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Bill Morris interviewed by C. E. "Mike" Hardy

Oh 44-8
February 13, 1976

Side one

MH The first part of this tape involves a discussion with William G. "Bill" Morris in Portland, Oregon, on the morning of Friday, February 13, 1976. Bill lives at [Interviewee's address and phone number removed from transcript]. One of my main purposes is to find out information relative to development of fuel moisture indicator as he was involved in this type of work for several years and I believe was acquainted with Richard E. McArdle ' s work during those early days .

BM When you mention the discussion as to the work that McArdle had done with fuel sticks at the time that Gisborne was. . .

MH I was talking to Chuck Wellner about that and he said that there was a parallel development - that Gisborne made them round and McArdle made them square and so forth.

BM The first fuel sticks that I saw that McArdle was working on was in 192 9. He had some limbwood sticks that he was rounding up in Wind River.

MH Did they have the bark on them or were they peeled?

BM Well, I think he had some of both. Some of them were bare. I can think of some of them, as I recall, had the bark on them.

MH Was he using different species?

BM I really don't know what he had. Then I was field assistant at that time and I came to work for the station on a full time basis as junior forester in 1932 - the summer of 1932. At that time we were making some of the square sticks and they were making them two inch - they were two inch square sticks. They were about this long. The first ones that he had - they were weighing on Harrod scales - balances - and he'd sent them out to - oh, I guess there were maybe twenty-five or thirty different ranger districts that were trying them out and they used the balances that he had made. I don't know whether it was the first year or the second year they had some brass slugs. I think that he made [them] up for weights on them instead of using the regular balance weights and I don't think that in that first year or two that the forests had them, but the sticks at that time had been cut to 100 grams dry weight so that all the scales could use the same.

MH Well, what did he do - oven dry the piece of wood and then make a slug the same weight as the oven dried weight?

BM Well, I kind of think so. I'd have to go back and look and I don't know, I guess I don't have anything at home and probably something in the files, but I'm sure somebody has the files that would show that. But I was going to look here in my diary and see when it was that they were cutting them to 100 grams. I think I probably have something that would show because I worked on some of that cutting and preparation of the sticks.

MH While you're looking, I gather that Gisborne was credited with having invented the fuel moisture stick. Was there any hassle or professional jealousy between Gisborne and McArdle in the development or were they corresponding back and forth. Do you have any idea?

BM Yes, they corresponded back and forth and I know that McArdle was aware of what Gisborne was doing but I don't know -I wouldn't say that there was any dissension. I think there was just, you might say, competition.

MH A mutual search sort of. I often wondered. I never heard and I never saw any memos in the records that would indicate any problems.

BM That's true. Which one had done the first with it I don't know. I didn't know at that time what Gisborne was doing. I knew what McArdle had out.

MH I think Gisborne started with just natural sticks too - twigs - and he didn't trim them to 100 grams. He was just drying them and weighing them. I forget whether it was Chuck Wellner or somebody indicated that McArdle may have been the first one to pin them together to make a discreet set.

BM ...when I was working on lightning storms. I analyzed, made a lot of maps and so forth of the Lookout lightning storm reports that [inaudible] had them over the entire region at that time.

MH That was about 1929 or along in there, wasn't it, or was it earlier?

BM Well, the lookouts had been collecting the data and making these lightning storm observations since about 1924 or 1925 because the first report that I put out - that was the first report that I was assigned to work on that was put out in mimeograph form. I had a seven year record and I think it went through 1931 - 1925 to 1931 inclusive.

MH Did you publish that or was it an office report?

BM Well, that was before we had Research Notes and it was a mimeograph publication.

MH 1931?

BM It was 1931 or 1932. I've got some copies of it that are down in the basement.

MH I got hold of this and it seems as though there were some indications here but I don't see it.

BM Then I prepared one that was in the Monthly Weather Review which came out a couple of years later. Then I worked with a meteorologist whose name was Stevens - I think he was out of the Washington office with the Weather Bureau - and what we were trying then was to get them to take our data and the data that were available and make the necessary meteorological analyses and tie them together and improve their forecasting. He published on it, too, in Monthly Weather Review.

MH And that was along in 1934?

BM Yes, about that time. I could show you the publication. I've got some copies of it.

MH I'd like to get at least the reference on it and then tie it in because Gisborne was working in the same vein, you know. In fact, he had a long, long running battle with the Weather Bureau on accuracy of their forecasts because he had some of those factors in his fire danger rating scheme. It was based on prediction of the various weather factors - lightning, and humidity, temperature and wind - and Gis said "I've gone as far as I can unless we get better forecasts." You knew Ralph Hannah? I guess he had quite a struggle with Ralph and that carried on to Krumm when Bill was there and so on. I think that's just downright ornery.

BM Well, we've had a time here with the Weather Bureau, too, the local people here - that was when McArdle still was here and he wanted me to go over to the Weather Bureau and get a file of their forecasts from the previous two or three years and compare them with our records of the lightning storm occurrence. Well, we did quite a lot of talking but [?] went over to the Weather Bureau and talked them out of a file of their forecasts as we thought they'd be sensitive about our coming and saying, "We want your forecasts and we want to compare them with what happened." Well, we went to them and we did get their files of forecast and we went to Seattle and at that time there was a man in Seattle and we got copies of a lot of their records and made the comparison as to how they were coming out with their forecasts.

MH How did they come out - about like they still do?

BM I think it was probably about the same. There was a man here at the time [?] with the service, C. I. Gague, and he was fairly cooperative about it but the meteorologist in charge at the station was an old timer and he was quite adamant about it and he didn't like the idea at all of doing all that checking.

