs of engineering and forestry, it's really Auburn and Maine and that's it really. The program at Oregon State was more of a civil engineering program with a little bit of forestry. And the forestry part of it.

BL: So you missed what we were talking about Auburn as being one of the unique programs as far as forest engineering is concerned and it is. I don't remember how far back we were on the tape but forest engineering is, again it's what you define as being a forest engineer. And we felt like if is says forestry and if it says engineering that it ought to be equally strong and so that's the way we designed the program and we continue with that. We had problems like most university curricula. They get revised and updated every about three to five years and the university imposes it's restrictions as far as what courses you can take and what you can't take. And you have the university came along with, really it wasn't the university, it was the state, state of Alabama came along and said, you know, every student that goes through a university should have these basic liberal arts type courses. And that compresses the time available to give technical courses like engineering and forestry. And so we had to come down to a decision whether we would stay with, what would we go with, because we couldn't continue to do equal

forestry and engineering. So what we chose was to in the four year program it would be engineering because we felt like that was the more rigorous of the two curricula. And then we worked a way where students possibly could get through in four years and get forestry accreditation courses too. But probably and really what we have experienced is most of our forest engineers it took four and a half to five years anyhow. And of course, at the University of New Brunswick it's a five-year program. And that's just you know if you're going to get all the social sciences that.

PM: That the state or whoever wants you to take, right.

BL: The state thinks, you're almost going to have to go to five years. And so we weren't that far off from what everybody else had sort of come to. But the initial program we had we actually we were able to cram both the technical requirement for both areas into four years. But it's now more like a five-year program but it does allow a graduate to become a professional accredited forester and a professional accredited engineer. And so that's important, real important because we've had our graduates go out, we've had some that have gone strictly engineering and done a great job. We've had some of them go out and really go straight forestry and done a great job. They typically in a forestry setting our forest engineers typically excel beyond the foresters because of the analytical background they have of becoming engineers. They could solve problems better than just a straight forester could. And so typically they rose quicker in the companies than their forestry peers so and they've done extremely well in the engineering professions too. Particularly they've gone into equipment manufacturing type companies and have done extremely well. We have a number of graduates working for like Caterpillar that have done extremely well in the engineering side.

PM: How would your program at Auburn compare with some of the ones in Canada? Do you have much of a sense of that?

BL: It's hard to say because I haven't really seen their graduates but I'd say it would be very similar to what you've got at University of New Brunswick and the one there at Maine. And in it's own right, well, I don't really know, I haven't had as much association with the west coast. So much of the Pacific northwest is dealing with the large timber, skyline cable logging systems so it's sort of mixing apples and oranges comparing it to the east.

PM: Yeah, fair enough, yeah.

BL: But if you're talking about anything east of the Mississippi River you know you've got enough similarity that you can say they're similar. But any program that gets a student to where they can become a professional engineer and a professional forester would certainly qualify them to be extremely confident.

PM: The last person to use the term motor manual when we were interviewing is Tom Bjerkelund. Do you know Tom?

BL: Oh yes, sure.

PM: Well, that was the last. Of course, we didn't know what he was talking about. [laughter] But we do now.

BL: That's a Scandinavian term.

PM: Oh, is it? I didn't know that that's where it came from.

BL: Yeah, that would be more Scandinavian and Canadian than it would be southern.

PM: Right. Well, that's my way of leading into the next topic that we'd like to talk about.

BL: Okay.

PM: Which is the HRP, the Harvesting Research Project.

BL: Okay.

PM: Did you come into it after it had been established?

BL: Not long after it was established.

PM: How did it get started or do you know, have a sense of how?

BL: Oh yeah, it was a desire on the part of some of the major companies, six of the major companies initially, in the United States, particularly in the south, who felt like that research needed to be coordinated and advance more rapidly by bringing together a group of people to concentrate on that. And so essentially the companies initially like loaned people to HRP [Harvesting Research Project] to work on the project. They took some of their best people and Tom Walbridge, Joe Blonsky, Joe Strickland. Union Camp supplied Art Bunker who's an industrial engineer. They supplied who they felt was their best people to come together and work on common things. Mechanization was pretty new and they were trying to look for mechanized solutions to timber harvesting.

PM: Let's date ourselves here. So was it 1970 or a little earlier than that?

BL: It would have been, let's see.

MC: Was it '68?

BL: Either '69 or '70. I'm not exactly sure.

PM: Okay, that's close enough.

BL: It's right at that time period. Maybe, let's see, maybe '68, maybe '68, '69, somewhere in that neighborhood. I joined them not long after it because the project I worked on was one of the first they wanted to work on and they were still essentially getting established when I joined them. I was finishing up at least the course work and the field research on my master's program and so they interviewed me as to possibly, you know, take that position.

PM: So in '68 they'd be talking a little skidders?

BL: Un-huh, yes.

PM: Forwarders?

BL: Very few forwarders, very few forwarders and they were not called forwarders. They were called prehaulers [laughter]

PM: Remember that phrase.

BL: And it was all short wood.

MC: All short wood?

BL: Yeah, it was all wood usually five or six foot long, not even eight foot.

MC: So it's the American Pulpwood Association, isn't it?

BL: Correct.

MC: And so pulpwood was to be taken seriously.

BL: Right and the companies that sponsored this were all pulp and paper companies. International Paper Company, Union Camp Corporation, Westvaco, Container Corporation of America, Owens Illinois and somebody else, there were six. I can't call the other one.

MC: What was the dominant kind of system at this point? What were the dominant systems?

BL: The small bobtail truck. You may have heard that term. Okay, the bobtail truck was certainly the dominant pulpwood producer. They were producing wood to these wood yards like you talked with Walter about, Walter Jarck. Because they had small capacity you couldn't take the wood very far so they would accumulate wood out in little local yards and then put it on rail and then railroad cars would take it to the pulp mill. That was the predominant system. One of the things taking a step backwards is you know just before that was when I was working on a master's degree. Okay, my master's degree, the topic of it was comparing long wood and short wood operations because tree length had just, was new. It was just, I mean that was the new boy on the block. In fact, I took most of my, well, I took all my data with International Paper Company's mill at Georgetown, South Carolina. And they were taking predominantly short wood from these small, mostly from these bobtail trucks and they as an experiment they said well, we'll take a little bit of this long wood and figured the loggers would have no part of it. And the loggers just overwhelmed them with wood because the loggers quickly recognized that it took much less labor to produce tree length wood than short wood.

