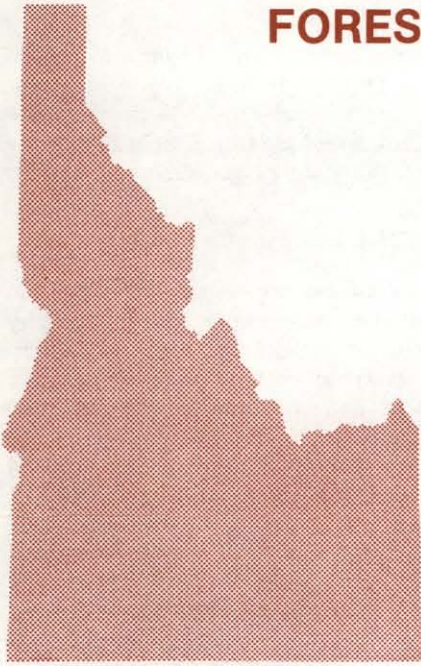


FOREST, WILDLIFE AND RANGE

EXPERIMENT STATION



Technical Report 19



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RESULTS OF A SURVEY ON RESIDENTIAL WOOD ENERGY USE IN IDAHO

Jo Ellen Force

ABSTRACT

Wood is used as a main or secondary heat source in 57 percent of the households in Idaho and residents in another 17 percent are considering adopting wood energy by 1990. Wood users are more likely than non-users to live in rural areas; have larger families; and live in a single-family home that they own. Forty percent of those considering adopting wood may do so even if there is no change or a decrease in the cost of their present fuel. Current wood users report burning an average of 3.8 cords in the winter of 1984-85. The most important reason they are burning

wood is to save money on their heating bill, and enjoyment of wood heat is the second most important reason. Over 80 percent of wood users collect their own wood and drive an average of 45 miles, one way, for 5 trips per season. All respondents are more concerned about the supply of wood from Idaho's forests than they are about other wood-related problems. However, non-users rate air pollution, inconvenience, messiness, and increased fire hazard as more important problems than users. Based on data from this study, the number of cords of wood removed annually from Idaho's forest lands is about 660,000 cords. An additional 200,000 cords per year will be needed by 1990 if all households currently considering adopting wood do so.

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OBJECTIVES

An important component of Idaho's energy picture is the use of firewood to meet residential heating needs. The overall purpose of this study was to better understand the use of wood energy for residential heating throughout the state of Idaho. Specific objectives were:

- 1) To determine the extent of adoption of wood energy for residential heating in Idaho;
- 2) To determine and compare the sociodemographic characteristics of wood users and non-users;
- 3) To estimate
 - a) the likelihood of non-users adopting wood in the next five years given changes in alternate heat energy costs; and
 - b) the probable sources of wood for people who change to wood;
- 4) To assess the amount, sources, motivations, and collecting behaviors of wood users; and
- 5) To evaluate the user's interest in and support of forest management practices that increase the supply and/or availability of firewood on forested lands. This report for the survey respondents addresses these concerns.

METHODS

In April 1985, a random sample of 1314 names and addresses was selected from the names listed in telephone books for the state of Idaho. A mail questionnaire was constructed and implemented according to Dillman's (1978) Total Design Method, which is based on social exchange theory and careful administration of the survey instrument. A non-response survey was conducted by randomly selecting non-respondents and attempting to contact them by telephone. Following coding and data entry, the data were analyzed using the Statistical Package for the Social Sciences (SPSS 1983).

The state was divided into seven geographic regions based on forest resource characteristics (available species and productivity), climatic zones, and population patterns. The Boise Standard Metropolitan Statistical Area (SMSA) was also delineated as an eighth region. This allowed a stratified sample to be taken to insure that all areas of the state had sufficient representation.

RESULTS

Of the 1314 questionnaires which were mailed, 165 were not delivered because of incorrect or incomplete addresses available in the telephone books. Fifty-three

questionnaires were returned uncompleted because of death, moving out of the state, or unwillingness to participate for other reasons. This left 1096 eligible respondents. The results reported here are based on 774 useable questionnaires (a 71 percent response rate). Response rates by geographic regions of the state ranged from 64 percent to 74 percent.