MH Some other agency trying to come in and tell them how to do it. Did you ever get them?

BM Yes, we finally got the forecasts but we didn't ever make any big point of it. We didn't publish anything. The Weather Bureau missed fifty or sixty or seventy percent, but we did have some things that showed, in general, what percent of the general storm days were not worked on the maps beyond charting the storms. They classified - it meant three classes: general, intermediate, and local storms. General storms would be where you'd get maybe two-thirds of the state covered with storms on any one day. Intermediate might be where it would be three or four or five ranger districts; and local storm would be where you'd get anywhere from just one storm to two or three reported. It was just kind of an arbitrary basis and we were particularly interested in those general storm dates as to whether they got those. As I recall I think we did include some statements about that in some of our publications, along with other things, but we didn't make a publication that really was centered on the Weather Bureau's accuracy.

MH I guess it was a universal problem and not just one between people in the northern Rocky Mountain country. I don't know whether we'll ever resolve perfect predictions. We used to have to classify in the old 10-09-E as whether it was mild, moderate or severe and when I was making a circuit on the fire danger rating system there in Region I, the guys in the ranger station would say, "How can you tell whether it was mild or moderate or severe?" Then the only conclusion we could come up to was when your neighbor's ranger district was mild or moderate then right over your headquarters it was severe. So it's a very nebulous nerve. Well, how long was McArdle here in fire research? Do you recall offhand? I can probably dig it up someplace but just roughly . . .

BM I think he left here about 1935 or 1936 and he went to be Dean over at Moscow.

MH Oh, yes. That's about the same time Jemison left Northern Rocky Mountain and went to Ashville.

BM It was about that time. I remember it was after we moved from where we used to be in an office building down in the lower part of town - down near the [?] Hotel. We moved up to that U. S. Courthouse it was built during that period - let's see 1933, 1934. McArdle was there until 1935 and he left and then Don Matthews was in charge of fire research. He had been first assistant to Mac when Mac came out.

MH I knew Don over in Missoula but he was in silvacultural research, wasn't it, or having to do with BRC special studies and such things as that.

BM And in the economics of BRC [blister rust control] control. Well, here's the thing I was looking for. I began working at the

lab, Twenty-first and Division Street on hazard sticks - that's what we called them in those days. I was still working on the lightning storm data, [and] was also working on Douglas Fir heredity plantation at that time. I got into that.

MH What was the year on that? 1929?

BM Well, I think it was later. Let's see - this is 1933 but this was when we were producing them in considerable numbers - hundreds. I forget whether we'd started doing the half inch sticks at that time or whether this was still the two inch sticks.

MH Didn't McArdle make some square half inch sticks? Because I've seen them.

BM Oh, yes, we had those for quite a long time. The first ones were Douglas Fir and then Ponderosa Pine. Ponderosa Pine was more consistently sensitive than the Douglas Fir.

MH Did you confine it to sapwood or didn't you differentiate between sapwood and heartwood?

BM Yes, we sorted the wood - sorted the lumber - that they used to make the stakes and I remember one year, I'm trying to think when that was, I guess after we moved over to the courthouse. There was a sawmill down there in Portland at the time and we selected some of the logs that they sawed material from to make the two inch. I'm trying to recall that process done that followed that and drying... oh, I know... at that time we weren't drying the sticks before use. We cut the sticks and cut off samples from each end and dried the samples to find out the moisture content of that particular stick. Then we went back and we cut off the end of the stick to bring it down to what should be -100 grams of dry weight based on the moisture content of the samples at each end. We had baskets and baskets of these little ends of sticks: we, of course, needed to keep track of them. We numbered the sticks - we'd put a gram number on the stick and gram number on the end. We'd run the ends through the oven and dry them and then we kept the sticks in storage in big metal cans so they wouldn't change moisture content while we were drying the ends. Then we'd go to the lab and saw off the ends of them. Now that was the two inch sticks.

MH Those were just single pieces too, weren't they?

BM Yes.

BM They weren't hooked on to anything - tree or anything like that?

BM I suppose maybe we did do some of that end sampling to begin with but they left off. I noticed before we [inaudible]. But the idea was that in oven-drying two inch sticks that you change the physical nature of the sticks considerably by the oven drying

and they checked - the two inch sticks [inaudible] oven dried before it was used.

BM We were using the half

MH Oh, that was all half inch?

BM Yes, and we managed to have used some two inch right up to [inaudible]. We may have used some two inch, too, but it was the half that we were most interested in. For a year or so for some of our research purposes [we] would carry on with a two inch to have something that had a little more lag than the half inch.

MH Well, you were sort of far-sighted in that then, since they're going back to the different lag time concepts, you know, in the new system.

BM I was gonna look a little further here in 1933 to see if I have anything more on stick preparation but I don't see it. All I've got is just a note that [when] I was working then I was just helping Don Matthews - he was the one that was in charge of the stick preparation at that time, in 1933, and I was actually doing mostly other things. And this was the Douglas Fir sheets for study of heredity.

MH You do say you have a publication on some of this comparative moisture?

BM On partial cut - all the way up to 35% cut - but there was one, I think, was about 65% cut and clear cut down there. There was something that was published down there. I'll get that bundle of things and bring them up and then you can use them for reference.

MH Yes, I could stick them down on here and then I would have it for reference.

BM Well, in July I helped with hazard stick samples - half day - hazard sticks and duff samples.

MH And that was about when?

BM This was still 1933. Then we got into the Tillamook fire. I spent a lot of time on this first Tillamook fire.

MH That was 1933?

BM Yes, making reports on that. Well, I might be just wasting your time here.

MH No, I'm sort of tying all of that development together.

