SURVEY OF RESIDENTIAL WOODSTOVE USERS IN SMITHERS, B.C. JANUARY 1989

by

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Summary

In view of increasing concern over poor air quality in Smithers, a door-to-door survey was conducted in January 1989. Its purpose was to collect information on domestic woodstove use in and around the town, and to measure public awareness of woodsmoke as a health hazard.

The survey covered 91% of all households in Smithers. It showed that 32% of in-town respondents used a woodstove and 10% used it as their primary heat source. This is lower than the provincial average of 38% and 14% respectively, and considerably lower than the rural area figures of 77% and 47%. Natural gas was the preferred heat source, and less than 1% of Smithers residents were totally dependent on wood heating.

Most woodstoves were in use for six months or less, and firewood consumption averaged 0.65 cords per winter month. This gives a total firewood consumption for the town of about 615 m^3 per winter month, or about 6% of the volume of waste wood burned at the two local sawmill burners.

Most firewood was collected in the fall, and much of it was burned the following winter. Thus, 38% of respondents stored firewood for three months or less and 44% stored it for less than six months, which is the minimum time recommended by the U.S. Wood Heating Education and Research Foundation.

64% of Smithers respondents could smell woodsmoke in their own neighbourhood and 22% reported that it affected them personally, mostly with asthma and other respiratory complaints. 57% considered woodsmoke in the valley to be a health problem, whereas 35% thought that it was not. Perception of woodsmoke as a health hazard was highest among respondents without stoves and lowest among those who used wood as their primary heat source. It was also strongly correlated with the ability to smell woodsmoke locally.

The commonest recorded comment was that the smoke problem in Smithers is caused by the sawmill burners; however, the second commonest was that woodstove use should somehow be regulated. Woodstove regulation may be difficult unless it is first proven that:

1. woodsmoke in Smithers is a health problem; and
2. domestic woodstoves are a significant source of woodsmoke in Smithers.

1. Introduction and Objectives

In recent years, there has been increasing concern about the apparent high level of air pollution, especially woodsmoke, in Smithers and the surrounding Bulkley Valley. Smoke from domestic woodstoves, the two sawmill burners and (in autumn) from forestry slashburning is very visible and can frequently be seen as a thick layer overlying the town for long periods during the winter. It can be smelled in town and it is known to pose a potential health problem (Cooper, 1980). Young children and those prone to lung diseases are particularly susceptible (Honicky et al., 1985; D. Hart, pers. comm.). It is of interest that one large Smithers drugstore sells more asthma-related pharmaceuticals than any other store of that chain in the province (P. Misfeldt, pers. comm.).

Domestic wood-burning stoves are one source of woodsmoke in Smithers. Although studies have been conducted on the prevalence of woodstoves nation-wide (IEA Consulting, 1984, cited in Crozier and Manna, 1989), no information exists on woodstove use in a small community such as Smithers.

A survey of Smithers residents was conducted in January 1989 to obtain information on the use of residential wood burning heaters and public attitudes toward the smokiness of the air in town. This study is the first of its kind in B.C. and was designed with two objectives:

1. To collect information on woodstove use in and around Smithers
2. To measure public awareness of woodsmoke as a health problem.

2. Study Location

Smithers is a town of about 5,000 inhabitants, located about 500 m above sea level in the north-central interior of British Columbia, 210km east of Prince Rupert. It lies in the 10 km wide Bulkley river valley between the Hudson Bay and Babine mountain ranges (Figure 1). Average daily low temperatures are below 0°C from November until April; prevailing winter winds are from the southeast and calm winds are recorded for 33% of the time (Table 1). Temperature inversions are common, especially in fall and winter when inversions lasting at least one day occurred 40% - 45% of the time. This means that pollution from smoke in and around Smithers is exacerbated by the generally poor air circulation typical of mountain valleys in the province.

