MINUTES OF THE HOUSE APPROPRIATIONS SUBCOMMITTEE ON EDUCATION
February 4, 1983

The House Appropriations Subcommittee on Education met at 8 a.m. on Friday, February 4, 1983 in Room 104 of the State Capitol. With Chairman Rep. Esther G. Bengtson presiding, all members were present. The budget for the Forestry Experiment Station was heard. Executive action was taken on the Bureau of Mines budget.

Tom Crosser, OBPP, gave his analysis. The budget for the Forestry Experiment Station, he explained, was current level, but there were substantial base modifications due to the mission-oriented research modification provided for in 1981. The base adjustments were made because the expenditures did not occur in the base year from which the 1984-5 projections were calculated. Two important items were left out of the base adjustments when OBPP made them: (1) Other Expenses, $10,000 of adjustments should be reflected in the base; (2) There is a $10,133 transfer in 1984 and a $10,741 transfer in 1985 which need to be included for the support services provided by the University of Montana. There is a $7,000 difference in health insurance levels; the OBPP calculated health benefits for some part-time employees which shouldn't have qualified. In the equipment category, OBPP provided the Experiment Station with most of the equipment they requested.

Bill Sykes, LFA, said that the LFA budget for the Station provided for current level services at a general fund increase of 10.5%. The second year start-up costs for the modified request provided for by the 1981 Legislature show up in Other Expenses. The major difference between the OBPP and LFA budgets in Personal Services is in the health insurance area. For Equipment, the LFA used a four-year average and a prioritized equipment request list to derive the amount to be expended.

Mr. Crosser said that the LFA's figures for Accounting Entity Transfers were the correct ones.

Chairman Bengtson wanted to know what the percentage increase had been in the Equipment category, from the 1981 to the 1983 biennium. Mr. Sykes said the increase in the entire budget had been 116.2%. The increase from 1983-1985 is about 6%, in Operations. Mr. Crosser pointed out that the 1982 actual expenditures did not reflect the entire mission-oriented research program, and this had to be factored into the base year in order to get a comparable estimate.

Rep. Donaldson explained that the 1982-3 increase was substantial because programs were stepped in; notably, the mission-oriented research program. Mr. Sykes said that the equipment increase granted by the Subcommittee was a 492% increase, from 1981 to 1983.

Neil Bucklew, President of the University of Montana, then spoke. See Exhibit "A." The Forestry Experiment Station provides important services to the State and State government, industry and individual citizens as well. The research goal is well accomplished by the work of the Station, which has an emphasis on applied research; this is a clear example of how the University through its programs contributes to the economic health and development of the State. In 1981, the Legislature moved the program to a new level of activity; he reported what they had done with the increased funding. Formal reviews conducted by the Society of Foresters and a federal research review team have been favorable.

Dean Benjamin Stout, Forestry School, U of M, then spoke. He reviewed what the Station had done in the past two years. (1) May, 1982: a symposium was held on the management of second-growth forests. (2) in late 1983 they will have their first report out on the inventories of part of the forests of Montana. They are beginning to get a sense of what the inventory is. They are involved with NASA in remote sensing work, which will help reduce the cost of collecting data. (3) Regarding getting an estimate of the productivity potential of the forests of Montana for wood, water, forage, wildlife, etc., they have made headway. See Exhibit "B" for an example. (4) They want to develop management regimes so that land managers can take advantage of them. 144 old studies which can be used in this effort have been found. He provided the Committee members with a copy of the research review which was done by the Cooperative State Research Service, a U.S. Dept. of Agriculture bureau which monitors the use of federal monies in research; see Exhibit "C," bulk testimony file. In addition to the things the Station said they would do in the 1983 biennium, they have become involved cooperatively with private landowners, the U.S. Forest Service, and the Soil Conservation Service in conducting studies; for one example of the results, see Exhibit "D." As a result there are now four organizations using the technology developed in the program outlined in Exhibit "D." Another project developed with money from the Dept. of Natural Resources is the Solar Lumber Dry Kiln project; see Exhibit "E." This kind of development can help small industry or landowners operate more efficiently and effectively without tremendous investment of capital.

In the last FTE increase the Station was granted, there was provision for five graduate students. They took this money and some University funding for graduate students and are now supporting nine students with mission-oriented research monies during part of the year. They are trying to use as best they know how the money which the Legislature gave them. They now have in place a data handling system which cost them $60,000 instead of the $250,000 which had been estimated by people in the computer and forest industry; the system is the pride of western Montana.