BM I'll see in 1934 if I have something on stick preparation. We usually made the sticks in late winter or early spring and never fall.

MH I forget whether you mentioned or not about what period of year did you start manufacturing your sticks for distribution and when did you finally close off on that?

BM In 1933 we were distributing them to all of the ranger districts in the Region and each ranger station had one. That was before we had begun trying to use three or four stations down in the district.

MH It seems as though - I've got to check - but there in Gisborne's area they didn't go in to general use until 1934 but I'm not sure. It was between 1931 and 1934 because I know in 1934 on the Pete King-McLendon Butte fire was the first time on a major fire that they had a set of complete weather stations to release the fire activity to. Before that, they'd had the sticks and full weather stuff, as I recall, [in] about ten stations in western Montana and northern Idaho. You had more information at your station where you had the sticks. What else did you have? Did you have a psychrometer and an anemometer?

BM No, they hadn't made those inexpensive instruments yet at that time. I may run across that in here. 1934. 1935. McArdle was the one that started that job of trying to manufacture an anemometer and a rain gauge and the fan psychrometer was developed over here to cut down on the cost of the instruments so that the ranger stations and industry could afford to equip the station, or would feel that they could afford to, and it resulted actually from the Tillamook fire. Following the Tillamook fire there was a man from State Forester's [office] and the people in charge of industry to see [if] you can prevent something like this [from] happening again. So they were looking and poking into everything.

One of the things was that they needed to have better measurement of the fire weather conditions in the logging areas at that time in order to get the insurance that they could carry - fire insurance. They had to have a hygrothermograph and those were rather expensive. At that time the loggers weren't interested in buying hygrothermographs unless somebody made them. They did have sling psychrometers at that time. They were put out by a manufacturing company - Taylor Instrument Company. But they had to have a hygrothermograph in order to have a record that satisfied the insurance company. As a result of the probing after the fire, the decision [was made] that they were going to have to have more complete records and better observation of fire conditions on the logging site. McArdle got going on the idea of trying to make some instruments that they could use to measure wind and relative humidity. And he had some contacts with the physics department over at Reed College and that had come about as a result of the lightning storm studies. We had a physics prof, over there. His name was O'Day and we'd had him working on some of the physics of static. That goes back again to the time when Gayle Simpson, he had been a radio operator during World War I in the navy, and he had been hired to kind of look after things up at Wind River where we had silvacultural studies going on at different times [inaudible] work up there. And he got interested in trying to use radio static to forecast the appearance of lightning and he had all kinds of radio equipment up there and he had a recorder running that would flick whenever a charge of

static would come over the radio. Well, this is kind of a side issue but that study was going on and McArdle was sort of overseeing that and he thought that it required a little more fundamental research: he felt that he needed a physicist to check and see if they really could get warning of the development of the storm from any of the static that they were getting. He was also using these lightning storm charts that I was working on at the time to see if the static they were getting was actually from lightning discharges - [from] storms already in progress rather than static building up ahead of the time lightning would occur. So he had O'Day working on that and O'Day spent a couple of summers over in the Blue Mountains with recording devices up there on Dixie Butte. Then as a result of that contact with O'Day, McArdle hired a couple of students that were going to Reed at the time under one of these - I don't know whether it was WPA - it was one of those relief projects at that time. We had the money through that. And he hired a couple of students to do some more counting on it - trying to develop these inexpensive instruments and one of them was George Byram. There was another fellow - I can't think of the fellow's name. Well, they both had quite an ability to make mechanical devices - the other fellow did especially. He was good with hand work and machine work and that kind of thing. We set up a shop down there in the basement at the U. S. Courthouse and they turned out - well, the Byram Hazemeter resulted from that work. It was when he started college. They worked at it while he was a student and after he graduated he was on another year or two. That was before he went back to Ashville working with George Jemison. They made the fan psychrometers and what we called a wind gauge - half-cylinder cups - I don't know whether you ever saw one of those old ones or not. It had four cups and the cups were about this long and cut like this - longitudinal - so it [inaudible] cups I say about that long and the base of it was about so much across.

MH Was that set vertically or horizontally? Were the ends closed?

BM Horizontally. No. They made 100 of those or 110 we put all of the [inaudible].

MH Did you paint the end of one different colors and just count the times it went around or how did you calibrate them or measure them?

BM They had a buzzer - they put a gear and there was this wire came down to the ground and there was a buzzer that connected up to it.

MH It was geared down so that so many revolutions would make one [inaudible]. How did you calibrate them? Do you recall?

BM I don't know how Vic calibrated those. I know at one time they were working on them. To begin with the initial calibration - we took a car and drove down the road thirty miles an hour. At that time, we had another fellow from the Weather Bureau who was

working with us part time. He had been, I think, over in Missoula and worked for them [but] had quit over there. His name was Crombie and at that time he was a man maybe forty years old and I remember that he was helping some at the time [when] they were doing some calibration. He was actually doing mostly office work and other kinds of fire danger work.

MH Do you recall that metal wind gauge? It started out as a flat piece of metal about three inches wide and maybe a foot and a half long. It was made in an "S" shape and it was painted at one end and you stood there and counted the number of times that went by and that was tied in to the miles per hour some way. I don't know when that was developed. I gotta look into that. I think that there is some of that information in some of the folders in the basement at the fire lab. But this one is one I hadn't heard of. I haven't seen it. Are there any of those in existence?

BM I was just thinking - I don't know where they'd be.