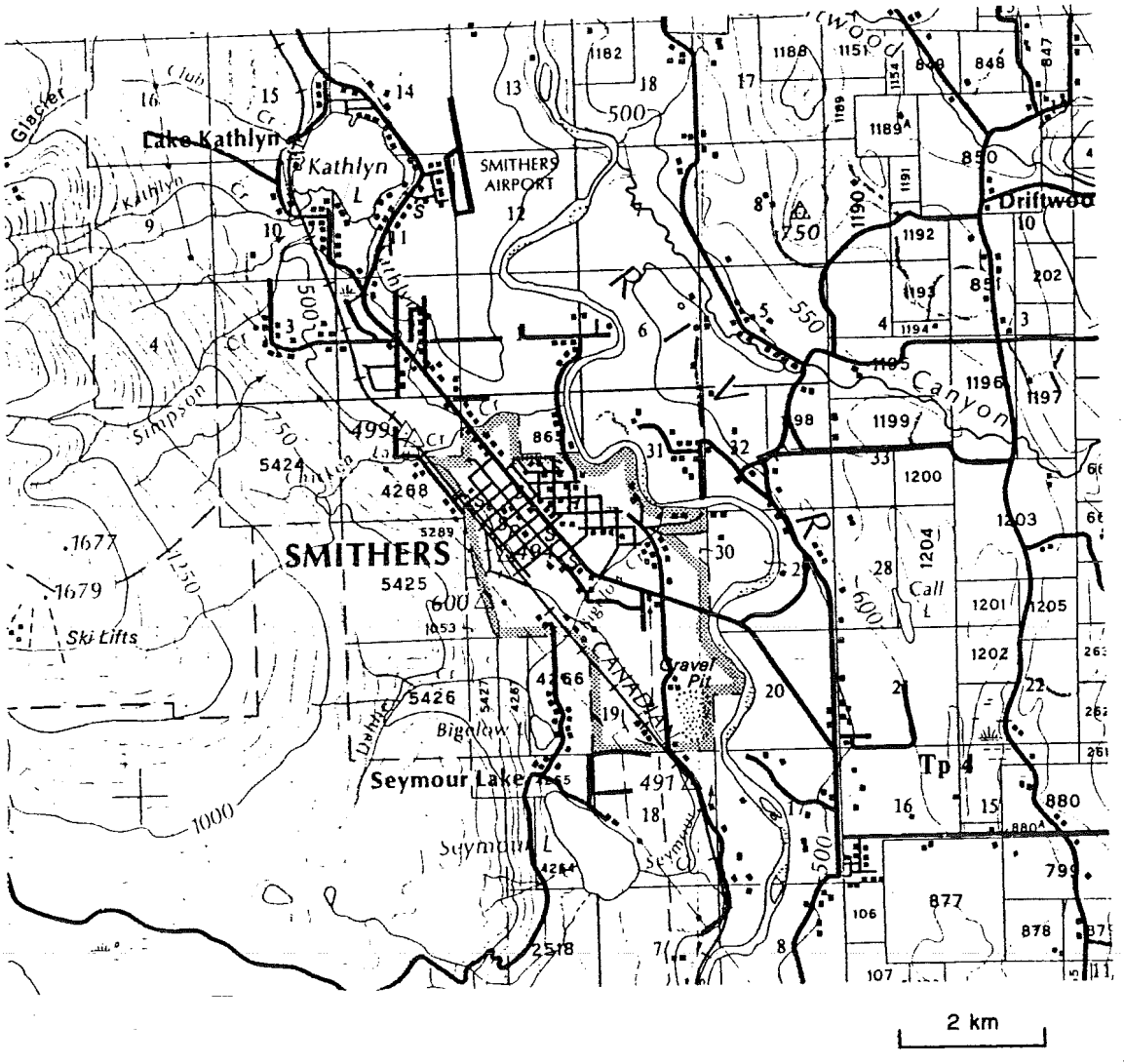

FIGURE 1 Location of study area

TABLE 1 Climate statistics for Smithers airport 1953 - 1987[1]

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature												
Average daily high (^{o}C)	-6.8	-0.4	3.9	9.9	15.4	18.9	21.3	20.6	15.7	9.0	0.8	-3.9
Average daily low (^{o}C)	-15.4	-10.1	-6.4	-1.7	2.5	6.0	8.1	7.6	4.0	0.5	-5.5	-11.2
Wind direction												
(% of time)												
SE	35	31	25	21	14	13	11	14	20	28	32	35
NW	3	4	7	11	15	17	17	15	10	6	4	3
calm	30	32	32	27	27	29	33	34	36	32	32	31

3. Materials and Methods

An Environmental Youth Corps team, under the supervision of Dale Harris, conducted a door-to-door survey of every householder in Smithers and a sample of householders in the surrounding rural area. Where the householder agreed to be interviewed, questions were asked concerning:

1. Use of wood as a source of heat;
2. Type and specifications of woodstove used;
3. Wood collection and amount burned;
4. Wood burning habits;
5. Awareness of smoke as a health problem;
6. Possible courses of action to resolve the smoke problem.

The survey questionnaire was drawn up by Dale Harris and Brian Wilkes, and is reproduced in Appendix I.

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[1] Environment Canada; Atmospheric Environment Service

4. Results and Discussion

A complete breakdown of questionnaire answers is given in Appendix II. This section describes the main points which emerged from the survey.

For the purposes of this report, a woodstove which is used as a main source of heat is referred to as a primary woodstove and a woodstove which is used as a supplementary heat source is referred to as a supplementary woodstove.

4.1. Use of wood as a source of heat

In Smithers, wood was not widely used as a heat source. 68% of respondents did not use a woodstove at all, 22% used wood as supplementary heating and only 10% used it as their main heat source (Table 2). Rural area residents were much more reliant on wood heat -- 47% used wood as their primary heat source, 29% used it as supplementary heat and only 23% did not use wood at all.

TABLE 2 Woodstove use in and around Smithers

	Primary woodstoves	Supplementary woodstoves	No woodstoves	no. surveys completed
In Smithers	10%	22%	68%	821
In rural area	47%	30%	23%	108

Almost all respondents had a heat source other than wood -- in particular, only 2 out of 821 in-town respondents reported no other form of heating. The commonest alternative heat sources were electricity, oil and (in town only) natural gas. Primary stove users in town most often used electricity as a back-up (53%); however, supplementary stove users most often had natural gas as their main heat source (67%). In the rural area, the commonest alternative heat source was always electricity. This may reflect the availability of natural gas. Homes which had gas heating available most often used it as the primary heat source. Natural gas is not available in the rural area outside Smithers.