Seventeen percent of the non-respondents were randomly selected and an attempt was made to reach them by telephone. There were no statistically significant differences (at the 0.05 level) between respondents and the households reached who had not returned the mail questionnaire on any of the seven questions asked: age, education, home ownership, wood use, likelihood a non-user will adopt wood in the next five years, use of electricity or natural gas as sources of heat, and place of residence.

Additional questions were asked of those contacted by telephone who reported using wood as a source of heat in their home. There was no statistically significant differences between mail respondents who are wood users and those wood users who were contacted by telephone on the following variables; number of cords of wood burned in 1984-85; use of wood as the main heat source; primary reason for using wood for heat; proportion collecting their own wood; and the proportion living in urban areas. The following statistically significant differences were found between mail respondents who use wood and those who were contacted by telephone: telephone respondents do not drive as far to obtain wood; are less likely to have electricity as another source of heat in their home and more likely to have gas; are more likely to use fireplaces to burn their wood; and a higher proportion live in rural areas. Thus, with these few exceptions, it is assumed that respondents represent the population being surveyed.

Adoption of Wood Energy in Idaho

Wood energy has been widely adopted for residential heating in Idaho. Fifty-seven percent of all respondents identified their household as one that uses wood. Respondents were almost equally split between those who say wood is the main source of heat in their home and those who report wood is a secondary heat source. Seventeen percent of the respondents are considering adopting wood energy in the next five years. Therefore, only 26 percent of the survey respondents expressed no interest in using wood energy. The use of wood energy is considerably higher than the 45 percent reported by the Pacific Northwest Residential Energy Survey (PNRE) (1980) and the 46 percent reported by Skog and Watterson (1983). Both of these studies were reporting data for 1980. One-third of the respondents in this 1985 study reported they have begun using wood since 1980.



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Sociodemographic Characteristics

A comparison of the sociodemographic characteristics of wood users and non-users is presented in Table 1. We see that non-users are older, tend to live in larger towns, have smaller households, and are more likely to be renting their home and living in a multi-family building than users are. There is no statistically significant difference between wood users and non-users in education, income or the number of years they have lived in the area where they now live. There were no differences between wood users and non-users in the following occupations: professional, clerical, laborer, salesperson, and factory or mill worker. Respondents giving their occupation as "retired" or "homemaker" were *less* likely to be wood users, whereas those respondents in the following occupations were *more* likely

to use wood: forest worker, construction/craft, farmer, and truck driver.

Changes in Wood Use

Forty percent of those households not currently using wood stated that they might use wood for heating in the next five years. This represents approximately 50,000 Idaho households that are potential wood energy adopters in the next five years.

Slightly over half of these potential wood energy adopters have used wood in the past even though they are not currently using wood. One-third of the potential wood users stated that they may adopt wood even if there is no change in the cost of their household's present heat source and another 6 percent may adopt wood even if the

Table 1. Sociodemographic characteristics of all respondents, wood users, and non-users.

Category	All Respondents	Wood Users	Non-Users
Age (mean years) ^a	48.4	46.6	50.9
Education (mean years) ^b	13.5	13.4	13.7
Income ^b			
Under \$10,000	15.6%	13.7%	18.0%
\$10,000-\$20,000	27.0%	27.6%	26.0%
\$20,000-\$30,000	26.4%	29.3%	21.4%
\$30,000-\$50,000	22.1%	21.8%	23.1%
Over \$50,000	8.9%	7.5%	11.3%
Place of Residence ^a			
Metropolitan	17.6%	11.7%	26.7%
Urban	45.9%	41.4%	51.4%
Rural	36.5%	46.9%	22.0%
No. in House Over 18 ^a	1.8	2.0	1.7
No. in House Under 18 ^a	.95	1.1	0.7
Home Ownership ^a			
Own Home	84.5%	88.2%	79.1%
Rent Home	12.6%	9.3%	17.3%
Type of dwelling ^a			
Single family	80.5%	84.3%	76.0%
Mobile Home/Trailer	11.7%	11.1%	12.7%
Multi-family unit	7.1%	4.5%	11.3%
Number of years lived in same area ^b	20.5	19.3	21.9
Occupation			
Professional ^b	24.9%	25.9%	27.1%
Forest Worker ^a	2.6%	4.4%	0.4%
Clerical ^b	2.6%	2.5%	2.9%
Construction/Crafts ^a	9.0%	12.1%	5.4%
Farmer ^a	5.9%	7.9%	4.0%
Laborer ^b	8.9%	9.6%	8.7%
Retired ^a	22.0%	19.8%	28.2%
Salesperson ^b	5.7%	5.7%	6.5%
Factory/Mill worker ^b	3.7%	4.0%	4.0%
Truck Driver ^a	1.7%	2.0%	1.4%
Homemaker ^a	8.9%	6.2%	11.6%