Regarding the research facility at Lubrecht Forest, he passed around a sketch of the building, which was being constructed from private funding sources. Their program modification requests that a half-time maintenance person be hired to maintain the new building, and money is requested to bring up to minimum standards the dining and kitchen facilities at Lubrecht.

Rep. Verner Bertelsen then testified. The Forestry Experiment Station provides an excellent and unique opportunity for Montana to be a leader in forestry research. Seed money for this program can encourage the industry to help get vital answers to forestry questions.

Julie Fosbender, Associated Students of the University of Montana, spoke; see Exhibit "F."

Questions were then asked. In response to Rep. Ernst, Dean Stout said that about 1,000 Forestry, Geology, Botany, and Zoology students passed through Lubrecht Forest per year.

Rep. Donaldson wanted to know why enrollment was dropping off in the Forestry Department. Dean Stout listed some of the factors: (1) the state of the economy; (2) the distance Montana is for out-of-State students to come to school to; (3) a downturn in employment by some agencies of foresters; (4) a reduction of students in that age category that would normally be coming to Forestry school; and (5) new schools of forestry being started up around the country. He added that many of UM's sister institutions had suffered greater enrollment reductions.

Dr. Stout reviewed the subject of extension forestry funding. The Legislature has declined to get involved in providing funds for an extension forester. Congress passed the Renewable Resources Extension Act. Montana's share of the funding from this act in FY 1983 was $40,000. This money went to the Extension Service in Bozeman with the understanding that it could be carried over to FY 1984. A man from their Energy Extension Program has been charged with also handling forestry extension. UM is working with the man, Roy Lynn, to do forestry extension work. Workshops in Deer Lodge and Flathead County have been planned. The new building at Lubrecht will be utilized to hold extension activities although they will be called service activities. Rep. Donaldson said he didn't feel the Legislature would ever be in a position where it could be involved in two separate extension services.

Dean Stout said he felt there would be increasing involvement from the private sector as regarded the Forestry Experiment Station. As evidence, he pointed out that there was a lot of enthusiasm on the part of the advisory council they had formed, which was comprised of representatives from industry, federal and State agencies and private landowners.

In response to Rep. Bengtson, Mr. Crosser said the Executive recommendation for equipment did not include the items the Station requested to refurbish the old kitchen at Lubrecht. His recommendation included a data processing unit and five growth chambers, among other items.

Dean Stout said that as of July 1, 1982, the Experiment Station had $900,000 in non-appropriated formula funds: grants and contracts from industry, State and federal agencies. The overhead on this money, about 40%, is for the benefit of the University; therefore they make a significant contribution to University monies through these funds.

Rep. Donaldson wanted to know how responsive the owners of small forests were to some of the long-term solutions being offered in forest research. Dr. Stout said that very often it was possible by using management alternatives to make money, but leave the forest in better shape than it was originally in. Therefore, the information they are developing is helping to increase the things that people can do with their land to increase its profitability.

In response to Sen. Haffey, Dr. Stout said that the Experiment Station was concentrating on the most productive lands in the State, and this will be expanded on in the future. He submitted that Montana could compete nationally and internationally in wood production if it identified the most productive sites and managed them effectively. The first step is to identify the areas where production would be effective.

The Committee took a fifteen-minute recess.

Executive action was taken on the Bureau of Mines budget. Sen. Haffey moved adoption of the LFA figures for Personal Services: $854,990 in 1984 and $856,880 in 1985. Motion carried unanimously.

Operating Expenses. Rep. Ernst moved the LFA figures of $329,632 in 1984 and $352,400 in 1985. Mr. Sykes said that the reason for the difference between OBPP and the LFA and the Regents' estimates was because the Regents included federal cooperative funds which were budget amended in FY 1982 but were not in the base. Mr. Crosser said that $200,000 had originally been in the OBPP budget for the cooperative funds. Dr. Bingler's revenue estimate is now $220,000, but rather than putting it in the current unrestricted budget, he had requested that the money be put in the restricted area.

Mr. Jack Noble, Deputy Commissioner for Management and Fiscal Affairs, University System, expressed concern that the revision of budget amendment bill before the Legislature might, if passed, cause it to be inferred that the Committee by not including those federal funds was rejecting them. If the monies come in, they anticipate providing the Bureau the authority to use the money. He wished the minutes to reflect that this was not a rejection of the money, but a change in accounting. Mr. Sykes said that when the Legislature appropriated the funds for the 1983 biennium, they didn't anticipate those funds coming, so it wouldn't be a rejection.