PM: How would they produce tree length at that time?

BL: They would chainsaw fell the tree, limb and top it at the stump, then use cable skidders that had multiple chokers. You know the cables that you put around individual stems and you would winch, you know, five or six stems to the skidder and take it to the landing and then load it tree length onto a tractor trailer to take it on to the mill.

PM: How would it be loaded?

BL: With a knuckle end loader.

PM: Okay, the knuckle boom loader?

BL: Knuckle boom loaders were fairly new at that point. Hydraulic knuckle boom loaders were fairly new. But they were fairly new but they were functioning and they used knuckle boom loaders also to load some of the short wood onto the, you know, like. See one reason it was really easy for the loggers to convert over is many of them were skidding tree length with skidders to the landing and then they would buck it up into short lengths and then load it onto tractor trailers but it would be short. And so when you went to tree length you just eliminated the bucking process and a little bit different trailers but basically the same thing they already were doing. So it cut out one whole step in the processing process so they were quite excited about it. But those were the predominant systems that were in effect at that time. Mechanical felling devices were brand new. They used the, that's about the time the mechanical felling device was starting to be used and it was primarily a small crawler tractor, D4 size Caterpillar size tractor with a big hydraulic shear mounted on the front of it and this was only used really on big trees but it would scissor and shear the trees off. And they started doing this down in the north Florida area because the underbrush was so thick that you couldn't find the trees after you cut them down with a chainsaw. And plus you were wading through all this mess so it was extremely difficult for a manual chainsaw

operator to go through and process the tree, cut it down and process it. So what they'd do is they'd fell it with these shears and then skid it out to a landing, a centralized, you know, place and limb and top it before they loaded it out so that was the first shear. Now one of the most, to me one of the major contributions that the Harvesting Research Project made was that it promoted the idea of a shear on the front of a machine that would grasp the tree and carry it vertically in the stand. The original shears just sheared it and the tree fell, directionally fell. But at the Harvesting Research Project it was experimented with, this was primarily with Joe Blonsky, came from Westvaco, where they would grab the tree and shear it and hold onto it and then walk through the woods, carrying it vertically. And these shears were mounted on little skid steering machines like the Case uniloader. Are you familiar with skid steer?

PM: No or we know it by another term, one or the other.

BL: A skid steer is a common machine that you would see in use for loading and for light construction work that has like a forklift on the front of it and it's got four wheels but they're connected with a single drive chain and it's hydrostatically driven. It's driven by hydraulic motors and you can have one side of your wheels going in one direction, one side the other, so it literally can turn on it's on space.

PM: Like a Bobcat ?

BL: Bobcat, Bobcat is another trade name, right? Melrose, Bobcat, Case Uniloader, well, Barco bought out some of the rights to Bobcat. But that was the first machine that was used for.

PM: Would it have been Bobcat size?

BL: Yes.

PM: You know, quite small?

BL: Right, because they initially were working again with small trees, which has been a nemesis of forestry forever of how to handle small trees efficiently. That was my research project at Weyerhaeuser. It was the first really big research project that I did at Auburn, is working with small trees. And so that was the idea you'd carry these things. Now what the feller buncher allowed you to do then is to move away from cable skidders to grapple skidders. You're familiar with the difference between the cable and the grapple?

PM: Yes.

BL: Okay. Well, the grapple skidder, by having the feller buncher you could put the trees into a bundle where you've got multiple trees and then you could back the skidder up to it and grab a bundle at a time, which again was very important with small trees because you had to batch process them to keep the cost down. And so the feller buncher was a key feature. The best I can tell that was first, the first thinking on this was at HRP [Harvesting Research Project].

PM: Okay, so this is just kind of the links that led to the feller buncher?

BL: Correct, that's right. Now you know nothing happens in the woods, you know, in a secretive fashion. As soon as, you know, these things got out then everybody tried it because it was not an impossible thing to do and so but I really think that HRP was the first place that that actually was done. But then other companies started making them. They took, the next step was they took skidders and turned the seat around in the skidder and replaced the back end of the skidder with a shear and made a feller buncher out of a skidder. Or they took like a loader, an articulated loader and put a shear on the back of it and that became the modern, the common feller buncher that we're associated with. But all this was coming out of, you know, that was the stuff dealing with HRP.

MC: In Canada feller buncher is big vehicles with big long booms on the end and pivoting all around them on a turntable. Why a front end loader with a shear on it?

BL: Because we didn't need track machines as a general rule. The ground conditions here in the south were such that you could drive up to individual trees and cut them. In Canada you would have softer ground. You'd be working on snow and then on the west coast you've got steep ground and the crawler tractor gave more traction and so you needed instead of driving to individual trees you reached the tree to get it. We coined the phrase swing to tree feller buncher. I think Auburn was where we coined that phrase, swing to tree feller buncher.

PM: I haven't heard that. I've heard drive to tree but I haven't heard swing to tree.

BL: Okay, we use both drive to tree and swing to tree. Another term for the boom mounted is a limited area feller buncher because you're sort of covering a limited area. But swing to tree seemed to make a lot of sense and I think we were the first to ever use it. We didn't copyright it. I guess we should have. You might get somebody else that will tell you something different but I think we did. But those were some of the major things I think that took place. There was a lot of thoughts about trying to simulate harvesting activities, computer simulate harvesting activities. And so that was a big project at HRP. And when you get with Bill Stuart at Mississippi State, Bill will talk about that. I'll leave it at that.

MC: Do remember any of the results of any the productivity tests that you carried out at HRP [Harvesting Research Project]?

BL: I can give you a whole big manual of them.

MC: Really?

BL: Oh yeah, it was published. It was all published. And the rates, if the activity is still going on like say manually felling with a chainsaw, the rates are still applicable.

PM: By far and away the most productive thing really was [voice too low to hear] the feller forwarder?

BL: That's right, still is.

PM: Why do those machines not come to dominate in the woods?