^aThese variables were statistically significantly different at p=.01

^bThere were no statistically significant differences between wood users and non-users on these variables.

cost of their current fuel decreases. Thus, for nearly 40 percent of the possible users, the decision appears to be unrelated to alternative fuel price increases. One-fourth state that current fuel costs must increase 10 to 25 percent before they will adopt wood and one-fourth say it will take a 50-percent increase in the price of their current fuel. The remainder will not adopt wood unless their current fuel costs increase 75 percent or more.

Thirty percent of the possible adopters say wood energy would become their main heat source. The equipment most likely to be used is a wood stove (57%) followed by a fireplace (26%) and a fireplace insert (22%). Table 2 gives information on how possible users say they will obtain wood-burning equipment and whether they will purchase or collect their firewood. If these respondents do begin using wood, they estimate using 4.67 cords per heating season. Possible users estimate using nearly one cord more per year than current users, who report burning 3.77 cords per household per year. The higher estimate by possible users may be because of their inexperience in using wood.

Table 2. Possible wood energy users' sources of wood-burning equipment and how to obtain their wood supply.

	All Possible Users	Previous Wood Users	No Previous Wood Use
Wood-burning equipment			
Would buy	68.1%	62.1%	86.4%
Already own	29.0%	37.9%	13.6%
(Chi-square = 8.27, p=0.004)			
Ways of obtaining wood			
Buy own wood	17.5%	11.9%	23.0%
Collect own wood	39.4%	46.3%	31.1%
Buy and collect wood	41.6%	41.8%	45.9%
(Chi-square = 4.24, p=0.1198, no significant difference)			

Information on Current Wood Users

What do we know about the amount, sources, motivations, and collecting behavior of the 57 percent of Idaho households who are currently using wood as a heat source in their homes? First, use is almost equally split between use of wood as a main heat source and use as a secondary heat source.

The number of cords reported being used during the 1984-85 heating season is presented in Table 3 for all respondents, and then partitioned by users for which wood is the main heat source versus the secondary heat source; users who collect their own wood versus those who buy all of their wood; and users living in rural, urban or metro-

politan areas.¹ The differences in wood use were as expected: those who use wood as their main heat source burn nearly twice as much as those using wood or a secondary heat source; those who collect their own wood use more than those who buy wood; and those living in rural areas burn more wood than those living in urban or metropolitan areas. Sources of wood for both current users and possible users are shown in Table 4.

Table 3. Average number of cords burned by wood users during the 1984-85 winter.

Group	Burned in 1984-85
All respondents	3.77
Wood use ^a	
Main heat	5.14
Secondary	2.91
Wood is ^b	
Bought	3.25
Collected	4.21
Population ^c	
Metro	2.62
Urban	3.51
Rural	4.29

^aAt the 0.05 level, main heaters use more wood than secondary all years.

^bAt the 0.05 level, wood collectors use more wood than buyers all years.

^cAt the 0.05 level, rural respondents use more wood than urban and metro respondents all years.

Table 4. Sources of wood for current wood users and for possible wood energy users.

Source	Current Wood Users (Percent)	Possible Users (Percent)
USDA Forest Service	59	54
Family, Friend or Household	16	10
Forest Products Company	13	6
Idaho State Lands	9	13
Bureau of Land Management	4	8
Don't Know	—	7

¹Population categories are based on U.S. Bureau of Census definitions (1981) as follows: metropolitan - comprised of all respondents living in an urbanized area with at least 50,000 inhabitants; urban - comprised of all respondents living in places between 2,500 and 49,999 inhabitants; and rural - comprised of all respondents living on ranches or farms and in towns or villages smaller than 2,500.