MH What I'd like to do is try to get a lot of those primitive instruments. We have a good share of them. We've got the duff hygrometer, the Byram hazemeter, and another one that Shallenberger and Little put together, and three or four different kinds of sticks, and we've been wanting to display those. We haven't figured out just where nor how or who is going to pay to have them made into a display. If you run across any of those, let me know, would you? Because they'd just get lost somewhere.

BM I doubt if anyone saved them. People aren't interested in saving something that's out of date.

MH Do you remember those old carbide lamps? [And] lights that the firefighters used - palousers I guess you called them - a little square box? A friend of mine found a whole bunch of them up in the attic of a ranger station. They were just in the way so he threw them all away. Just a few years later, companies started manufacturing them for people and charging them big high prices as [a] curiosity. Well, anyway, that instrumentation is interesting because I didn't realize there had been that parallel work done here.

BM I just recall now, too, that stick scales - Byram developed the swinging beam stick scale that had a bend in the arm. That was after we had changed to 100 gram dry weight so that all of them weighed the same; and the first ones that we made sure [of] were for just a two inch stick I think. And then the next model they changed the beam just a little bit and they put two loops on that so that you had one loop for the half inch stick and one for the two inch. If you recall, the shape was flat metal. Well, to begin with they were just galvanized iron painted black and after we had some of them made on contract they came out in brass.

MH We had some of the brass ones there in Region 1 when I came on in 1951.

BM That was a brass device, I think.

MH Well, Byram must have carried through and developed from that the Appalachian scale which had the sliding scale, because the flats were variable in dry weight. That was all Byram's stuff. I wonder why Gisborne continued? He kept on with the Triple-beam scale, you know. That's what the standard was there in Region 1 when I came and we continued with it.

BM Well, the year was 1934 when I was sawing hazard sticks half day. Then the next half day splitting hazard sticks. So we were still splitting the ends then, in 1934, to determine the dry weight of the intermediate.

MH I see, cutting off the ends, you mean.

BM We tended the dry kiln all night. I've got somebody here - I think it was Western Pine Association helped him design the dry kiln for drying these sticks and stick samples. It was an oven about eight feet long and about so high and about so deep, and it had two or three racks in it - metal screen racks that you slide in and pull out. [A] big door and it was saw dust insulation in the walls - double walls about so thick on it and big heavy doors in the front and heavy counterweight on the back - push it down, clamp it, then you'd pull it out like this and it had a fan underneath the first shelf about so high from the floor and then the space underneath was a solid floor under the first shelf rack and then down on this lower part he had a fan at one end. It was a fan about so big around. On one end it had inlet air coming in through the fan. It blew it through underneath and over the heating elements. We had electric heating elements in there and it came up around the ends and over the top and could go down the sides to around the shelves so that it got pretty uniform heat distribution in there. Then there were vents where you could let the moisture out. When we'd start drying these materials, we'd run it thirty-six hours or so at a stretch sometimes and [inaudible] ran it all night. We'd stay down there at the office and I remember sleeping on the laboratory table with bench at night. They weren't going to take a chance on leaving that thing running all night without somebody there. Nothing ever happened to it, it was all right, but we just didn't want to take any chances.

MH Such devotion to duty. You'd have a hard time getting anybody to do that now.

BM Yes, I'll say. They'd want triple time for it or something.

MH Well, back in those days you asked for a steady job and you got it.

BM: Well, that was March, 1934, and I was working on other things—putting away CWA tables, lightning charts, testing fan psychrometers. So they had the fan psychrometer in at this time—in 1934.

MH: That's the one with the little disc and with a hand crank? You know, that finally got so expensive that using a little motor was cheaper because it was all hand work.

BM: I was working on a lightning storm reports (unintelligible) working on (unintelligible) lightning static report.

MH: Do you suppose (unintelligible) and Schafer (?) are aware of that look into it by O'Day and you people?

BM: I don't recall whether they was anything published. I don't think that it ever got into real publication for one thing (unintelligible). Golly, getting a report out of a day…(laughs) I remember the discussion about it, you know, getting him to write up the stuff. Then there was some question, too, about whether he really had anything from his measurements over there on Dixie Butte that they could stand behind. Whether he had an answer or not. He had different kinds of instruments from what Simpson was using and—

MH: Interesting thing is is that was an approach—a real innovation. It's too bad those kinds of things didn't get published so they would in the literature so people could draw on it. Even though they weren't a success.

BM: Well, I'm pretty sure that Simpson's—

[Break in audio]

BM: —put out a publications like they do now. We had one thing that's *Research Notes*, which came out about that time. But it was just in mimeograph form.

MH: Boy, those are hard to come by because most of all the mimeographed reports and so forth were filed, and then they got lost with the files when the files were put back, you know, the three-year and then the five-year. Then if the right guy wasn't there, they got tossed out. We're having difficulty in finding a lot of Gisborne's earlier reports. I found a few that Chuck Wellner had that Gisborne had stuck in his own desk.

BM: Well, I think there were probably some of Simpson's progress reports. I'm sure it would have been in mimeographed form, and it would probably be…could be found somewhere in storage files. (unintelligible).

MH: Yes, a person would have to go back and go through each box listing during that period of time. I just barely got started looking into the possibilities of finding that kind of thing

over there at Missoula. It's gonna be a laborious chore. I'm going to find every other avenue first before I start that. Some of that kind of work is the basis for another study done to pull all that information together - background to a lot of these new developments.

BM A paper I gave down at Berkeley at the AAAS Pacific Coast division - I remember giving a paper down there and that was in the spring of 1934 and I gave one up at the University of Washington when they had lightning storm studies up there. At that time also there was a period that lightning storms occur in particular zones - that the fires would occur in paths and zones and our charts didn't show that there was any real zone that the fires - the way they were reported by the lookouts, anyway - the path the storm seemed to take. They were just pretty much scattered. They didn't follow the ridge tops or the main divides or anything. They could be going this way at one time and that way another time.