4.2. Type and specifications of woodstove used

Most stoves, in town and in the rural area, were manufactured either by RSF Energy (36%) or by Fisher (19%). 35 other manufacturers accounted for 33%, with 13% unknown. The preponderance of RSF stoves could be because they are long-burning units which are made locally. Nearly all stoves were CSA or ULC approved. Most (63%) did not use a thermostatically-controlled damper, although thermostats were much more common in the rural area (56%) than in town (27%).

4.3 Wood collection and quantity burned

Most respondents (53%) collected firewood in the fall. The wood was generally stored either for less than three months (38%) or for more than twelve (39%). There was no difference between in-town and rural area responses, but respondents with primary stoves were more likely to collect wood as they needed it rather than storing it to "cure".

Major trends in domestic woodburning are shown in Figures 2a-c. Most primary woodstoves were in use every day for about six months, whereas most supplementary stoves were used less frequently (Figure 2a -- "only when it is cold outside" was a common response) and only for about 4 1/2 months (Figure 2b). Most primary woodstoves consumed 3-5 cords of firewood in a typical year, compared to 1-3 cords for supplementary stoves (Figure 2c). Both primary and supplementary woodstoves were used more intensively in the rural area than in town.

4.4. Wood burning habits

Most stoves were fairly long-burning, averaging 7.8 hours burn time per load. 58% burned for eight hours or longer and 69% burned through the night at least some of the time. On average, primary stoves burned slightly longer than supplementary stoves and rural area stoves burned longer than those in town. A significant proportion (23%) of supplementary stoves burned for less than four hours -- this may indicate an evening-only burning period which was not seen with primary stoves. 84% of respondents burned nothing but wood, and a further 10% sometimes burned paper.

Figure 2a. During the winter, how often do you burn wood?

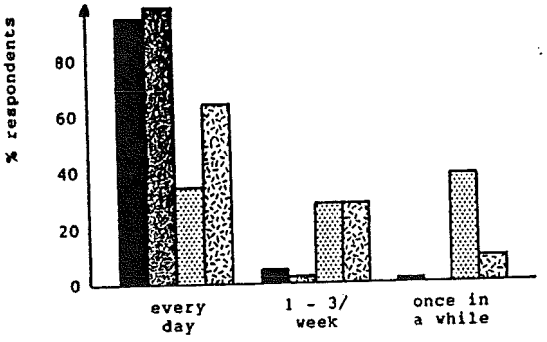

Figure 2b. How many months do you burn wood?

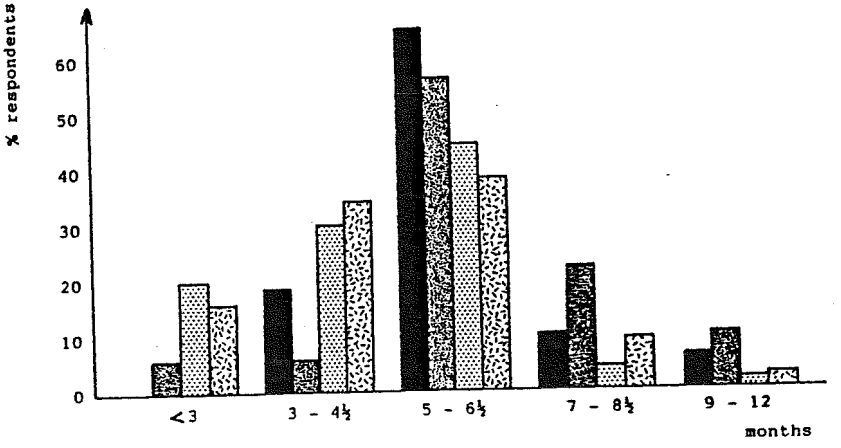

Figure 2c. How much wood do you burn in a typical year?

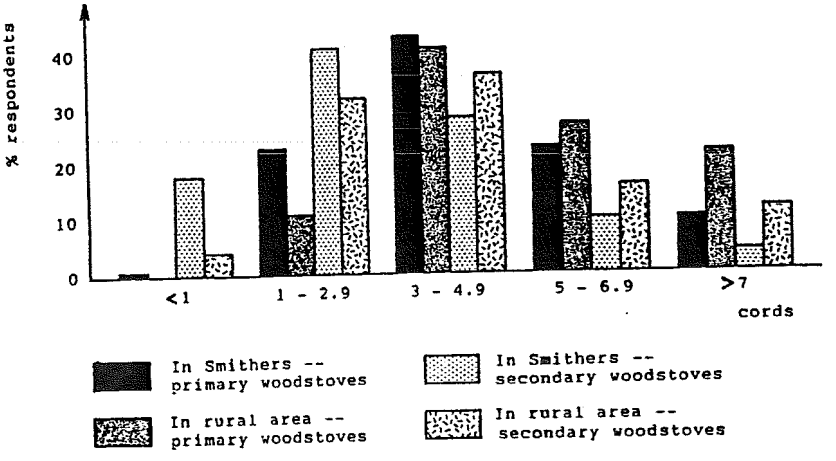

FIGURE 2 Trends in domestic woodburning

4.5 Awareness of smoke as a health problem

In town, 70% of respondents could smell woodsmoke at least some of the time (Table 3). Those without woodstoves were most sensitive (25% always noticed the smell) and primary stove users were least sensitive (14% always noticed the smell). Woodsmoke was less noticeable in the rural area, where 57% of respondents could smell it at least some of the time and only 3% always noticed it.