Eight reasons were listed as possible motivations for using wood to heat one's home. The mean ratings for all respondents using wood are shown in Table 5.

Table 6 compares the type of wood-burning equipment, collecting versus buying wood, and alternate sources of heat for all respondents, including those who use wood as their main heat and those who use wood for secondary heat. As might be expected, respondents using wood as the main heat source use more efficient wood-burning equipment and are less likely to buy their wood.

Two-thirds of the collectors report collecting all of their own wood. Seven percent of all wood users buy less than 25 percent; 5 percent buy from 25 to 50 percent; and 5 percent buy more than 50 percent of their wood. The remaining seventeen percent of all wood users reported that they bought all of their wood, or it was supplied by someone else.

Table 5. Reasons respondents use wood for residential heating.

Reason	Rating ^a
To save money on my heating bill	5.05
To enjoy the use of wood heat	4.56
To be self-sufficient	4.11
To use a convenient Idaho fuel source	3.99
To help reduce America's consumption of oil and gas	3.62
To involve my family in energy conservation	3.50
To take advantage of firewood on public lands	3.38
To enjoy wood collecting as recreation	2.98

^aRespondents were asked to rate each reason by a scale from 6 (extremely important) to 1 (not important).

Table 6. Wood-burning equipment, collecting, and other sources of heat for all respondents, those using wood as a main heat source, and those using wood as a secondary heat source.

	All Wood Users (%)	Wood Is Main Source (%)	Wood Is Secondary Source (%)
Contribution of wood energy to total heating needs	—	49	51
Wood-burning equipment ¹			
Fireplace	26	9	38
Wood Stove	68	84	56
Wood Furnace	4	6	2
Fireplace Insert	16	13	20
Respondent burns only firewood	63	73	54
Respondent buys all wood used	17	12	21
Respondent collects all wood used for heating	53	66	41
Respondent collects some wood used and purchases a portion of the wood	30	22	38
Other sources of heat available in the household (a)			
Electricity	63	59	66
Natural Gas	20	19	22
Oil	15	13	16
Solar	5	6	4
Other	6	7	6

¹Percentages add to more than 100 percent because many respondents reported using more than one type of wood-burning equipment in their household or had more than one other source of heat available.

Table 7 presents information on the collecting behaviors of those respondents who reported collecting some or all of their own wood. Collectors' behaviors of today

Table 7. Behaviors of respondents who collect wood for residential heating.

<u>Forms of firewood used</u>	<u>Percentage</u>
Standing dead	61
Dead and down	27
Logging slash	5
Logs yarded to roadside	3
<u>Distance willing to go from vehicle to collect</u>	
Less than 100 feet	32
100 - 300 feet	49
300 - 500 feet	8
More than 500 feet	10
<u>Type of vehicle used to collect</u>	
Half-ton truck	45
Three-quarter ton truck	35
One-ton truck	8
Two-ton truck	5
Other	7
<u>Reasons collectors might become wood buyers in future</u>	
Decline in health	42
Higher prices for oil, gas, electric	22
Harder to find wood	11
Have to drive further to collect	9
<u>Average number trips per season</u>	
5.05 trips	
<u>Cords collected per trip</u>	<u>Average Cords</u>
Using half-ton truck	0.84
Using three-quarter ton truck	0.94
Using one-ton truck	0.80
Using two-ton truck	2.11
<u>Miles driven one way to</u>	<u>Average Miles</u>
Collecting site	44.7 miles
Closest miles driven one way	29.2 miles
Farthest miles, one way	65.0 miles
Willing to drive, one way	64.1 miles
<u>Reasons they collect their own wood</u>	<u>Rating^a</u>
To save money	5.14
To be self sufficient	4.30
To be in woods	4.26
To get exercise	3.81
To enjoy collecting as recreation	3.19

^aRated on a scale of 6 (most important) to 1 (not important)

have changed little from those of four years ago as reported by Force (1982, 1985). There is still a clear preference for standing dead wood or dead and down wood, and little preference for slash piles and logs yarded to the roadside. Not surprisingly, approximately four-fifths of the collectors are still unwilling to go more than 300 feet from their vehicle to obtain wood. The distances being driven are still quite high and the vehicles being used to transport wood have not changed. The most important reason to collect their own firewood has remained "to save money", followed by "self-sufficiency" and the opportunity to be in the woods. A decline in personal health is still the primary reason a collector might decide to buy wood.