MH Did you break the storms down into your photo [?] systems or your orographies or daily heating type of storms? You might have found a localization. I think they did in Fuquay's work. You know in the vicinity of certain peaks where you've got the upflow and then the buildup. I think there is something different but as far as frontal storms I think that got thrown out there, too.

BM I plotted the lightning fires then too, compared those with the storm paths and had maps showing the fires. I'd say this whole area would be one where there would be a storm, or would be a part of a national forest maybe, e.g. Wenatchee or whatnot, would have a general area [that] might be half a ranger district that would have more storms in it than an area over here fifty miles away over the six or seven year period that they ran. As far as being able to say that storms are more likely to come up this ridge or follow this divide as a track, that didn't work out.

MH Right there in the region when you look like from a satellite down on the earth you can see how insignificant these little valleys and peaks are to the total circulation system. This information on instrumentation is interesting because I didn't realize that had been worked on so much here either.

BM Here's the name of that fire weather man up at Seattle - Ben Melin. After he left the Weather Bureau then he set up his own advisory service here.

MH He was the one who was willing to give you the information? He and not the MIC? Is Ben still in that service? I haven't heard anything about him for quite a while.

BM I don't know. I haven't been to a Western Forestry meeting for a number of years and that was where I would see him - at least that is the last few years that I was working - that's where I would see him, but I have lost track.

MH You haven't heard any more of him or haven't seen his ads in any of the journals?

BM I don't know whether he is living.

MH I don't either. He was working out of Portland, wasn't he?

BM Yes.

MH I know he was awful busy but he didn't indicate he was making much money.

BM No, he never boasted of making a mint on it, anyway. And I think there for the first few years it was pretty tough sledding. He got a contract with Crown Zellerbach after a year or so of practice work and I suspect that was one of his better sources of income. Discussing fire danger station data tabulation with Don Kromby - that was the other fellow...

MH Was that also in 1932?

BM Let's see, it was 1934. Lightning storm reports, Douglas Fir heredity studies.

MH Is Don Matthews alive?

BM Yes.

MH I hadn't heard of him for a long, long time.

BM Yes, I see him once in a while and I called and talked to his wife here not long ago. He lives quite a way south of Portland so we don't get out there and don't see him very often.

MH Yes, what little I knew of him I liked him.

BM Yes, Don was a fine fellow. I liked Don. I see a note here where I had to put a new axle on my car when I was staying over at Pringle Falls out there at [inaudible]. [I] had a 1928 I think it was - 1928 Oldsmobile. The axles used to break every now and then, the rear axle, and only had one break in the garage at home which was a little more convenient than this one was. I'd taken my wife and she was over there. We were working at Pringle Falls for several weeks in the fall and this was November 7. On Sunday we were driving up to Avis Lake and there was a snowbank there where it had snowed and some of it had melted away and no one had been through it. It was only a foot or a foot and a half or so and I thought, "Well, this [is] first one we've come to, I don't know if there will be any others but I think I can get on through here." I kind of pushed into it and I got the rear axle broke and the last place that we'd passed was five or six miles back. There was a ranch back there so I told her to stay there and we had a boy then that was two years old or three. I told her to stay in the car and I'd go back to this ranch and see if I couldn't get somebody to come up and pull us out. She

stayed a little while and it was kind of threatening - the sky was getting kind of dark. She didn't like the idea of staying there so she started walking back. About the time I got the rancher in his car and left the ranch going back to the car, I met her in the road. We went back and pulled the car out - took it down toward Lapine [?] and going down the highway I'd have to jump out and run alongside every once in a while to kick that wheel back in. It was broken just in about so long in from the end - inside bearing from the wheel. We were lucky to get a new one.

MH I was just thinking driving over here yesterday, for some reason or other, that you never hear of a broken axle or broken housing. You know the housing used to break a lot on those old cars. I haven't heard of it for years.

BM Then I ordered an axle up from Bend and they sent it out on the bus to Lapine [?]. We were staying in a motel there at Lapine [?] while we were working up here at Pringle Falls. About all I had was a hammer, screw driver, and a pair of pliers and I did have a punch in that little kit of tools that I had in the car - a center punch. The bearing had a little scallop in the inside edge of the ridge and I put the punch on - hammered on it -and I finally got the thing rotated so that I could loosen the housing. It was pressed into the housing. I couldn't pull it out. I didn't have a bearing puller or anything, but I got that thing rotating enough, and it was pressed into the housing, and I got it loosened up so I could get it out and got the bearing out. Then I took a piece of wire with a loop on it and was able to get it in there and get the loop around the remainder of the axle that was just about so far inside the housing [and] pulled it out. In that model it [the shaft] wasn't keyed in to the differential at all. I didn't have any trouble getting it loose and hooking a new one in and I spent all day at it.

Starting [in] 1933 [with] graphic records [and] Wind River hazard sticks to determine methods and things to be tested in 1935. I think that maybe then we couldn't decide whether to continue using the two inch sticks or not.

MH Had you put the half inch sticks together by then?

BM Yes, we used 100 gram sticks then, I'm sure. We doweled them. They were the square sticks at that time.

MH Was it three or four?

BM Three, I think. They were long.

MH One of you was using three and I guess it was you. Three squares doweled together.

BM I've got several pairs of those down the basement now - those little square sticks. There were some that we were cleaning out over there at the lab one time and we had a lot of

stuff left and I brought them home for kindling wood.

MH You've still got them, though? I think have a set. If we decide to set up a display, would you be willing to part with one set if I don't find any?