TABLE 3 Sensitivity to woodsmoke smell

	Always notice smell	Sometimes notice smell	Never notice smell	no. of respondents
In Smithers	22%	47%	30%	805
In rural area	3%	54%	43%	107

In town, 31% of those who could smell the woodsmoke (22% of the total) reported that it affected them personally. Again, the proportion was highest amongst those without woodstoves (35%) and lowest amongst primary stove users (19%). Reported smoke-related complaints are listed in Table 4. The commonest was asthma (40 respondents); another 15 respondents quoted respiratory or bronchial problems.

TABLE 4 Reported effects of woodsmoke

Problem	no. of respondents
Asthma	40
Respiratory/bronchial problems	15
Coughs & colds	13
Allergies	13
Ash & soot	9
Eye irritation	8
Throat irritation	4
Dirty laundry	3
Can't open windows	3
"Like the smell"	8
"Don't like the smell"	24

56% of respondents thought that smoke in the Valley was a health problem (Table 5). The proportion was higher in town (57%) than in the rural area (47%) and, like the ability to smell smoke, it was highest among those without woodstoves (61%) and lowest among primary stove users (44%). In town, 35% thought that woodsmoke was not a health problem and 8% did not know. In the rural area, 43% did not know or gave an unclear answer -- however, several of these interviewees thought that woodsmoke was a health problem in town but not in their own rural neighbourhood.

TABLE 5 Perception of woodsmoke as a health problem

	Is a health problem	Don't know	Is not a health problem	no. respondents
<u>In Smithers</u>				
primary woodstoves	44%	6%	50%	80
supplementary woodstoves	51%	10%	39%	172
no woodstoves	61%	8%	31%	534
Total	57%	8%	35%	786
<u>In rural area</u>				
primary woodstoves	44%	42%	15%	48
supplementary woodstoves	45%	48%	6%	31
no woodstoves	58%	38%	4%	24
Total	47%	43%	10%	103

It is curious that so many woodstove users did not consider woodsmoke a health problem, since these are the people most at risk. Some smoke and gases escape into the home's atmosphere every time the stove door is opened, and residents of homes with woodstoves are known be more vulnerable to respiratory complaints than residents of homes without (D. Hart, pers. comm.)

Awareness of smoke as a health problem was strongly linked with the ability to smell it (Table 6). 67% of those who noticed the smell also considered it a health problem, whereas 60% of those who could not smell smoke did not consider it a health problem.

TABLE 6 Sensitivity and perception

	Is a health problem	Don't know	Is not a health problem	no. of respondents
Notice smell	67%	9%	24%	605
Don't notice smell	31%	9%	60%	281

4.6 Possible courses of action

A summary of respondents' suggestions is shown in Table 7. This table is a composite of suggested courses of action and of remarks in the "Comments" section of the questionnaire, since responses in these two categories were very similar.

Many Smithers residents considered woodsmoke to be a health problem, but the single commonest remark was that the problem was primarily caused by the two sawmill burners located near Smithers. Certainly the mills burn more wood than domestic woodstoves. During the winter, Smithers residents burn an average of 0.73 cords per month per primary woodstove and 0.62 cords per month per supplementary woodstove. This gives a total for the town of about 170 cords or about 615 m^3 of firewood per winter month, whereas the sawmills burn about 15 times this amount (based on volumes of wood waste burned supplied by the sawmills in February 1989). Whether they produce 15 times the amount of smoke is not known.

TABLE 7 Respondents' suggestions

Comment/suggestion	no. of respondents
Problem comes from mills/ regulate mill smoke	139
Regulate stove burning	115
Improve stove technology	52
Convert to other heat sources	44
Education/better burning habits	31
Problem comes from slashburns/ regulate slashburning	24
Problem comes from hospital	5
Problem comes from other sources	4
Chimney cleaning/ better stove maintenance	3
Pinpoint source of smoke	2
Monitor smoke emissions	2
Conduct health study	1
Tax woodstove users	1
System of fines for smoky fires	1
Better home insulation	1
Ban garbage burning	1

Many respondents felt that woodstoves contributed to the poor air quality in Smithers and 139 suggestions concerned some form of woodstove regulation. Introduction of burning bans during temperature inversions was frequently suggested -- this might not always be practical since inversions occur on 65% of winter mornings and 45% of winter afternoons (B. Thompson, pers. comm.), but could be introduced for prolonged or severe inversions. Other suggestions included burning only during very cold weather (although this may be when temperature inversions mostly occur); or limiting overall woodstove use by burning only on alternate days, or by limiting the total amount of wood burned.

26 respondents suggested that wood burning be banned altogether, whereas several people remarked that woodstove use should be regulated but not banned. Public acceptance of a complete or partial ban may depend on whether the homeowner has an efficient, reliable source of back-up heat which is not too expensive to operate. The preponderance of electric back-up heating where wood is the primary source suggests that this may not necessarily be so.

52 respondents suggested improving woodstove technology -- catalytic combustors were frequently mentioned. These provide for more efficient combustion but are expensive and easily ruined if garbage or treated wood is burned. This seems not to be a problem in Smithers (see Section 4.4).

31 respondents suggested educating people to use their woodstoves more efficiently; in particular, to burn dry wood. Considering that 38% of respondents stored their firewood for three months or less, whereas the Wood Heating Education and Research Foundation (Washington D.C.) recommend storing for 6-18 months, this appears to be a very valid comment.