Sen. Haffey moved that the minutes reflect that the use of the federal funds was not considered rejected: they had not been considered, but would be available for budget amendment.

The question was called for on the original motion, to accept the LFA figures for Operating expenses; motion carried unanimously.

Equipment. Mr. Crosser said he had spoken with Ed Bingler, who had informed him that since the time the Bureau's budget had been submitted, the manual x-ray Defractor system was available from another college program, so they could deduct $35,000 from the OBPP 1984 estimate.

Sen. Haffey moved adoption of the LFA estimates. Motion carried unanimously.

Mandatory Transfer. Mr. Sykes explained that in FY 1982 the Bureau moved their aquifer testing operation and analytical lab into designated accounts. $20,000 was moved by Mr. Sykes out of the Mandatory transfer for the lab. Accounting practices dictate that when any activity is moved into a designated status, those activities are supposed to be totally self-supporting. He moved $3,000 out of the mandatory transfer for the aquifer testing operation. Mr. Crosser said he basically did the same thing, but when he took out the analytical lab transfers, it was from a higher base than the LFA. The Chairman wanted to know if unrestricted monies could be put into restricted accounts. Mr. Sykes said monies could be transferred from research projects, but this was the only way it could be done.

Rep. Peck moved the LFA figures for Mandatory Transfer; motion carried unanimously.

Sen. Hammond moved the Other Funds line with the LFA figures; motion carried unanimously.

Modified requests. The Committee turned to the Bureau of Mines page in the Regents' budget book. (Exhibit "A," Feb. 3, 1983)

Basic Investigations of Geology Ground Water and Mineral Resources modified. Mr. Sykes said the Bureau wanted to change the two FTE in the modified to a .63 FTE minerals economist and a .5 FTE geophysicist; the bottom line figure of $144,000 would remain the same, however. Mr. Sykes said that the minerals economist position would be a split assignment with Montana Tech. Sen. Jacobson said the modified request for a minerals economist had been denied in 1981 because it was not a top priority item. Mr. Sykes said the top priority in this budget was the resource data management system. He added that if all three modifieds were accepted, it would represent a 27.7% increase from the 1983 biennium. The modifieds would represent a 16.7% increase over the LFA's current level budget.

Sen. Haffey said there were two different sets of reasons why the modifieds should be either accepted or rejected. (1) the notion of efficiency in the way that available information is handled, and (2) whether or not the area of mineral resource economics would be pursued.

Sen. Tveit submitted that the State needed to pursue its mineral resources and their potential to the best of its ability, because of the vast potential the State had.

The Chairman questioned whether a minerals economist was needed on the State level. She wanted to know if there were sufficient minerals economists in the private sector, and if they could be utilized. She pointed out the roles played by the International Trade Commission, Dept. of Commerce, etc.

Sen. Jacobson pointed out that there were significant ground water problems in the State: Flooding of the mines in Butte, if it occurred, would be a State problem. She rose in support of addressing this modified before such a situation occurred, so that proper monitoring of the situation could be performed; in addition, monitoring was needed to be continued in eastern Montana. She submitted that as the State expanded its economic base, two things were in the State's favor: (1) available water, and the quality thereof; and (2) mineral resources, which the State doesn't have a good handle on. She saw the minerals economist as one who could accomplish the second goal as well as teaching others his knowledge of the mineral economy at the Universities.

Sen. Tveit said the modified was a small price to pay for such a huge industry. The Chairman pointed out that support for the Bureau of Mines was being provided on a current level basis, and work would continue. She submitted the modified might not generate the kinds of economic payback into the economy that some people expected it would.

Sen. Hammond rose in support of putting money directly into the saline seep problem and other ground water areas, in a non-administrative capacity.

Sen. Haffey said that in 1981 the Subcommittee had agreed that the basic kinds of research a minerals economist performed was something that the mining industry did not enter into, but that the government did enter into. Therefore, private industry shouldn't be looked to to provide minerals economists.

Rep. Ernst wanted to know where the role of the Regents fit in. He wanted to know how many economists there were at the Universities.

Mr. Jack Noble, University System, said that in the areas where economists have been funded, they are doing a good job. He said he didn't feel the Regents would view as their prerogative funding economists in the area of instruction at the University of Montana. The Regents feel the mineral economist would be most productive if located in the Bureau of Mines.

The meeting was adjourned at 10:30 a.m.