BM I'll give you a set now.

MH Okay. Yes, that will be great.

BM [inaudible] hazard stick preparation - hazard stick purchase. That must be when I was out buying lumber and what not - sawing and splitting. That would still be the two inch sticks. That was in 1935 - splitting. At first I was going over to the mills, what we were trying to do was get Douglas Fir that had kind of a fine grain. We didn't want that coarse summerwood growth, you know.

MH Yes, that didn't accept or give off moisture.

BM Supervising stick moisture complications - inspecting planks for additional hazard sticks with planks we were buying from the mill, computations of cutting weights, supervising the mill's cutting to final length of main pieces - that was two inch - inspecting additional planks to replace rejects. We got some we didn't think were good enough.

MH Did you know that all fuel sticks are made under contract now?

BM Yes, I heard that they had somebody making them.

MH Yes, they're having quite a few rejects. I was walking down the hall the other day and two people from purchasing nabbed me and said, "Come on in this room a minute," and showed me a box of sets. There must have been 100 or so in it. [He] picked one up and said, "What do you think of that?" It was awful pitchy and I mentioned that and I thought, "My gosh, there is a whole supply like this?" And that was just a box of rejects, thank goodness. But they were wondering what they ought to do about tightening up the controls or inspections so the contractor wouldn't lose so many. Anyway...

BM How much are they using them over there? Are all the ranger districts using them?

MH Yes, I thought it fell through but it seems like this new system calls for sticks, the very latest - just in the last couple of years, so they're manufacturing several thousand again. They were completely out for a while, you know. They were using humidity and some criteria, but now I gather - and I've got to check to be sure - but they're back into that. I don't know whether they call that the one hour or the ten hour lag time. You people didn't do much with the duff hygrometer over here, did you? That was a good instrument provided you got it put in place

in the right place and could keep it in calibration.

BM No, we had just one I remember. It's been around, used a little bit experimentally and that was all that I knew about. Well, I'm interested in all that they're back to using again. I was very disappointed when they decided to dump the fuel sticks out of danger stations.

MH So was I. I still think there is a better way of doing it but nobody has come up with it yet. I stopped in at Beckman Instruments down in southern California - that great big outfit, you know - real sophisticated instrument measure - it's in my home town and talked to a fellow that had to do with that kind of thing and told him the problem and what we were up against and so forth and he sat back in his chair, sort of thought it over, and said, "Well, why don't you use wooden sticks?" I got up and walked out. We talked about it for a while but I thought that was pretty good. He couldn't come up with any ceramic or electromechanical, or anything like that, idea which I was hoping for.

BM Yes, we were splitting 2x2 inch sticks here in 1935.

MH How come you called it splitting instead of trimming?

BM Well, you see we cut out this 2x2 inch piece and then we split it into smaller pieces for getting the moisture content. I see I've got something here about comparing splitting and slicing -using a slicing method. I don't know what the slicing method was. Fire danger station instructions [inaudible] splitting 1/2 by 1/2 [inch] pine sticks in the kiln three hours and weighing samples. So we were using both of them then I don't know whether this was on a production basis or experimental. This was April, 1935. I know that there was a period in there of a year or two when we were using both of them. We had the scales made to weigh both of them, that big scale [Harrod scale] with the arm made [with] two loops on: one for the two inch sticks for 400 grams and the half inch sticks for 100 grams dry weight.

MH I always wondered why that other hole in the arm - I guess it was a hole in the arm, wasn't it? I always wondered what that was [used] for and I never knew. But they were 400 grams?

BM [inaudible] sticks to 100 grams. 1935.

MH Wasn't there a - the Biram anemometer? That was the one with the split cylinder? Oh, wait a minute. I know. There is a Biram rain anemometer but that was made by... I used them - I've still got one. I used them down in the southern states. I worked down there for a few months under Dave Bruce down there on some rate of spread studies in the pineries for putting into a fire danger system, which we never did.

BM We used to use them on [inaudible] sticks and fire danger station equipment. This was all 1935.

MH: Well, this is excellent. This is the kind of tie in that I was hoping that you'd be able to recollect on.

BM: Checking O'Day's lightning report. He was still working on some of that in '35. We went over there one spring, helping him take his stuff over there, up to Dixie Butte (unintelligible) fire weather forecasting and investigation. We (unintelligible) meter description for (unintelligible). We had some, oh, kind of a display of fire danger instruments. One time we had them in the window down there. First National Bank had a window facing the sidewalk. I remember we had a display of instruments down there one time (unintelligible).

MH: You know, sometimes I wonder if some of those early instruments wouldn't be satisfactory enough for use now. Because some of these that we're using are so expensive. I think a lot of our instrumentation and devices, like our fire danger rating system, are so more sophisticated than our ability to use the information when you get out on a fire or when you're preparing for a fire. I've often thought that you just don't need all that degree of intensity because we don't know how to use it yet.

BM: Well, these instruments that they made here after those fellows made up that first set of instruments then we wanted to get more to equip more stations. Those fellows were available. That program had been discontinued. Then we went to contracting. We took this old half-cylinder cup instrument, you know, and showed it to somebody—contractors—and there was a fellow who had a machine shop here in Portland that was interested in trying to build some of those and to get the contract for making them. He put some of his own design into the wind gauge, and he built quite a lot of those for three or four years or so.

MH: Do you remember the name of that one?

BM: Chisholm.

MH: Chisholm! Yes! Oh yes! Yes. Those are two guy—Chisholm with his anemometer and…In fact (unintelligible) bought Chisholm out, and then they modified and improved on the Chisholm. That was an excellent tool provided you put it back together correctly. I remember his instructions.