24 respondents considered forestry slashburning a problem. This was the only comment which was more prevalent in the rural area than in Smithers. Slashburning produces large quantities of smoke but the burning season is quite limited -- the Bulkley Forest District lit slashburns in or around the Bulkley Valley on 5 days during 1990 (E. MacDermid, pers. comm.). However, the smoke becomes highly visible across the entire area, not just in Smithers, which may account for the high level of concern among rural area residents.

The lack of concern about garbage burning and poor home insulation corresponds with the survey's findings that these factors are not commonly a problem in Smithers.

More than half the respondents in Smithers thought that woodsmoke was a problem, but it was commonly believed that the problem lies with the sawmill burners and not with domestic woodstoves. The mills certainly do contribute to the problem; however, several people commented that the woodsmoke smell was most obvious in the morning and evening. This is when most woodstoves are lit, or are refueled after being banked up to burn through the daytime or overnight. This suggests that woodstoves could be having a much greater effect, at least in their immediate neighbourhood, than is apparent from their low numbers and the comparatively small amount of firewood they consume.

5. Conclusions

1. 32% of households in Smithers used a woodstove and 10% used wood as their primary source of heat. This is lower than the provincial average, which was determined by IEA Consulting Ltd in 1984 to be 38% and 14% respectively, despite the fact that firewood is readily available in and around Smithers. Less than 1% of households were completely dependent on wood heat.

2. Most stoves are CSA or ULC approved but do not use a thermostatically-controlled damper.

3. About half of the woodstoves in Smithers are used every day during the winter. This comprises nearly all primary woodstoves and 34% of supplementary woodstoves.

4. Woodstove use is considerably less in Smithers than in the rural area. Part of this may be due to the availability of natural gas, which is the preferred heat source in town but is not available in the rural area. Woodstoves in the rural area are used more often, the burning season is longer, and the stoves consume more wood both per winter month and overall per year.

5. Much of the firewood burned in Smithers is not properly cured, even though green or partially green wood burns less efficiently and produces more smoke and creosote than dry wood. Most firewood is stored for less than a year, 44% is stored for less than six months and 38% is stored for less than three months. Many respondents stated that they collected only dry wood; however, all wood which has been exposed to the weather should be allowed to dry under cover before burning. Several respondents commented on woodstove users' failure to burn dry wood.

6. Air pollution from domestic garbage burning is not considered a problem in Smithers.

7. More than half the respondents in Smithers thought that woodsmoke was a health problem, but there was a great deal of uncertainty as to where the smoke was coming from. Burning regulations may be more easily introduced if it can be clearly shown that:

a. woodsmoke definitely is a health problem in Smithers; and
b. domestic woodstoves are a significant source of woodsmoke in Smithers.

8. One third of Smithers residents, including 50% of primary woodstove users, thought that woodsmoke was not a health problem. A program of public education may be advisable to publicize the known adverse effects of woodsmoke. This could also increase public support for any future voluntary or mandatory smoke regulation.

6. References

Cooper, J.A. 1980. Environmental impact of residential wood combustion emissions and its implications. J. Air Pollut. Control Assoc. 30:855-861.

Crozier, R.J. and B. Manna. 1989. Impact of residential wood combustion on ambient air quality in Cranbrook, B.C., Canada. Report prepared for B.C. Min. Environ., Nelson, B.C.

Hart, D. General practitioner and spokesman for Physicians Environmental Concerns Committee. Personal communication, October 1990.

Honicky, R.E., J.S. Osborne and C.A. Akpom. 1985. Symptoms of respiratory illness in young children and the use of wood-burning stoves for indoor heating. Pediatrics 75:587-593.

I.E.A. Consulting Group Ltd. 1984. Residential woodburning in Canada - A digest of results from the national study of the viability of using wood for domestic heating. DSS contract 145Q 23216-2-6-42.

MacDermid, E. Resource Assistant, Ministry of Forests, Bulkley Forest District. Personal communication, October 1990.

Misfeldt, P. Pharmacist and owner of Pharmasave 105, Smithers. Personal communication, October 1990.

Thompson, B. Atmospheric Environment Service, Environment Canada, Vancouver, B.C. Personal communication, October 1990.

APPENDIX I

Street Address: _____

We are members of an Environment Youth Corps crew and we are doing a door-to-door survey to collect data on the use of wood burning stoves in the Smithers and outlying areas.

May we ask you a few questions?

Agreed _____ Refused _____

Reason for Refusing: _____

_____

Observation: _____

1. Do you have a wood stove? yes_____ no_____
   How many? _____

2. Is wood your main source of heat? yes_____ no_____ Do you have a back-up heat source: yes_____ no_____. If so, what type?_____.