Support of Forest Management Practices

Respondents who collect firewood were asked to rate their preferences for fuelwood management practices that forest managers might implement to aid fuelwood collectors. Each practice was rated on a 6-point scale ranging from "strongly prefer" to "no opinion". Average ratings were calculated for each practice and are reported in Table 8.

The most strongly preferred practice by collectors is that of allowing collectors to get firewood before an area is burned for management purposes. Some changes in prescribed burning practices have been implemented by 7 of the 10 national forests in Idaho (Force 1984a, b). Planting areas with trees that would be desirable firewood in the future received support from collectors, but has not been implemented on any national forest in Idaho (Force 1984a, b).

Although these data provide forest managers with information on the acceptance of current firewood management practices and potential acceptance of other practices they may decide to implement in the next few years, they also illuminate some inconsistencies in the responses. Only 8 percent of the collectors report using logging slash or logs yarded to the roadside (Table 7) although these practices are given reasonably high preferences as fuelwood management practices respondents would like to see forest managers adopt (Table 8).

Problems Associated With Using Wood

Respondents were asked to rate six wood heat-related problems on a scale of 6 (extremely important) to 1 (not important). The mean ratings are reported in Table 9 for all respondents, wood users, and non-users. We see that non-users rate four of the six problems as having statistically significantly greater importance than wood users rated them. These problems associated with using wood energy for residential heating are factors that need to be addressed if wood energy use is to be more widely adopted. However, respondents are more concerned about the supply of wood from Idaho's forests than they are about other problems. This is a concern that forest managers can address.

Table 8. Respondents' preferences for forest managers to use as fuelwood management practices.

Management Practice	Respondents' Preference(a)
Allowing collectors to get firewood before burning an area	5.70
Including firewood collecting in forest plans	5.44
Encouraging collectors to use logging slash	5.06
Planting areas with firewood species for future use	5.02
Opening roads to firewood areas	4.88
Establishing special areas for collecting firewood	4.78
Moving wood that cannot be sold commercially to collecting areas (YUM)	4.72
Establishing road access policies that benefit firewood collectors	4.72
Restricting to less than 10 the number of cords per permit	4.69
Budgeting money for firewood management	4.36
Establishing piles of logs (log decks) by roads for collectors	4.34
Appointing foresters specifically to manage firewood	4.32
Allowing firewood collectors to cut trees that are too small to sell commercially	4.28
Charging for personal use permits	4.23
Allowing live tree cutting for fuelwood in some areas	3.17

^aRespondents were asked to rate practices on a scale of 6 (Strongly Prefer) to 2 (Do Not Prefer). One (1) represented "No Opinion". The percent of respondents indicating "No Opinion" ranged from 1.8% to 6.1% on the 15 items.

Table 9. Respondents ratings of problems associated with using wood for home heating.

Problem	All Respondents	Wood Users	Non-Users
Cutting live trees	4.64 ^a	4.68	4.59
Over-cutting in forests	4.80	4.76	4.86
Increased air pollution from burning wood	3.94	3.59	4.49 ^b
Inconvenient source of heat requiring attention, time, and labor	3.25	2.91	3.78 ^b
Increased fire hazard in home	3.74	3.43	4.24 ^b
House gets dirtier from wood debris, smoke, and soot	3.35	3.17	3.63 ^b

^aRespondents were asked to rate the problems on a scale of 6 (extremely important) to 1 (not important). These are the mean ratings.

^bThe mean ratings are statistically significantly different at the 0.05 level, using a t-test between wood users and non-users.

CONCLUSIONS

Data from this study show that the use of wood energy is an important factor in Idaho's overall energy picture. With nearly 175,000 households using an average of 3.77 cords of wood to meet some of their heating needs, Idaho's forest lands must supply 660,000 cords of wood annually. Up to an additional 200,000 cords per year would be needed by 1990 if all those households currently considering adopting wood decide to do so. The impact of such widespread use of wood energy must also be considered by energy planners trying to predict demand for alternate fuels.

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