BM: Yes, had to slip it down in just right or—

MH: Oh, otherwise you'd—

BM: (unintelligible)

MH: —bend the little spring counter. Oh, we had some priceless letters from him and some correspondence indicating that too many fools that try to fix things when they shouldn't. I forget just the wording. I'd like to find some of those. Then F.A. Anderson is another guy here that started making rain gauges. He did that for years and years.

BM: Then quite a long time after that…Well, then Chisholm made scales. He made the Appalachian-type scale. He made some for us—the brass, the old brass-type scale. Then he made the Appalachian-type scale for, I don't know

several years. I used to go and check them every once in a while as somebody would be ordering some from back east and they'd want us to check them.

MH Julian P. Friez is the company that made the old hygrothermograph and didn't they make the Appalachian scale for a while, too?

BM I don't know if they made the scale. Maybe they did. They made the anemometer. They were the principle Weather Bureau [for] the big airways and small airways. But Chisholm's price on the anemometers kept going up and up and it finally got up there and then Friez made them under competition too. I guess there was some other places around the country that were making other types of inexpensive anemometers, and then Friez' price came down some. It got to the point where they almost met and Chisholm went out of business: sold the rights he had to Western Fire Equipment.

MH And then Gisborne got this Stewart from Massachusetts someplace interested in making them out of the Handy Conduit outlet and he made thousands of those. No two alike and no two would work alike and each one you had to just personalize it. It was the damnedest combination of stuff I ever saw, but they sold for twenty-five bucks or less and our region was plumb full of them.

BM I didn't realize that [inaudible].

MH I had charge of repairing and recalibrating them for several years. Experiment Stations used to do that as a service to the region and I think Region 4 got into it, too, and they'd finance it. It was one hell of a job to get those things to do what's proper and then if somebody from the field would take it apart to lube it or clean it or something it was out of adjustment. They'd bind. One guy even reported that his was running backwards. To follow through on instrument development for fire danger rating purposes would be an interesting subject. You could go through it specifically with the names of the companies and you'd have to go back into purchase orders and all that kind of thing I suppose.

BM There was another fellow we had working on lightning storm analysis. His name was Ward. I think his training had actually been in architecture. He'd gotten interested in meteorology somewhere and he was a pretty sharp fellow. I don't know whether he'd had a course or two of meteorology somewhere: he was available and we had him analyzing storms. That was before we finally got Stevens of the Washington office of the Weather Bureau to some out.

MH What year was he [Stevens]?

BM This was in 1935. [He was] reviewing Ward's report on lightning storm weather, reviewing Ward's manuscript tabulations,

digging out history of forest fire studies in the U. S., writing it into the picture descriptions for American Forest, I guess. I don't think that ever came out.

MH What was that - forest fire history?

BM Forest fire studies in the U. S. I was working at that time on something that I was supposed to get into American Forests and I finally dropped it. Then at that time I got interested in measuring ground canopy density to have some kind of a measurement you could use when you were talking about heavy shade or light shade or whatnot in the ground canopy and I was using photoelectric cells. At that time we had these old photoelectric cells in a square box like this and it had a battery with it and what not. I'd walk along the ground and hold the thing like this and take a reading. I was trying to find out how you could use that some way as kind of a standard measurement of ground canopies. Then about that time the exposure meters came out - photoelectric exposure meters -and I began using them on the roads (?). I shared a Journal of Forestry article on measurement of ground canopy density.

MH I heard of that being done. I didn't remember who it was that worked on that. Was that along about the same time? It must have been.

BM This was 1935. Another thing we were doing then was taking a measurement in the open. I had to do it on a cloudless day because on a cloudy day it's too variable, and take a certain segment of the sky and you open, and then go into the timber and take the measurements there and express one as a ratio to the other.

MH Then try to verify it with the actual ground closure.

BM Well, we had no real measurements of the ground closure. I had tried to do it some with photographic film and that kind of thing. [I'd] take the picture looking out and then get the negatives and compare them on the light that came through that negative with one coming through another, you know, in another condition, and went to this direct reading of total light counts as measured by the instrument - preparing a First National Bank display of forest fire fuels - that was in their window.

MH You must have had some good friends in the bank there that were interested.

BM I don't know who got the bank's [inaudible]. I guess McArdle was still here at this time - probably he did.

MH Incidentally, have you read the book of McArdle's? It's one of the oral histories that they've been putting together by the Forest History Society and it's called Recollections of a Career in Public Forestry, It's authored by McArdle and [inaudible] of Forest History - not Maiden, but something like that that's been

doing that. I don't know whether it's in published form yet or not. I thought maybe if you had read it you might know whether he had any of this in his work or not. I have to check. Pete Steen is the director for sure. He started here under you. I met him over in Missoula when he went over to help on that first retardant evaluation - so he mentioned that possibility. Let's see if I can find where I can find it.

BM Now here's reference to Brown's manuscript on "Factors Affecting Visibility" prepared for Monthly Weather Review.

MH That was also in 1935?

BM 1935, yes. Discussing Weather Bureau fire weather service. I don't know who was discussing it.

MH That was about the time they initiated the fire weather service as such, wasn't it?

BM No. These fire weather forecasters that were here - they were - I think it was 1926 or around about that time. Something that was a result of the Western Forestry Conservation Association meeting urging. [inaudible] article on electronic photocell measurement of canopy. Talking of fire studies - it was Hornby. He must have been here in...

MH Let's see. He died in 1937, wasn't it? I believe I've got it.

BM Then I was out examining slash study plots that McArdle had installed - spent the whole fall on that. [We] had burned and unburned slash areas all over western Oregon and western Washington. We were keeping records on those and examining them every few years.