Rep Esther G Bengtson Chrm

Rep. Esther G. Bengtson - Chairman

DA

Education Subcommittee
2/4/83
EXHIBIT A

2/4/83

To: Education Subcommittee

From: Neil S. Bucklew and Benjamin B. Stout

Re: Montana Forest and Conservation Experiment Station

1. Introduction - Bucklew

2. Review of memo to Committee - 9/15/81 - Stout

   a. State of the Art of Managing Second Growth Forests

   b. Inventories

   c. Productivity

   d. Management Regimes

   e. Research Evaluation

3. Cooperation

4. On-going work

5. Lubrecht Buildings

6. Budget - 83-85

7. Questions of Bucklew and Stout - The Subcommittee

Research Note

Number Twenty—January 1983
Montana Forest and Conservation Experiment Station
School of Forestry, University of Montana
Missoula, Montana 59812

Using Height/Diameter Curves to Estimate Site Index in Old-Growth Western Larch Stands[1]

by

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School of Forestry
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Site index, the height of dominant trees at a subjectively chosen base age, is the conventional descriptor of the potential productivity of a site. The taller a tree is at a given age, the better a site is considered to be. Because height and volume are positively correlated, the site index reflects both the height growth of a tree and, indirectly, potential volume growth of a stand. Possible sources of error in estimating site index include age determination (Husch 1956, Ferree et al., 1958, Mader 1963) and unrepresentative height growth. Height growth may be reduced in very dense or very open stands, and the pattern of height growth within a stand may vary if the trees are not all the same age (Carmean 1975, McQuilken 1975).

Height/diameter curves have been proposed as an alternative method of estimating site index (Meyer 1940, McLintock and Bickford 1957, Stout and Shumway 1982). Diameter can be measured more quickly and easily than age. A height/diameter predictor could save time and reduce the error in site index estimation caused by errors in age determination. It might also reduce errors caused by suppressed juvenile growth or reduced height growth in an overstocked stand. The height/diameter relationship has been proposed as a site index for stands of uneven age or mixed species.

This study tested the hypothesis that the height/diameter relationship of western larch trees varies with site quality and thus can be used to estimate site index.

Methods

Height/diameter data were obtained from three sources. The U.S. Forest Service Intermountain Experiment Station provided access to data collected by Cummings in the 1930s. Some of the data came from the Forest Service's Forest Product Laboratory's Western Wood Density Survey. Additional data were collected in the field. Fieldwork for the latter was done in the fall of 1981 on the Lolo National Forest. Height and diameter were measured in pure and mixed western larch stands, and site index was measured in each stand with Brickell's (1970) formula and height and age measurements of several dominant trees. The three sources combined contributed data on 1,369 trees. Ages were not available for every tree, but the

[1] *This study was funded by a McIntire/Stennis grant and by the Mission-Oriented Research Program of the Montana Forest and Conservation Experiment Station*

Table 1
Models Tested in This Study

1. $H = a + bD - cD^2$
2. $H = a + b \log D$
3. $H = a + b(1/D)$
4. $\log H = a + b \log D$
5. $H = 4.5 + S(1-e^{-bD})$
6. $H = S(1-e^{-bD})^m$

information collected included trees up to and more than 300 years old. Heights ranged to up to 200 feet and diameters up to 45 inches. Site index ranged from 28 to 80 feet at 50 years.

Several height/diameter equations were fitted to the data by site class with least squares regression in order to select an equation that provided an adequate fit over the range of the data (Table 1). Examination of the residuals and comparison of the magnitude of standard errors of regression provided criteria for selection of a model.

Site classes were comprised of 10-foot site index intervals. Site class 1 included trees with a site index of 70 or above, site class 2 included trees with a site index between 60 and 70, and so on. Site class 5 included all trees with a site index less than 40. The height/diameter curves for the five site classes were compared to determine whether the height/diameter relationship varies with site quality.

Results

There was a marked difference in height/diameter curves between sites for large trees, with trees on a good site reaching greater heights at a given diameter than trees on a poor site (Figure 1). However, the curves could not be distinguished for small trees. It is possible that variations in stocking in younger stands mask the influence of site on the height/diameter relationship.

Not only were trees on a good site taller at a given diameter than trees on a poor site, but the pattern of growth was different. Initially, all the height/diameter curves were steep, indicating that small trees have a proportionally large increase in height with respect to diameter. After a time, the curves leveled off. This leveling occurred at a smaller diameter on poor sites than on good sites. Relative height growth decreased, while diameter growth continued.