BL: Because of their size, it's plain and simple. In fact, when I was with Weyerhaeuser we analyzed the feller forwarder and said it would be a good machine on the properties of Weyerhaeuser in Oklahoma. And they did bring it and they did run it and I don't know, it may still be running. But it was just as productive as we thought. The land pattern in the east though in general is not, your harvest land is not contiguous enough to use that big a machine. See to move it on highways you've got to take the wheels off. In Canada see you just walk it from tract to tract and you're cutting square miles at a whack and so moving it from wood to wood is no big deal. And you don't take it into the shop to maintain it. You maintain it right out there on the site. It's set up to where it's like a rolling factory. And if you've got the land area to operate it, it is the most efficient machine that's in the woods. Also, I'd say one of the other things that has possibly caused its demise has been the need to merchandise. It's really geared to doing just mass moving of wood and sorting out of higher valued products is much more difficult with that type of an operation. But if you're just wanting to move wood, just fiber, there's nothing any faster. I mean it incorporates several features. I mean it's not magical. It's a multi stem cutter. When the head reaches out to cut a tree it can cut one tree. It can cut two trees. It can cut three cut. It can cut four trees before it has to lay it back into its bunk. In other words, it cuts until the mouth is full. Again, old John Kurelek, he has these arms on the front of it. It's got four arms and what happens, two arms go out after a tree and you cut that tree and it comes in and then your other arms go out and so you've always got the tree in hold as you accumulate trees. And so until you fill up the mouth of this device you don't have to lay it

in the bunk. So that's multi stem processing. The other thing is that you're carrying out basically a truckload of wood at a time. I mean the back end of that thing is just a big truckload of wood. The dumping process is very efficient. You essentially drive out from underneath the wood and it's just, everything about it is efficient. Now you do suffer some losses or when we analyzed it at Weyerhaeuser you saved a lot of money on felling and forwarding but then it cost you a little bit more money to delimb the wood because at that time we really didn't have that good of mechanical delimber. I'd say now it's probably not that kind of deal but you pretty much got to have a mechanical delimber, a slide boom delimber to be able to delimb the limbs because they're together in the mat. And to separate them out you've got to have a pretty strong machine to pick up the pieces and limb them and then lay the tree lengths out. But it's still the most efficient machine that I've ever time studied. There may be something that's faster or better but I've never seen one. [laughter]

MC: Nor have we.

BL: I remember Emmett Thompson had a tour one time up in the Maine area. I think University of Maine probably was putting it on. And he came back and told me he says I have never seen such a big machine cut such a small tree. [laughter] And it's true, it's true.

PM: Now that leads to interesting things and that is the current system to the front end loader feller bunchers here and then you've got the skidder to unload it and put it on the truck. It seems to be only for the standard system in the south. Is it and why?

BL: That is. It's with the, you left the delimber out. You've got to delimb it somehow. Okay, so.

PM: But they use a gate.

BL: Well, that's one way. There's a combination of things that have come in. The feller buncher, improvements have been made to the feller buncher. It's basically the same animal that worked with that I talked about that we started conceptually working with at HRP [Harvesting Research Project]. But the carriers have changed. One of the biggest innovations was one that a company named Hydrax came up with where they made the carrier hydrostatic instead of gear driven. Instead of having like an automatic transmission on a car to drive it where you shifted gears, you had a hydrostatic motor that you just could move the direction of the flow of the hydraulic motor, hydraulic fluid and you could change directions. This made the device a lot faster. And all the companies fell in line with Hydrax. But Hydrax made a big contribution there to go to hydrostatics. And that's made a very efficient loader and now you can get various brands that have hydrostatically driven feller bunchers. The other thing with the feller buncher is going to a saw over a shear. Walter Jarck's old company, Georgia Pacific, had as much to do with it as anybody else. He may have told you. They came to the conclusion that they didn't want any more sheared wood. The Canadians found this sooner than we did here in the south in that you got the splitting and butt shattering.

MC: When it was frozen.

BL: When it was frozen, that's right. It started showing up there quicker than it did here but then after they realized it, it was happening here too. You wouldn't find it until actually the lumber had been sawn and dried and everything. So you had a lot of money in the lumber and all of a sudden the butt log starts splitting on you. And so GP started, Georgia Pacific started putting the edict out that they're not going to take any more sheared wood. So thus caused the interest in going to the saws. And there were several different kinds of saws were developed. There was a lot of different versions and things came along but what it has come down to is most of your sawing action is a big heavy disc and this again was a Koehring innovation. It's a John Kurelek innovation. A big thick disc that's a big chunk of metal that carries lots of kinetic energy I believe whirling with teeth on the edge of it and you essentially drive it into the tree and before the kinetic energy dies on you, you cut the tree. So you actually, the hydraulic motor gets this thing up to the point where it's up to it's full RPMs and then the kinetic energy is what actually cuts the

tree off. Takes a big kerf, you know, two or three inches of kerf, chips out but it's very fast. It's faster than a shear and it doesn't give you the butt shatter. Now there were some and in some cases there still is the idea of using a bar and chain to cut through a tree.

MC: Chainsaw?

BL: It's a chainsaw, yeah, and it's cutting its way through. It's not shattering its way through like a disc saw does. But that's what most contractors now are using a drive to tree feller buncher with a disc. That's the most common felling device. Now you will find excavators with a boom and one of these discs, you know, disc saws on the end of that boom. But they'll usually be working in places where you can't work drive to tree machines. Because with an excavator type machine with a track on it the tracks are expensive to maintain, it's not as fast. I can't lie anymore, Dale's here. [laughter] But it's just more expensive to operate unless you have to use, you know, a swing to tree machine you'd prefer to use a drive to tree. So that's the way trees are cut down.

PM: We had been talking about the saw blade to the shear, a better carrier so. I guess we're headed into grapple skidder as an improvement and delimber.