3. What make and model of stove is it?_____
   BTU rating is known?_____.

4. Is your stove regulated by a thermostat? yes_____ no__

5. Is your stove CSA or ULC approved? CSA_____ ULC_____
   Don't know_____

6. During the winter, how often is your stove used?
   Everyday_____ Once or twice/week_____
   Once in a while_____ How often _____

7. How many months do you burn wood? _____

8. How much wood do you burn in a typical year?
   Large pickup loads _____
   Small pickup loads _____
   Other _____

9. When is most of your wood collected?

   Winter_____ Spring_____ Summer_____ Fall_____

10. How long is your wood stored before burning? ___ months

11. What kind of wood do you burn? _____Hardwood (poplar, birch, cottonwood) ___ Softwood (pine, spruce)

12. If fully loaded, what is the average burn time?
_____ Hours per load
Does it burn through the night? yes____ no____
Sometimes_____

13. What is the square footage of area heated by wood?

Less than 1000 sq. ft._____ 1000-1500 sq. ft._____
1500-2000 sq. ft._____ Don't know_____

14. Is your house well insulated? yes____ no____
Recently upgraded? yes____ no____
Does it need to be? yes____ no____

15. Do you burn anything other than wood in your stove, i.e. garbage, newspaper? yes____ no____

16. Do you ever notice a wood smoke smell in your neighborhood? yes____ no____
How often do you smell smoke?
Sometimes ____ Always ____ Never ____

17. Does smelling the smoke affect you? yes____ no____
How? _____

_____

18. Do you think wood smoke in the Valley is a health problem? yes_____ no____

19. Do you think anything should be done about it?
yes____ no____

20. What could be done? _____
_____
_____

Comments: _____
_____
_____
_____

Interviewer: _____

Person interviewed: Male _____
Female _____

Age: 15-20_____ 20-40____ 40-60____ 60+_____

APPENDIX II

QUESTIONNAIRE RESPONSES

Note: On some completed questionnaires, no answer was recorded for certain questions. When deriving percentages, these questionnaires were not included in the total for that question because it was not clear whether the respondent had no opinion, or did not know, or whether the question had not been asked.

Some questions were asked only if the answer to the previous question was Yes (for example, see Question 2). In these cases, percentages given were derived from the number of respondents who answered the previous question. Such questions are clearly marked, both in the question heading and in the answer totals.

1. Do you have a woodstove?

	In Smithers		In rural area	
Yes	260	32%	83	77%
No	561	68%	25	23%
Total	821	100%	108	100%

2. (If yes) Is wood your main source of heat?

	In Smithers		In rural area	
Yes	81	10%	51	47%
No	179	22%	32	30%
Total	260	32%	83	77%

2a. (If yes) Do you have a back-up heat source?

	In Smithers		In rural area	
Yes	71	8.6%	40	37%
No	2	0.2%	11	10%
no answer	*8*	*1.0%*	-	-
Total	81	10%	51	47%

2b. What type?

Wood as main heat source:

	In Smithers		In rural area	
Gas	21	31%	-	-
Oil	10	15%	16	40%
Electric	36	53%	24	60%
Propane	1	1%	-	-
Total	68	100%	40	100%
no answer	*13*		*11*	

Wood as supplementary heat source:

	In Smithers		In rural area	
Gas	112	67%	-	-
Oil	16	9%	11	39%
Electric	40	24%	14	50%
Propane	-	-	2	7%
Solar	-	-	1	4%
Total	168	100%	28	100%
no answer	*11*		*4*	

3. What make and model of stove is it?

	In Smithers
RSF (model unknown)	64
RSF Ardent	2
RSF Aurora	3
RSF Princess	1
RSF 600	1
RSF 90	1
RSF 80	2
RSF 75	1
RSF 65	11
RSF 45	1
Total RSF	*86*
Fisher (model unknown)	44
Fisher Grandpa	3
Fisher Papa	3
Fisher Mama	4
Fisher Baby	1
Total Fisher	*55*
Blaze King	12
Jotul	8
Valley Comfort	5
Kozi	5
Earth Stove	4
Franklin	4
Osborne	4
Enterprise	4
"Cookstove"	3
Kent	2
Hevac	2
Fire Chief	2
Ashley	2
Bunns	1
Tarme	1
Energy King	1

Free Heat Machine	1
Polar Therme	1
Aromatic	1
Morso	1
Clear Jewel	1
Kingsmen	1
Wood Chief	1
Dorwood	1
Sears Parlour	1
Camp	1
Lopi	1
Harbour	1
McClary	1
Lakewood	1
Candar	1
Acorn	1
Woodsmen	1
Homemade	1
Unknown	38
Total other	*116*

4. Is your stove regulated by a thermostat?

	In Smithers				In rural area			
	primary stoves		supplementary stoves		primary stoves		supplementary stoves	
Yes	29	37%	38	22%	33	66%	13	41%
No	50	63%	132	78%	17	34%	19	59%
Total	79	100%	170	100%	50	100%	32	100%
no answer	*2*		*9*		*1*		-	

5. Is your stove CSA or ULC approved?

	In Smithers				In rural area			
	primary stoves		supplementary stoves		primary stoves		supplementary stoves	
Yes	68	87%	136	83%	39	85%	31	97%
No	-	-	2	1%	-	-	-	-
Don't know	10	13%	26	16%	7	15%	1	3%
Total	78	100%	164	100%	46	100%	32	100%
no answer	*3*		*15*		*5*		-	

6. During the winter, how often is your stove used?

	In Smithers				In rural area			
	primary stoves		supplementary stoves		primary stoves		supplementary stoves	
Every day	74	94%	58	34%	48	98%	20	63%
1-2/week	3	4%	49	28%	1	2%	9	28%
Once in a while	2	2%	60	35%	-	-	3	9%
Hardly ever	-	-	6	3%	-	-	-	-
Total	79	100%	173	100%	49	100%	32	100%
no answer	*2*		*6*		*2*		-	