MH How long had McArdle been here? Was he in fire research all the time he was here?

BM He began in about 1924 when he first came here. It was while he was still doing graduate work at Michigan and he worked here and then [would] take leave and go back. He was working on his doctorate. He began with his first assignment which was growth of Douglas Fir and he put out [the] Douglas Fir Growth and Yield Bulletin which is still one of the standards. There was an SAF meeting and the state of Oregon had made a very extensive computerized study of the timber stands of Oregon - all state, private, federal - the whole thing - with growth estimates up to the year 2050 and all different kinds of possibilities worked into their models. It's an elaborate study and the fellows that did the work were describing it and showing charts and they referred to Bulletin 201 and that is still used - net growth and yield figures from that.

MH Yes, old is not necessarily antiquated.

BM No. If they've got good stuff, it should stand although sometimes people tend to discount it just because it is old. Well, like that old thing right there.

MH First you question the methods and then you question their ability to analyze it right and everything else -and instrumentation.

BM Checking half by half hazard sticks December, 1935, [is] something I may want to look up at some other time. There is a reference here to Walt's party. That was Walt Meyer. He was the mensurationist who came here and took up the mensuration following McArdle's initial work. He went from here back to Yale and he was professor of Forest Management there for years after he lived here. But he left here in 1935. Started half by half hazard sticks and hygrothermograph comparison tests.

MH That would be the end of 1935?

BM That was when we were wondering just which one we should rely on.

MH You never did have a really joint effort between your group and Gisborne's group on this, did you? You sort of corresponded and evidently related but went your own way rather than a national effort.

BM No. Here's some kind of experimental work with weighed cores - ends and so forth - hazard sticks exposed to Wind River and sectioned weekly. That must have been - I'm trying to figure out how the change occurred within the sticks - what the trend was.

MH Here is a publication by Bill Morris entitled Lightening Storms and Forest Fires on the National Forests of Oregon and Washington. It is summarized by W. R. Stevens in Monthly Weather Review, October, 1934, pages 370 to 375 That is volume 62 number 10. Another one in the review section of Journal of Forestry, November, 1934, volume 32, number 8, entitled Lightning Storms and Fires on the National Forests of Oregon and Washington. It refers to a mimeographed report that Morris had prepared. The report itself is twenty-seven pages - mimeographed, illustrated and it was put out in June, 1934. Bill has a copy of the original mimeographed report in his personal files. The PNW station used to have Forest Research Notes. Number 15 of November 15, 1934, is dedicated to fire research activities and developments. It is called Fire Research Issue put together by Richard E. McArdle and Donald N. Matthews. It has the latest information on new instruments for measuring fire danger, fire detection studies, fuel inflammability studies, lightning fire studies and fire damage studies. I need to find one of these at Ogden or get a copy from Bill Morris. This is a pertinent issue. At an American meteorological meeting in early 1934, Bill Morris presented a paper on the "Altitudinal Distribution of Lightning Fires in the National Forests of Oregon and Washington". It is

reported on in the June/July issue in 1934 of the bulletin American Meteorological Society, page 159. A paragraph in the report states, "Lightning causes about 50% of the fires in the region"... and that..." many of them occur in the more inaccessible portions and therefore present a different problem of accessibility and control from the man-made fires which are more likely to break out along the roads, trails and streams." He concluded from this study that fires occur at all elevations apparently in direct and equal proportion to the land area at any given elevation. Another article in West Coast Lumberman, volume 68, June, 1942, is an article by Morris entitled "Gauging Fire Weather in the Woods" page 18, 20 and 67. It also gives, in addition to various instruments that had been developed around here, a sort of meter relationship between wind velocity and fuel moisture sticks on a one to one hundred basis. Another article by Morris entitled "Fire Weather on Clearcut, Partly Cut and Virgin Timber areas at Westfir, Oregon" in the Timberman, volume 42, number 10, August, 1941, pages 20-28. This closely parallels the clearcut, half timber, and full timber studies by Jemison and Hayes at Priest River. Send to Bill Morris information of a publication by Anderson, Rothermel, Brown and others having to do with fuel size facing distribution, wind and rate of spread.

BM ...and stayed there for two or three days and that is where [inaudible] Charlie Buck and others were carrying on their test fires in brush types and they burned a plot or two while we were there in demonstration. Then we went up there to where they were doing the heredity work - genetics work.

MH Placerville?

BM Yes. Then they went on by themselves.

MH Weidman was there, wasn't he? In Placerville?

BM I think so.

MH Because he had been director of Northern Rocky Mountain Station. You moved up there right along in there.

BM That was the first meeting that they had that involved the fire researchers at one time.

MH As far as I recall, I guess it is. Let's see - you said there was Gisborne and Jemison...

BM There're names - Les Harper - August 27 to September 2. Discussed fire research with Jack Mitchell from Lake States, Les Harper, Ralph Nelson (he was at the southeast then), Paul Stickel, George Jemison [inaudible] and we started out on this trip and we went to many different places and then we finally get down there to California [and] drove to Mount Shasta to attend a forest fire research conference with the men plus Jack Camel (he was fire control in the regional office at this time), [and] Ted Shoemaker in Region 1.

MH Yes, very close. Well, in fact, Ted's son and wife still meet with us several times a year for dinner -before Community Concert or City Symphony. He's young Ted.

BM Harry Gisborne, Jack Curry, he was from the south.

MH Yes, he was my boss, in [a] way, when I worked down there.

BM A. A. Brown, Charlie Buck, Wallace Farns and Bruce - he was the Californian - no, wait, I think he was from FPL...

End of tape