BL: That's right. I guess we were discussing about what's being done now. And so they, you know, they rapidly went away from the cable skidder to a grapple skidder. They found that you could run grapple skidders in much more difficult terrain than people thought. And so to get away from pulling that cable out of that winch, operators have ingeniously figured out ways to use the grapple skidder. We used to have one cable skidder for like a half dozen grapple skidders when I worked for Weyerhaeuser with their company logging jobs. But still the cable skidder was something that nobody wanted to really do because it's a lot of work. See at one time at some jobs as we were doing the studies with HRP we would have operations that would have like three men operating one skidder. You'd have one man on the skidder. You'd have one man out in the woods setting chokers on the trees. And you'd have another person at the landing that would unhook the chokers when the skidder came in. That'd keep the skidder running faster but you've got three pieces of labor, three individuals performing that one task. And, of course, with a grapple skidder you only have to have one person to do all of it and he does it very rapidly. So you could instead of taking ten minutes to make a trip, a turn with a skidder, you can do it in three minutes, five minutes, something like that for the same distance. But then so that's sort of where we've gone now in the south is with the grapple skidder. But then you've got to get the limbs off of it and I guess maybe it's probably been at least, at least twenty-five years ago someone discovered that pine trees have brittle limbs and you could back them through a lattice work of pipes called a gate and break them off and have reasonably acceptable stubs left on the tree. And so the gate delimber was brought into the picture. And actually it's longer than that because we used gate delimbers when I was at Weyerhaeuser in 1977. So gate delimbers probably date back to 1976 or '75. So they go back quite a ways. But that was felt to be a fairly inexpensive way of delimbing the trees. It did reduce the capacity of the skidder because skidders were made to pull trees and not to back trees and so we figured, at Weyerhaeuser we figured we lost about thirty percent of our payload by doing gate delimbing.

MC: So this would be done as soon as the skidder arrived at the landing?

BL: Usually between the stump area and the landing is where the gates would be set up and initially the gates were tied up to a couple of trees. They were chained to a couple of trees and then later you had gates that were free standing that had like a base and a support arm that you could back the trees through.

MC: [Voice too low to hear.]

BL: Correct, that's right, that's right.

MC: So the skidder would have to go by it, back through and then go?

BL: Back up, that's right. Many times you would have a pivot tree so the skidder would go around the pivot tree and the pivot tree would sort of direct the, sort of aim the tops to where then you could back it through the limb more efficiently.

MC: But that limited the load that the grapple still could take?

BL: That's correct and also initially the skidders were not well designed as far as guarding and things on them to push the trees through there and so they had to improve the guarding on the back of the skidder and they also had to keep the reverse gear strong enough to where it would take that kind of abuse.

PM: When you think about it they're grouping a bunch of full trees.

BL: That's correct.

PM: I mean a grapple kind of tree so it would come up against the back of the skidder.

BL: Yeah, right. Well, you hold on to them tight but yeah, they do come up against the back of the skidder. And you used the correct term there too, it's full tree, full tree, tree length, and whole tree. [laughter] Okay, I'm glad to hear that. I've always adopted that and I think Canada is where those definitions originated.

MC: Yes, that's right.

BL: But I think those are good definitions.

PM: Well, we learned a lot from Tom Bjerkelund actually.

BL: Did you?

PM: Yes.

BL: Okay.

PM: Because we knew nothing about this when we started.

BL: Right, yeah. Yeah, actually Canada had a number of conferences that sorted through some of this terminology stuff and came out with some consistent terminology and I've always tried to adopt that. We've never had an association that sort of dictated terminology in forest engineering. But you know whenever, you know, you get smart people together and they come up with a good term or a good procedure, then I've always felt it was wise to copy instead of try to reinvent if at all possible. So the gate has been a useful tool for our skidding operations here in the south. And it's only in fairly recent times that there's been some improvements. The system today most contractors, logging contractors use usually the gate in combination with a delimbing using pull through delimbers and you've probably heard that terminology yet. Pull through delimber is just a set of knives and a cutoff saw that's attached to the loader. And the loader sets the full trees into some arms that have knives on them and the arms collapse down on the trees and then the loader essentially pulls the tree through and the sharp edge of the knives break or cut the limbs off. And then you've got a chainsaw, a bar and chain cutoff saw that you can top the tree length with.

MC: [Voice too low to hear]?

BL: No, it did it vertically. It did it vertically.

MC: It pulled the tree through a fixed set of knives?

BL: But it did it vertically. This is horizontal.

MC: As opposed to what we would call a stroke delimber?

BL: Correct, yeah.

MC: And what's the head attached to?

BL: It's on the loader. It's an attachment to the, you know, the loader is typically got a, is, you know, long enough that the limbing knives it on one end and then you've got the rest of the loader on the back of it. So that, some contractors try to limb all their trees with this pull through delimber. But probably the more predominant way of doing it is you gate them first and then you finish it off with the pull through. Now you can imagine this caused some engineering situations as far as loaders are considered, just like the grapple skidders were not geared up to back trees through a gate. The power of the limber, you're actually using the turntable, the device the loader sits on, you're using the strength of the turntable to actually pull these trees through. So again they had to beef up the turntable and the strength of the pulling to perform this operation. But that's a pretty common, that's probably the most common system now in the south. Now we do have some strokers, stroke delimbers that are being used. Some of the better contractors, better contractors do use stroke delimbers We have a device that flails the limbs off called a delimbinator, which is like a box with flail limbers. Have you heard the term flailing? That originated in Canada but the flail in Canada was on the front of a like a front end loader and it was a big wheel with a bunch of chains on it and you wheeled it and knocked the limbs off. The delimbinator is sort of the same except it's a stationary device that you pull the tops through with a loader or I think you can do it with a skidder to take the limbs off but the limbs are flailed off. But I don't think those are as predominant as the combination of the gate and the pull through delimber. So that's the way most of the wood in the south I think is being delivered today. I'm skipping over any of the lesser used equipment like cut to length. If you've got a chipping operation the wood will probably come tree length or full tree to the chipper and then it's made into chips and transported instead of tree length.

MC: In Canada cut to length with Scandinavian single grip harvesting system you're definitely developing a niche.

BL: Right.

MC: And is it in the south and if so, why not?