7. How many months do you burn wood?

	In Smithers				In rural area			
	primary stoves		supplementary stoves		primary stoves		supplementary stoves	
9 - 12	5	6%	3	2%	5	10%	1	3%
7 - 8.5	8	10%	6	4%	11	22%	3	9%
5 - 6.5	50	65%	68	44%	28	56%	12	38%
3 - 4.5	14	18%	46	30%	3	6%	11	34%
<3	-	-	30	20%	3	6%	5	16%
Total	77	100%	153	100%	50	100%	32	100%
Average	5.99 mo.		4.49 mo.		6.33 mo.		4.75 mo.	
no answer	*4*		*26*		*1*		-	

8. How much wood do you burn in a typical year?[1]

	In Smithers				In rural area			
	primary stoves		supplementary stoves		primary stoves		supplementary stoves	
<7	6	10%	4	4%	8	22%	3	12%
5 - 6.9	14	23%	11	10%	10	27%	4	16%
3 - 4.9	26	43%	32	28%	15	41%	9	36%
1 - 2.9	14	23%	46	41%	4	11%	8	32%
<1	1	1%	20	18%	-	-	1	4%
Total	61	100%	83	100%	37	100%	25	100%
Average	4.22 cords		2.64 cords		5.42 cords		3.88 cords	
no answer	*20*		*96*		*14*		*7*	

[1] large pickup load = 0.66 cords
small pickup load = 0.33 cords
logging truck load = 12 cords

9. When is most of your wood collected?

	In Smithers				In rural area			
	primary stoves		supplementary stoves		primary stoves		supplementary stoves	
Spring	6	8%	8	6%	2	5%	4	15%
Summer	16	21%	31	22%	11	25%	8	30%
Fall	42	54%	80	56%	23	52%	9	33%
Winter	10	13%	15	11%	3	7%	6	22%
All year	4	5%	8	6%	5	11%	-	-
Total	78	100%	142	100%	44	100%	27	100%
no answer	*3*		*37*		*7*		*5*	

10. How long is your wood stored before burning?

	In Smithers				In rural area			
	primary stoves		supplementary stoves		primary stoves		supplementary stoves	
>24	7	10%	17	13%	7	17%	5	18%
12 - 23	15	22%	39	29%	8	19%	7	25%
7 - 11	1	2%	3	2%	2	5%	2	7%
5 - 6.5	5	8%	10	8%	2	5%	1	4%
3 - 4.5	5	8%	12	9%	7	17%	6	21%
1 - 2.5	27	40%	33	24%	11	26%	6	21%
<1	2	3%	5	4%	2	5%	1	4%
"dry"[2]	5	8%	14	11%	3	7%	-	-
Total	67	100%	133	100%	42	100%	28	100%
Average	7.39 mo.		10.57 mo.		10.01 mo.		9.36 mo.	
no answer	*14*		*46*		*9*		*4*	

months	primary stoves (total)		supplementary stoves (total)	
>12	37	34%	68	43%
3.5 - 11	16	15%	25	16%
<3	48	44%	53	33%
"dry"	8	7%	14	9%

[2] respondent answered "dry when collected" -- no storage time given

11. What kind of wood do you burn?

	In Smithers		In rural area	
	primary stoves	supplementary stoves	primary stoves	supplementary stoves
softwood	52 72%	94 71%	31 66%	22 69%
hardwood	9 13%	16 12%	7 15%	3 9%
both	11 15%	22 17%	9 19%	7 22%
Total	72 100%	132 100%	47 100%	32 100%
no answer	*9*	*47*	*4*	-

12. If fully loaded, what is the average burn time?

	In Smithers		In rural area	
	primary stoves	supplementary stoves	primary stoves	supplementary stoves
<13	8 11%	5 4%	1 2%	1 3%
10 - 12	21 29%	25 18%	11 23%	7 23%
8 - 9.5	22 30%	41 30%	18 38%	8 27%
6 - 7.5	11 15%	21 15%	10 21%	3 10%
4 - 5.5	7 10%	14 10%	5 11%	5 17%
2 - 3.5	2 3%	22 16%	2 4%	3 10%
<2	2 3%	10 7%	- -	3 10%
Total	73 100%	138 100%	47 100%	30 100%
Average	9.11 hrs.	7.19 hrs.	7.95 hrs.	7.13 hrs.
no answer	*8*	*41*	*4*	*2*

hours	primary stoves (total)	supplementary stoves (total)
>13	9 8%	6 4%
8 - 12	72 60%	81 48%
4 - 7.5	33 28%	43 25%
<4	6 5%	38 23%

12a. Does it burn through the night?