Recommendations

These curves may be used to estimate site index in the same way that height/age site curves are used. Measured heights and diameter can be compared to the curves or Table 2 to find the site class. Because the curves did not separate appreciably before trees reached a 20-inch diameter, this method will be useful only in stands of trees with diameters of 20 inches or larger, such as those found in old-growth timber. The number of trees necessary for determination of the stand's site index depends on the height/diameter variability within the stand. Three to seven trees should be adequate for most purposes. Additional measurements can be taken for the desired level of precision.

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Figure 1
Height/Diameter Site Curves for Western Larch

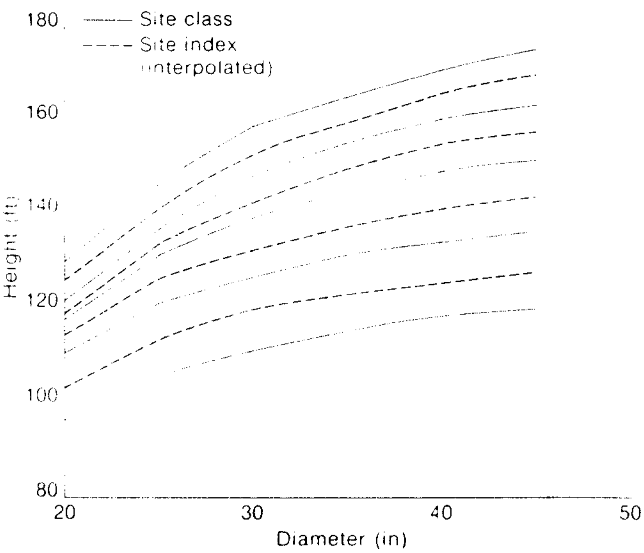

Table 2
Heights of Trees by Diameter and Site Class

DBH	Site Index 36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74
20	98	101	104	106	109	111	112	114	116	117	118	119	120	120	121	122	123	125	127	128
21	100	103	105	108	111	113	115	116	118	120	121	122	122	123	124	125	127	128	130	131
22	102	104	107	110	113	115	117	118	120	122	123	124	125	126	127	128	130	131	133	135
23	103	106	109	112	115	117	119	121	122	124	126	127	128	129	130	131	133	134	136	138
24	105	108	111	114	117	119	121	123	125	127	128	129	130	131	133	134	136	137	139	141
25	107	110	113	116	119	121	123	125	127	129	131	132	133	134	135	137	139	141	142	144
26	108	111	114	117	120	122	124	126	129	131	132	134	135	136	138	139	141	143	145	146
27	109	112	115	118	121	124	126	128	130	132	134	135	137	138	140	141	143	145	147	149
28	110	113	116	119	122	125	127	129	131	134	136	137	139	140	142	144	145	147	149	151
29	111	114	117	120	123	126	128	131	133	135	137	139	141	142	144	146	148	149	151	153
30	112	115	118	121	124	127	130	132	134	137	139	141	143	144	146	148	150	152	153	155
31	112	116	119	122	125	128	131	133	135	138	140	142	144	146	148	149	151	153	155	157
32	113	116	120	123	126	129	131	134	136	139	141	143	145	147	149	151	153	155	156	158
33	114	117	120	124	127	130	132	135	137	140	142	144	146	148	150	152	154	156	158	160
34	115	118	121	124	128	131	133	136	138	141	143	145	147	149	152	154	156	158	160	161
35	116	119	122	125	128	131	134	137	139	142	144	146	149	151	153	155	157	159	161	163
36	116	119	123	126	129	132	135	137	140	143	145	147	150	152	154	156	158	160	162	164
37	116	120	123	126	130	133	135	138	141	143	146	148	151	153	155	157	159	161	163	165
38	117	120	124	127	130	133	136	139	141	144	147	149	152	154	156	159	161	163	165	167
39	117	121	124	127	131	134	137	139	142	145	148	150	153	155	158	160	162	164	166	168
40	118	121	125	128	131	134	137	140	143	146	148	151	154	156	159	161	163	165	167	169
41	118	122	125	128	132	135	138	141	143	146	149	152	154	157	159	162	164	166	168	170
42	119	122	125	129	132	135	138	141	144	147	150	152	155	157	160	162	164	166	169	171
43	119	122	126	129	133	136	139	142	144	147	150	153	155	158	161	163	165	167	169	171
44	119	123	126	130	133	136	139	142	145	148	151	153	156	159	161	164	166	168	170	172
45	120	123	127	130	133	137	140	143	146	149	151	154	157	159	162	164	166	169	171	173