BL: [laughter] Well, you're talking to the wrong person to find out why it won't work. We had a, this dates back to the early research that we did at Auburn. We had a company come to us. American Can Company came to us just when I was beginning to start work at Auburn. This was in '79 and they had a problem of how do we do first thinnings economically. Okay, because they had lots of plantations coming on board and they needed to be thinned and you were dealing with handling little five-inch trees and how do you do it. So we spent an entire summer, the summer of 1980, looking at every conceivable way of doing first thinnings. We went everywhere from the motor manual systems with Scandinavian ground cable systems, tilt winch stuff, working with Soren Eriksson and Erickson all the way up to feller bunchers with grapple skidders and we used forwarders also. We used, they were short wood forwarders. They were prehaulers in

southern terminology but we used that. And the conclusion of that study came out and really we were trying to achieve two things. One is it had to be economically feasible but also it had to be silviculturally sound, which meant you had to improve the stand because a thinning is not for harvesting wood, it's for improving the stand for some later cut. And we came out with yes, you can use tree length methods for doing first thinnings. But the operators have to be extremely careful because you are skidding a long package through the woods and you're trying not to damage the residual trees, which is really the reason for doing the thinning in the first place. And it takes a specialized crew to do that and that has panned out. There are a lot of first thinning specialized crews now in the south. But you don't put a tree length clearcut crew into first thinnings because they'll just destroy it. You have to have a mentality of being careful. The operators have to. But the other system is with a cut to length, at that time cut to length wasn't a terminology at that time. It was a forwarder system. The forwarder system took the wood out, basically with no damage in a no-brainer type system. You could have much less skilled operators and still do a superior job with what you did with the tree length. So that was our conclusion after, you know, a year of study and another year probably of analysis. And that's grown along and that has just been reinforced over the years. We didn't have single grip harvesters at that time. We were doing it with feller bunchers and chainsaw operators and things like that. But the idea of carrying the wood instead of dragging the wood was the fundamental principle that was embodied in the cut to length principle as opposed to the tree length principle.

PM: This meant all the processing might be done at the stump.

BL: Yes, unless you went to something like the feller forwarder but we didn't have any real narrow feller forwarders. And that has progressed through time and it just became more solid that this is the better way to go. And as time has come along cut to length in my thinking is the superior fashion to meet the wood demands of the future. And the south has been slow to adopt that philosophy and it's a lot of reasons for it. A lot of the mill operations, in particular as I mentioned earlier, Weyerhaeuser I think is the leader in terms of companies that most progressive, most innovative and they have adopted a centralized merchandising process as opposed to a decentralized harvester process. Weyerhaeuser concept is you develop tree lengths and then you transport them by truck to a centralized location at which point you break the tree length down into its products. And you do this, you know, in a more of a mill controlled type setting. And that has been their conclusion is the most efficient way of handling trees. And they've got good reasons probably to think that. But they've gone that way. A lot of companies have followed suit. There are some things you can do with that. You can accurately measure lengths. You can do a pretty good job of merchandizing out the higher valued product. And tree length is more of a, it's really a simpler process. It's not a finesse system. It's a brute force kind of a system. Tree length looks more productive, looks more active than cut to length. You've got skidders racing back and forth in the woods whereas a crawler sort of creeps around the woods. It doesn't look as productive. I go back to my old fella John Kurelek. Before we went up to see the feller forwarders operate in Canada the first time I'd ever seen them, I asked John I said John, what am I going to see when I get up to see these feller forwarders. And in his thoughtful, pensive engineering type manner John says he says you will not be impressed. I said why won't I be impressed, John. He says it will look slow to you. And if you've seen the feller forwarder operate it does. It moves along at a mile or two miles an hour at best and it just looks extremely lethargic until you put a stopwatch on it and you look at the capacity. What it's doing is it's working continuously. Okay, the cut to length approach does the same thing. Everything is efficient and you've got tremendously more capability with cut to length than you can with tree length. But it looks slow. It involves two machines that their combined cost is about the same amount of money or actually a little bit less money, but similar money to what it takes for like four or five machines in tree length. And so they say well, I'm putting all my money in these two machines that doesn't produce as much wood as the other tree length operation does. And those are the things pretty much. I mean resistance to change. The mills have not endorsed it. The buying people and basically your mills drive what the loggers do. If the mills say we've got to

have cut length wood the loggers will produce cut length wood. But the mills have geared up for tree length. They store their wood under a crane that's a pinwheel style crane that's geared more to tree length. So the handling mechanisms of the mills are more geared to tree length. On the other hand the mills are suffering tremendous inefficiency in working with tree length wood over cut to length wood because the cut to length wood is already sized and sorted and the mills can increase their production. Generally speaking they can increase their production significantly by having sorted logs, sorted by size, coming through their mill as opposed to having to process a tree length. Think about a tree length piece of wood. You've got a big butt log and you've got a medium size log and then you've got a small log. Okay, the headset on that saw that's cutting that up into lumber has to reset for every log that comes through, whereas, if you were running just say eight inch diameter logs through that headset, the headset doesn't have to change and so it's faster. Through put's faster. And the Europeans, Scandinavians in particular have all figured that out and I think they scratch their head pretty soundly when they.

MC: [Voice too low to hear.]

BL: That's right and you sort it. You know you've got it all sorted out on the, in the tally on the machine and, you know, mill knows what's coming. You can you know if you needed the big logs you could haul just big logs to the mill. If you needed little bitty logs, you could select little bitty logs and send them to the mill. You got full control, species. I mean you've got the whole, you've got ultimate control with cut to length and that's the smart way to go. It also, socially speaking, the cut to length system is the more socially accepted system because you're using a forwarder that's carrying say a half a truck load of wood at a time, as opposed to a skidder that's pulling about a twentieth of a load at a time, you can stretch your roads and loading areas out wider. So that means you don't need as many roads. You don't need as many landings. And you're disturbance to the ground is mostly associated with the roads and loading areas. Okay, with a forwarder you virtually have no disturbance. I mean if you had to you could forward it a mile to take the wood out, whereas, a skidder is typically wanting to stay under, at least under five hundred foot a skid to keep everything running efficiently and keep your cost down. So you do a lot more disturbance. You're also you're dragging the wood across the ground so you're scarifying the ground with tree length wood. With a forwarder you're carrying the wood so there's only the footprint of the wheel and you can design your wheels to where you have the size wise is no more compaction than hardly walking on the ground. And we've got other tricks that you can do by putting brush down in the trail that will reduce the compaction. So you virtually have no compaction. Because the machine is articulated you can snake it through the woods with squiggly paths so you don't have the row effect that you got to do with tree length. So the stand ends up after it's been cut doesn't look like it's been mechanically groomed. I mean you go in and it looks appealing. I mean if you didn't know the trees had been taken out, you know, you wouldn't know that an operation had gone on. And I think, again this gets back to socially this is a more acceptable way of logging than what we do with the tree length operation. So I think eventually this is the way we've got to go on it. I know out in Montana we're going to be moving in that direction because the economics of, I mean the importance of forestry and timber production in the west is not nearly as important as it is here in the south. So if you can't do things in an acceptable fashion, then they'll be shut down. And I think eventually that's going to come here to the south too. But that's a real positive thing too because it says that we do have a facility that would be more acceptable to the public and virtually no environmental damages at all. I mean you cross streams. You can come to a stream, you can put down immersible logs in the stream and walk across the stream without really muddying the stream up and then when you get through going across the stream you pick your logs out of the stream, load them in your back and you're gone and you hardly disturb the ground at all. With a tree length operation you're usually going to put a culvert in. The culvert's going to be covered in dirt and then when you get through skidding across there you've got to dig that culvert back out and the associated dirt with it and you got trash and mud going down the stream. Not much, it's not a big deal, but still it's more than if you did it with a cut to length. So the cut to length is, it's making some inroads into