	In Smithers		In rural area	
	primary stoves	supplementary stoves	primary stoves	supplementary stoves
Yes	61 81%	81 55%	36 75%	19 73%
Sometimes	4 5%	7 5%	1 2%	- -
No	10 13%	60 41%	11 23%	7 27%
Total	75 100%	148 100%	48 100%	26 100%
no answer	*6*	*31*	*3*	*6*

13. What is the square footage of area heated by wood?

	In Smithers				In rural area			
	primary stoves		supplementary stoves		primary stoves		supplementary stoves	
< 1000	17	23%	42	28%	7	14%	9	28%
1000 - 1500	35	47%	72	49%	18	36%	15	47%
1500 - 2000	14	19%	15	10%	17	34%	2	6%
> 2000	-	-	5	3%	7	14%	4	13%
don't know	9	12%	14	9%	1	2%	2	6%
Total	75	100%	148	100%	50	100%	32	100%
no answer	*6*		*31*		*1*		-	

14. Is your house well insulated?

	In Smithers				In rural area			
	primary stoves		supplementary stoves		primary stoves		supplementary stoves	
Yes	61	80%	136	90%	36	78%	28	90%
No	15	20%	15	10%	10	22%	3	10%
Total	76	100%	151	100%	46	100%	31	100%
no answer	*5*		*28*		*5*		*1*	

15. Do you burn anything other than wood in your stove?

	In Smithers				In rural area			
	primary stoves		supplementary stoves		primary stoves		supplementary stoves	
Yes	8	11%	8	5%	3	6%	2	6%
paper	10	13%	14	9%	6	12%	-	-
No	57	76%	132	86%	41	82%	29	94%
Total	75	100%	154	100%	50	100%	31	100%
no answer	*6*		*25*		*1*		*1*	

16. Do you ever notice a woodsmoke smell in your neighbourhood?

	In Smithers						In rural area					
	primary stoves		supplementary stoves		no stoves		primary stoves		supplementary stoves		no stoves	
Yes	48	61%	126	72%	386	70%	28	56%	19	59%	14	56%
No	31	39%	50	28%	164	30%	22	44%	13	41%	11	44%
Total	79	100%	176	100%	550	100%	50	100%	32	100%	25	100%
no answer	*2*		*3*		*11*		*1*		-		-	

16a. (if yes) How often do you smell smoke?

	In Smithers						In rural area					
	primary stoves		supplementary stoves		no stoves		primary stoves		supplementary stoves		no stoves	
Always	11	14%	30	17%	137	25%	1	2%	1	3%	1	4%
Sometimes	35	43%	92	52%	234	43%	21	42%	14	44%	10	40%
no answer	*2*	*3%*	*4*	*2%*	*15*	*3%*	*6*	*12%*	*4*	*13%*	*3*	*12%*
Total	48	61%	126	72%	386	70%	28	56%	19	59%	14	56%

17. (if yes) Does smelling the smoke affect you?

	In Smithers						In rural area					
	primary stoves		supplementary stoves		no stoves		primary stoves		supplementary stoves		no stoves	
Yes	9	11%	30	17%	136	25%	3	6%	2	6%	1	4%
No	37	46%	92	52%	237	43%	24	48%	15	47%	10	40%
no answer	*2*	*3%*	*4*	*2%*	*13*	*2%*	*1*	*2%*	*2*	*6%*	*3*	*12%*
Total	48	61%	126	72%	386	70%	28	56%	19	59%	14	56%

17a. How?

	In Smithers		
	primary stoves	supplementary stoves	no stoves
Asthma	1	6	33
Respiratory/bronchitis/lungs	-	7	8
Cough/cold/sinus/sneezing	1	3	9
Allergies	-	2	11
Ash/soot	1	-	9
Irritated eyes	-	-	8
Irritated throat	1	-	3
Dirty laundry	-	-	3
Can't open windows	1	1	1
"Like the smell"	-	3	5
"Don't like the smell"	-	6	18

18. Do you think wood smoke in the Valley is a health problem?

	In Smithers						In rural area					
	primary stoves		supplementary stoves		no stoves		primary stoves		supplementary stoves		no stoves	
Yes	35	44%	87	51%	324	61%	21	44%	14	45%	14	58%
No	40	50%	67	39%	166	31%	7	15%	2	6%	1	4%
don't know	5	6%	18	10%	44	8%	20	42%	15	48%	9	38%
Total	80	100%	172	100%	534	100%	48	100%	31	100%	24	100%
no answer	*1*		*7*		*27*		*3*		*1*		*1*	

19. Do you think anything should be done about it?

	In Smithers			In rural area		
	primary stoves	supplementary stoves	no stoves	primary stoves	supplementary stoves	no stoves
Yes	27	67	262	15	9	12
No	10	9	21	2	1	1
don't know	-	5	10	2	-	-
Total	37	81	293	19	10	13

20. What could be done?/Comments

	In Smithers			In rural area		
	primary stoves	supplementary stoves	no stoves	primary stoves	supplementary stoves	no stoves
Regulate mill smoke/ problem comes from mills	8	26	83	11	5	6
Regulate stove burning	7	18	83	2	3	2
Improve stove technology	6	5	37	1	1	2
Convert to other heat sources	5	4	30	3	1	1
Education/better burning	-	9	20	-	2	-
Ban wood burning	2	-	22	-	-	1
Regulate slashburning/ problem comes from slashburns	-	5	9	3	3	4
Problem comes from hospital	1	1	2	1	-	-
Problem comes from other sources	1	1	-	1	1	-
Chimney cleaning/ better stove maintenance	-	1	1	1	-	-
Pinpoint source of smoke	-	2	-	-	-	-
Monitor air pollution	-	-	2	-	-	-
Conduct health study	-	-	1	-	-	-
Tax woodstove owners	-	-	1	-	-	-
System of fines for smoky fires	-	-	1	-	-	-
Better home insulation	-	-	-	1	-	-
Ban garbage burning	-	-	-	1	-	-