Tree Height

The above heights are derived from the following equations with intermediate values produced by interpolation

Site class 1: $H = 4.5 + 178(1-e^{-.076D})^{1.4556}$

Site class 2: $H = 4.5 + 167(1-e^{-.076D})^{1.4368}$

Site class 3: $H = 4.5 + 151(1-e^{-.076D})^{1.1455}$

Site class 4: $H = 4.5 + 135(1-e^{-.076D})^{.9671}$

Site class 5: $H = 4.5 + 117(1-e^{-.076D})^{.9416}$

Montana Forest and Conservation Experiment Station
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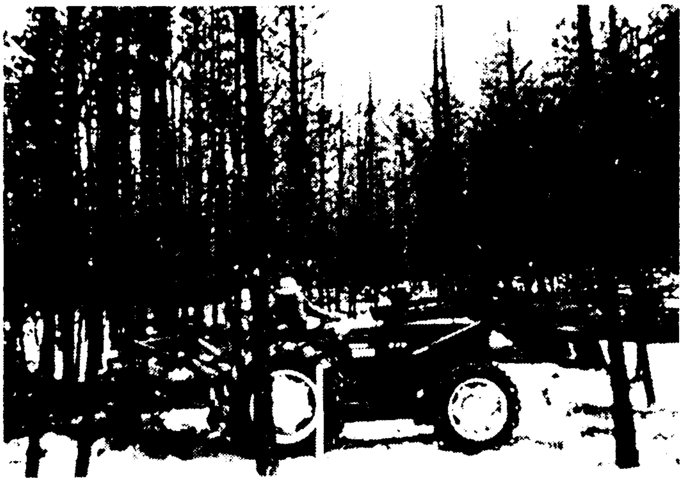
2/4/83
EXHIBIT "D"

FULL-TREE THINNING & CHIPPING

Lubrecht Experimental Forest



"SKIDDING FULL TREES WITH A FARM TRACTOR ON THE LUBRECHT EXPERIMENTAL FOREST"

Full tree thinning can enable landowners to increase the productivity of their renewable timberland with minimal direct costs. Whole trees are directionally felled and stacked in the woods and then removed to a central landing, where they are processed into a range of saleable products which will help defray thinning costs. Small trees can be used for posts, poles, firewood or chipped into boiler fuel. By removing whole trees from the woods, the landowner also receives the benefits of reduced fire and insect damage; increased grass and forage production; easy stand accessibility for future harvesting, and an aesthetically pleasing area.

Timberland owners can use a conventional farm tractor equipped with a shop-built hydraulic grapple to skid full trees. In tests conducted by the School of Forestry, University of Montana, farm tractors have efficiently skidded small trees for distances up to 200 yards on gentle terrain with production rates of over 200 stems per hour. The heeling bar which enables the operator to lift a bunch of small stems completely off the ground is an important feature of these grapples. With the heeling bar, the operator can accumulate small bunches in the woods or stack the material on the landing for future processing.

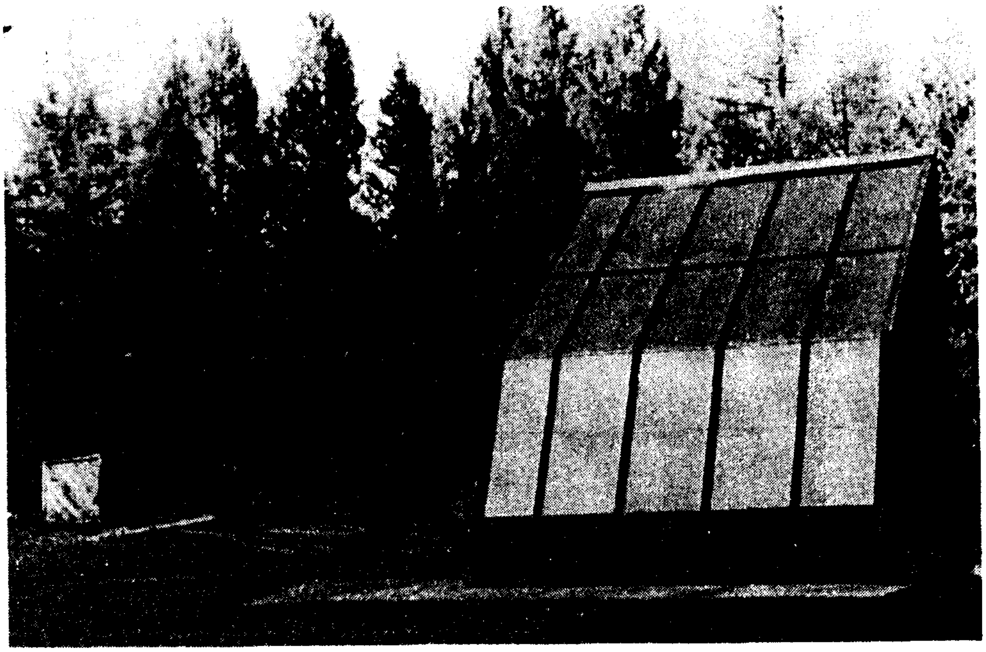
For more information on the full tree thinning system or the hydraulic grapples contact respectively:

Hank Goetz / Frank Maus
Lubrecht Forest
Greenough, MT 59836
(406) 244-5524

USDA, Forest Service
Missoula Equipment Development Center
Bldg. #1, Fort Missoula
Missoula, MT 59801
(406) 329-3155

2/4/83
EXHIBIT "E"

SOLAR LUMBER DRY KILN



Solar Research has been included within the scope of the University of Montana, School of Forestry. Recently completed at the Lubrecht Experimental Forest was a solar dry kiln with a capacity of 10,000 board feet. The solar kiln is being used for extensive research aimed ultimately at showing that solar energy can provide an economical, efficient alternative to the increasingly expensive systems now used in lumber-drying methods.

The primary objectives of the research are to measure and evaluate the rates of lumber drying and quality of the dry lumber. The solar kiln values are compared to air drying, and to conventional steam kiln drying methods utilized in western Montana.

Preliminary results indicate that one-inch lumber can be dried to a final moisture content of 19 percent within 10 days during the summer months (June-September) with negligible degrade. Air drying an equivalent volume can require 40 to 50 days, and causes varying degrees of lumber degrade. Testing is being conducted to determine winter (October-March) results. Expectations are that solar drying of the one-inch boards will require approximately 60 days, as compared to 180 days for air drying. Conventional steam kiln drying requires approximately three days, regardless of season, but at high winter-time energy costs. Most smaller sawmills, and mills that lack adequate steam capabilities, find this added cost prohibitive.

Technical Information

Construction: The University of Montana's solar kiln is a passive-gain "greenhouse" frame construction; 19 feet long, 16 feet wide and 22 feet high. The southwest facing is covered with a special thermoplastic glazing and has an internal liner of black, corrugated, aluminum sheeting that acts as a collection plate. Cart-truck assemblies mounted on standard rails facilitate loading of the kiln.

Air Circulation and Ventilation: Air within the kiln is circulated by three reversible 30 inch ceiling fans. The relative humidity is controlled by two sets of louvered intake vents and exhaust fans, activated by a manually-set humidistat.

Control Electronics: The circulation system is regulated by a Campbell Scientific Micrologger, which also records values of temperature, insolation, and relative humidity. The data are stored on a standard cassette tape. The micrologger is programmed to eliminate the need for daily, on-site personnel. Lumber shell and core moisture contents are measured by in-stack moisture probes that are interfaced to a Delmhorst moisture metering system, and recorded by a strip-chart recorder.

Capacity: Approximately 7,000 board feet of one-inch common boards, or 10,000 board feet of two-inch dimensional lumber, can be loaded per kiln charge.

Cost: To date, construction costs of the kiln are approximately $8,000. Operational costs are being established.

Applicability

Larger Commercial Operations: Large operators could reduce high energy bills by incorporating solar kilns, as production kilns, pre-driers or both.

Small mills, and ones without adequate steam supplies: These could extend drying capability without the large capital investment required by conventional kiln systems by using solar kilns.

Rancher, Farmer, Private Landowner: A solar kiln used in conjunction with a small sawmill, can provide a method of complete timber processing without dependency upon large capital investments to provide maximum return from timber crops.