the south but it's been painfully slow. And I say that by personal pain because I'm so convinced that that's the best way to go and not to have it actually happen has been disappointing. [laughter] That's probably a lot more answer than you wanted.

MC: Well, no.

PM: It's interesting because you're the first person in quite some time that's advocated [voice too low to hear] [cut to length].

BL: Did I omit any of the negatives?

MC: No negatives.

PM: Well, the only negative as far as we know is that it is not as productive. But maybe there are different ways of looking at productivity.

BL: Well, I did a paper for, we have this equipment show here in the south. It meets in Atlanta about every two years called Expo and they typically have some breakout sessions that they present papers and training and that kind of stuff. And I presented a paper about maybe four years ago now that I took new equipment costs for both tree length and for cut to length. I took new equipment costs. I took the best production rates we could come with. I built in every cost factor we could and cost analysis has been my specialty so don't think anybody can argue my methodology there. And you put those together and cut to length beats it hands down, if you take new equipment costs. Now for an existing contractor he doesn't go out and buy a whole thing of new equipment and that's a deterrent also, is changing. It's really you can do a little phase into it but mostly you need to do a complete change over. That means you've got to sell your existing equipment and you've got to buy this new expensive equipment.

MC: And learn how to use it.

BL: And you've got to learn how to use it. And you've got other deterrents. Companies, some of the companies that have sold the cut to length equipment didn't know as much about it as they should know about it. Some of it has been fairly, the equipment was new. See some of the American companies have gotten into cut to length equipment and unfortunately they often times debug their equipment with their contractors. So the equipment was not completely debugged when it went out on the ground and the poor logger had to figure out how to do it. And there's also some very, again we're talking about a brute force system, compared to a finesse system. Cut to length is finesse, properly done it's finesse. Tree length is brute force. And it's just a mentality that's, in Europe and Scandinavia, you know, the operators they've got to have a couple of years of school before they even put them on a machine. Here if you get a couple weeks of training that's probably excessive. And that's been a hard thing for them to bridge. Now it's been much easier to do this up in the lakes states area. The lake states cut to length is Y

BL: You'll find cut length a lot more predominate because they started out with the pre haulers, the short wood machines, and it was more of an easy progression. A lot of our machinery in the United States was manufactured up in the Great Lakes area, there and Canada too. But the Great Lakes, a lot of it is where it originated and so they had to manufacture right next door and they really, it was a little easier for them to get into it. They were also using a lot of, they still use a lot of short wood and a lot of the forwarding type activities started out with short wood. And so it's been easier for them to move into it in some ways than down here in the south.

PM: [Voice too low to hear.]

BL: That's right, you can progress into it. It was more of an evolution than it was a changeover. You have to find a contractor that is really open to radical changes. I'll give you an example. I'm heading to Minnesota next week taking a contractor, a friend of ours, a logging contractor from Montana, to visit a Ponsse operation and he is fully intending to buy cut to length. He's got a fully mechanized system now, tree length system with stroke delimber, grapple skidders, swing feller buncher. He was exposed to cut to length by TimberJack. They took him to the Elmia equipment show in Sweden and he saw it. He says this is what we need. But that was four years ago, three years ago. But his operation has gotten to the point because of labor and because of changes in the mills that are receiving the wood, plus the mentality of the people who are selling the wood, he sees that this is the way he needs to go and so he's moving to it. But it's taken three years for him to come to that conclusion and then also, you know, but then you've got to put them on to the right equipment to accomplish the job that he has. I'm helping him with it and again, I've worked with them a lot and I think I probably know the best equipment for him but he's got to make that decision. He's spending the, I mean the asking price for the two machines is seven hundred and fifty thousand dollars.

MC: For both of them?

BL: For the combination of the two machines.

PM: [Voice too low].

BL: Right, yeah, so it's not a small thing plus he's got to get rid of two, at least two high valued pieces of machinery. So bringing all that together you've got to really want to do it and it's easier not to do it than it is to do it. [laughter]

PM: It's kind of interesting you're talking about a brute force mentality. It's almost reflected in the design and appearance of the machines.

BL: Oh yeah.

PM: You know because [voice too low to hear].

BL: Robust, yeah, right.

MC: [Voices too low to understand.]

BL: Right, oh yeah, and does the radio work well. You know you've got to have a good radio and you've got to have a place to keep your drinks cool and also heat up your sandwich. You know those are all parts of the machine that are essential. [laughter]

PM: The one other thing that I can think of to add is that's really interesting is obviously historically the master shift is from short wood to tree length and did kind of occur around the time of the HRP [Harvesting Research Project]?

BL: It was just before it. As I was saying, I did my master's work right before, as HRP [Harvesting Research Project] was getting started and just before it and it had just been in effect just a matter of two or three years. So I'd say probably, let's see, when would that be, like about probably that shift started somewhere about the mid >60s, about '65.

PM: Why did it happen?

BL: Almost by accident. The pulp mills which dominated activities they were taking short wood and they never intended that tree length would become I don't think that important. But the

contractors, logging contractors just really jumped on it because they saw less work and, of course, they got the wood cheaper. [laughter] They could get less money.

MC: So presumably the companies that were accepting tree length were also into saw logs as well as pulpwood, is that true?

BL: No.

MC: That's not true?

BL: No, it was pretty much one or the other. The sawmills took saw logs and the pulp mill took pulp. And there was not that much chips coming out of the sawmills, going to the pulp mills at that time so it was either one or the other and a lot of saw log size trees went into pulpwood. That's what they called good pulpwood. [laughter] Big old trees. There was an abundance and you just didn't have to be that efficient. The margins were large enough that you could be sloppy and still make money. I think they did pay less money for tree length than they did for short wood and that short-term incentive was enough to push it towards the tree length. I mean it's really even, I'm trying to say, I don't know, really the pulp mills have never really adopted tree length per se. The pulp mills were, actually say that the mill, it took short wood or chips. And what has happened is the tree length, if it came in in tree length they slashed it up and processed it, debarked it as short wood. And in terms of actually processing a tree length tree, it's really being done at satellite chipping yards now so it comes in and cuts it into chips and the chips get transported to the mill.

MC: [Voice too low to hear.]

BL: Well, yeah, yeah. Generally the saw logs go to the sawmill and then if there's any chips that come off the saw logs then that goes to the pulp mill. But the wood, except in the case of where Weyerhaeuser uses the merchandising effect, most of the mills don't accept both. They accept one or the other. So you sort actually in the woods. You sort at the landing. And so you've got a load of pulpwood or you got a load of saw timber and you don't cross over.

MC: Right, so even though there may be a bit of a saw log?

BL: Now, see this, now you're opening another can of worms. As the plantations have developed you've got first thinnings, which will be totally pulpwood size trees. But your second thinning will be about fifty fifty. You've got a saw long on the butt and you've got pulpwood in the top. So how do you merchandise out that saw log portion?

MC: Cut to length.

BL: Cut to length. That's right. That's another driver towards it because it's such a small amount. Now the loggers have tried to do well and many of them, what they'll do is they'll cut that butt log out with their, when they do the pull through delimber, they'll saw, they'll go down to a six inch top and take out a small log out of that second thinning and create logs like that. And then the rest of it will go for pulpwood. Sometimes that top doesn't actually end up in pulpwood so it just gets wasted. But that's how most of them are doing it. But now again, ideally you know to get your best return is through cut to length. They have also been able to actually get a small saw log out of first thinnings, using cut to length because you will have some trees that will have it. In fact, we had one company there in Alabama that they looked at it and they found that they could benefit everybody, the landowner and the logger and everybody else by using cut to length and taking that butt log out of the first thinning.

PM: [Voice too low to hear.]

BL: For merchandising.

PM: For merchandising.

BL: Right. Well, one thing we've gotten down to is we got a lot more products now than we used to have. I mean you know when we first started talking about saw logs we didn't have the concept of chipping saw. Chipping saw used a much smaller log to make lumber. It was technology and the technology has continued to improve. They've got a term now called super pulpwood and super pulpwood is this butt log out of first thinning that you can make lumber out of. You can make a couple of two-by-fours out of it, that comes out of a first thinning. And that technology didn't exist. And technology continues to improve where you can better utilize the trees. In Scandinavia they used much smaller trees to make solid wood products than what we have. And as you continue to try to improve your profit margin you search out these better products and the old tree length system is just, it's a great way to move masses of wood but it's not a good way to merchandise out the highest and best use. So that again, all the reasons why I say that cut to length will be the future.

PM: Would you say that some of the [voice too low to hear]. I mean the kinds of systems you were looking at [voice too low to hear]?

BL: I wouldn't say so, no.

MC: The shift was already done.

BL: The what?

MC: The shift had already occurred.

BL: Well, it was occurring, rapidly occurring, right, yeah. It was on the march. Maybe the improved feller buncher approach was contributed to doing more with tree length. But I wouldn't say that it really pushed in that direction.

PM: I guess the other thing the story is the shift to tree length and was also the disappearance of the pulpwood operations [voice too low to hear]. Those are the people who [voice too low to hear].

BL: When I did my research for my master's thesis there was literature in the library that said that the bobtail truck was on the way out. Well, that was in the late >60s. [laughter] The bobtail truck didn't disappear really until, the Department of Transportation had probably more to do with getting rid of the bobtail truck than any other single thing. The bobtail truck continues to be an effective way of removing trees out of people's yards and these kinds of things. It's not as low cost as the more mechanized approaches but it fills a niche. But the thing that probably killed it more than anything else was the transportation laws. It was very difficult to keep the trucks highway legal and continue to drive them through the woods. The bobtail truck really is sort of a forwarder anyhow, you know. It doubles as one.

PM: Yes. Okay, I've got one thing to ask and that is about the wood supply system. The Canadian wood supply system is quite different than the southern ones and it also appears that the southern one has undergone considerable changes from when you started to the way it is now.

BL: How do you mean? What are you defining as the wood supply system?

PM: Well, our system has never had wood [dealers] [Two people talking at one time.]

BL: Wood with the dealers and all this?

PM: Yes. What are your thoughts on how that system has worked in comparison to Canada?

BL: Well, for one thing your land ownership is so much different. The Canadian ownership is mostly governmental controlled. And so it's more, you've got logger contracts. You've got larger blocks of timber to work on. And the southern system evolved with a seventy-five percent of your wood base being privately owned and in small tracts, mostly what we call the non industrial private landowner who owned just small tracts of land. And so you had to deal with a lot more landowners. So you needed a bigger force to do this dealing. I mean if you can buy a square mile of timber that's a lot easier than buying a twenty acre tract of timber. I mean it takes basically the same work to buy a square mile as it does to buy twenty acres and so you just needed a lot bigger force. And what a lot of the companies came to was that they needed some local, local yokel to buy wood for them and there's where the dealer system came from. The dealers were local people who had personal contact with landowners. Often times they were part of the community and they may be trusted and so they could talk to a Joe Blow farmer and buy some wood from his wood lot. It was not industrial lands that you're cutting wood from. Many times these landowners would only make one or two harvests in their lifetime. So you had to have somebody local that could talk with them and so they're the dealers. It also served as time has gone by as a way to put another layer between the mill and the purchase of the wood so the liability issues associated with it were improved by having this middle man.

MC: What would the companies, why would they continue to do that?