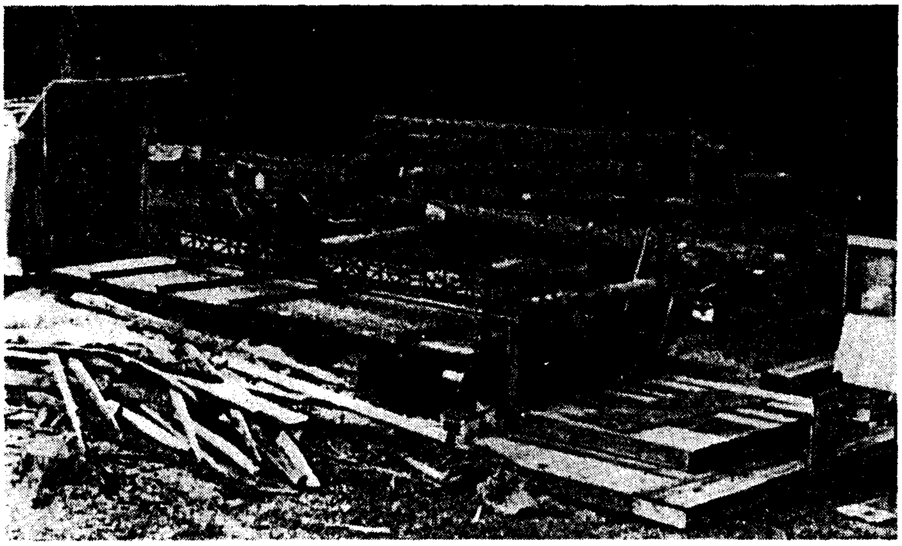
Funding

Funding for the solar kiln project was made by the Montana Department of Natural Resources and Conservation, Grant No. RAE 82-1015.

* * BY: Dr. Edwin J. Burke, University of Montana School of Forestry * *

MOBILE DIMENSION CIRCULAR SAWMILL

The University of Montana School of Forestry, owns and operates a Mobile Dimension sawmill at the Lubrecht Experimental Forest northeast of Missoula. The circular sawmill is utilized as a teaching facility for students to provide practical experience in sawmill design, operation and management. The lumber processed by students and staff is used for construction at the Lubrecht camp and for other School of Forestry projects.



Technical Information

Portable or permanent: Originally, the mill was constructed as a trailer-type, portable mill, utilizing twin mobile-home axles mounted to a steel I-beam frame, and a standard trailer hitch. The sawmill now is mounted on concrete pillars and is a permanent installation.

Frame: Steel, 4 x 3/8 inch I-beam; 24 foot length, 6 foot width.

Power unit, saw rig and track carriage: The mill incorporates Mobile Dimension Corporation components; a standard Volkswagon engine, a belt driving a 30 inch headsaw and two 12 inch adjustable, vertical, arbor-edge saws. The saw unit is self-driven and tracks on a carriage which can accomodate logs up to 22 feet long. End stands have a synchronous travel capacity of approximately 30 inches and driven by two battery-powered motors.

Operator controls: Located for ease of operation by single or multiple operators.

Output: Output capability is from 1,000 to 2,000 board feet per eight-hour day.

Dimensional Accuracy: Plus or minus 1/32 of an inch.

Total Cost: Approximately $9,000.

Applicability

Because of the low cost, ease of operation and maintenance, dimensional accuracy and portability, this type of circular sawmill can provide the private landowner or small business with an economical way to process timber. It might not be feasible for large, commercial operations.

User Benefits

The small sawmill user can expect: Low capital investment and operating costs, as compared to other alternatives.

Minimized transportation costs and handling problems: Mill mobility allows the user to set-up on the site, to eliminate extensive log hauling and mechanical damage to the logs and the environment.

Higher product monetary return: The operator is able to market a more "finished" product with good dimensional uniformity.

High Log Yield: With proper cutting technique and set-up, the operator can reduce slab waste to increase the yield per log.

Simple design and operation: The design, for one or more operators, makes this type of mill an excellent choice for teaching and for an inexperienced operator.

* * BY: Edwin J. Burke, University of Montana School of Forestry. * *

2/4/83
EXHIBIT "F."

Testimony in support of the Montana Forest and Conservation Station.

Madam Chairman and members of the committee, I am Julie Fosbender and I represent the Associated Students of the University of Montana.

We rise in support of the Montana Forest and Conservation Station. The research at Lubrecht Experimental Forest is supported by many sources, such as the United States Forest Service and private industry, and the benefit of this new knowledge is shared by all. Our faculty participating in this research are at the cutting edge of their science and this carries over into the classroom. Students working with the researchers learn new, valuable, and marketable skills. Spring Camp, which teaches forestry methods in the field at Lubrecht, is very beneficial to students seeking summer seasonal employment with such federal agencies as the forest service. All of these aforementioned reasons play an important role in the continuing accreditation of the Forestry School.

We urge your support of the station. Thank you.