BL: Just anything, say the logger tears down a fence and the cows get out. The cows get run over in the highway. Okay, it will be the dealer's responsibility instead of the company that's buying the wood. You just got another layer in there that it acts to buffer some of the liability issues. As times gone by where you know everybody sues everybody then building another buffer in there was a prudent thing. It's an expensive addition because originally all the dealers did was just procure wood. Now as time's gone by the dealership, most dealerships offer additional services. The dealers never had foresters until more recent years. Now most of your better dealers have foresters so they can go in and not only set up the sale to be cut but they can offer other services like inventory, you know, timber management plans. They might offer some consulting with wildlife management. It's more of a multi service organization. But originally it was just a local guy that could communicate with the landowners and buy timber, much better than sending a brand new spic and span forester wet behind the ears out trying to buy wood from some cranky old farmer. [laughter]

PM: Was there also a matter of organizing the workforce?

BL: In the case of where they were dealing with the small producers like the bobtail trucks, yes. They also could sort of organize these small people. A lot of times these were fairly uneducated folks that did the bobtail truck work. I mean it was often times a guy on the truck and he hired somebody that could run a chainsaw and they were not very professional, let's say, and somebody had to amass this group to be effective production force. And the dealer again, he was that guy. Like I had one young forester tell me one time said that he had a friend that was a dealer that said the way you have an effective dealership is that you have a country store, a little country store that would sell groceries and gasoline. And then the way you established your workforce to go out and cut your wood is you offered credit to the patrons of your country store. And so after they got, you know, they're on the line for some debt for food, then you had a willing workforce to go out and cut wood for you. [laughter] You know the old thing owe your soul to the company store? This was an effective way and like you remember we were talking that most of the wood came in by these short wood trucks. They'd come to the wood yard. The

short wood trucks would accumulate wood at the wood yards like Walter Jarck was telling you about. There were company wood yards and then there were dealer wood yards. But again it was just an assembly point because these bobtail trucks couldn't haul the wood very far, you know, twenty or thirty miles at most and so you couldn't bring it from long distances and so you had to have an assembly place close by to them and the dealers ran those things.

MC: Why didn't the companies hire a workforce, train it, run it, you know?

BL: Well, they tried it. Many companies had company logging operations but they concluded that they could, well, they didn't conclude, they observed that they could get the wood cheaper through independent contractors. A company is required to have standards, labor standards. They had to meet the OSHA standards. They had to pay all the taxed and they had to dot all the Is and cross all the Ts about the government regulations. And many of the dealers could get by without doing that. Not so much now but in those days you know it was much looser. Whereas the big companies couldn't get by with that but the, you know, the small dealer could.
PM: So how do the companies go about mechanizing such a decentralized system buffered between them and the people actually doing the work per se, contractors?

BL: Through dealers, the dealership system, in other words, instead of buying wood from a logger they bought wood from a dealer.

PM: But how do they get a system like that to become more mechanized?

BL: It just, by squeezing the contractors, requiring them to do more with less. And then, you know, equipment companies would come out with new innovations and so the loggers would want the latest thing. If he can get out another load a day for the same amount of manpower and similar cost, then he's, you know, it behooves him to, you know, he wants to make more money. Typically mechanization did not cut the cost of logging but it increased the amount of wood that the producer could produce. Therefore, you may be making a smaller margin but you're making more smaller margins so your total dollar amount is better. And so there was an incentive there for contractors to move to that. Many of the contractors and I suspect that's probably even true today, all started out as bobtail truck operations and then they evolved into the more mechanized systems. The smart ones did. Now some of them, you know, stayed where they were but it depended on the ambition level of the contractor.

MC: Did the companies help them do so out of making loans?

BL: Sometimes if they in special situations where they were trying to promote say a particular system or say they got a big swamp they want to log and it'll take specialized equipment to log this big swamp. They would underwrite or counter sign notes with loggers, the better loggers, to go and purchase the equipment to make this kind of thing happen, yeah. And in general the companies supported mechanization and improvements. You know we had a lot of industry association work where like the American Pulpwood Association. I mean really HRP [Harvesting Research Project] was a way to enlighten the public, the contractors as to more efficient ways of doing things and to, you know, promote those things. So yeah, I mean they didn't, the purchasing wood products companies have always been concerned about the loggers. I mean they're mostly concerned about getting low cost wood but also they have some positive concerns about improving the workforce. And some more than others, you know. Some it was just, you know, pretty much business but in general, especially when the companies were run by foresters, foresters tended to be a little more personal than if it was run strictly by accountants or lawyers or people less tied to the land.

MC: One quick final question, who owns the satellite chipping yards?

BL: Who owns the satellite chip yards? Various ones, there are companies independent.

PM: Specializing?

BL: Right, that specialize in it. Some of them have direct ties to manufacturing facilities. Some of them are completely independent. A lot of them, the companies would like to have the satellite chip yards independent because the mills are typically unionized and the satellite chip yards are not unionized. So again that lowers the cost of wood by not having to have unionized laborers doing it and it's a good efficient way. The pulp mills, realistically a pulp mill is just a big chemical operation and if they could turn a faucet of chips on and turn it off that would be better than if they have to go through the thought process of procuring round wood and chipping it and all this kind of mess. So if they can get themselves down to where they buy chips the same way they buy chemicals, that would be their preferable way of doing it. And you know, that's a generalization but I think it's realistically, I say that because of, you know, taking students through tours and things. A lot of times I had to almost demand that they take the students through the wood room where the wood comes in. They wanted to show us all the chemical operations and the paper making part and the supply of wood is just a necessary evil.

PM: Thank you very kindly.

BL: Did you want me to talk about why we took the production studies at HRP [Harvesting Research Project]?

PM: Yes.

BL: We talked about that while we were on break.

PM: Well, I missed all of this.

MC: So why did they want those production studies?

BL: Okay, it's because, it was generated from Canadian experience where the woods labor was unionized and the unions were arguing over what price wood should be paid for, what the woods work should be, how much you should be paid for producing the wood. And the way that they solved the union problems was to have these production rates that were taken and statistically sampled and come up with rates that said how long it took to do such and such an operation. And when the HRP was put together there was a concern that labor in the south would become unionized and that they needed the rates on record so that you could argue what was going to be paid, you know, for doing woods work. And of course, the unions have never gotten into southern loggers as they were in Canada.

MC: Wonderful, thank you very much.

BL: My pleasure.

PM: Very enjoyable, very interesting.