

The Domestic Fuelwood Sector in Whangarei and Northland and the Role of Manuka as a Fuelwood and a Forest.

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Executive Summary

This project looked at the sources, types and amount of fuelwood used by householders in Whangarei and Northland. The role of manuka, or ti-tree, was specifically considered in order to estimate the level of scrub clearance necessary to supply the quantities consumed.

Manuka is a popular, hot burning fuelwood. It is also one of the main pioneering natives, being tolerant of a wide range of environmental conditions including nutrient deficiency, drought, waterlogging and soil toxicity and is a frequent and important habitat for the kiwi and is a good nursery for future forests.

The project set out to;

- determine household consumption of fuelwood in Whangarei
- estimate total fuelwood consumption in Northland
- identify the sources of the fuelwood and the varieties and proportions of tree species used.

The Commercial and Urban Surveys conducted provide indicative figures for total volumes consumed and the area of manuka forest that is being cleared to supply the volumes of ti-tree that are being consumed. It is noted that manuka is not necessarily being cleared for fuelwood but is often a by-product of land clearance for other purposes.

An Urban Survey of 440 households showed 51.4% of respondents used fuelwood for heating. The average consumption of fuelwood by users was 3.71 m³, which, if representative, suggests a fuelwood demand for Whangarei of 29,973 m³.

Ti-tree was the most frequently offered fuelwood in Northland, with 42 % of suppliers offering it and accounted for around 35 % of Whangarei's commercial fuelwood supplies. Next most popular were pine, macrocarpa and eucalypt (29-31 %), and then totara (24%), and puriri (16%).

Using a "rule of thumb" for fuelwood growth rates of 20 m³/ha/year, the estimated annual fuelwood consumption by Northlanders, 84,151 m³/year,

would require the sustainable management of around 4,000 hectares of mixed commercial fuelwood plantation and manuka forest.

Actual consumption of ti-tree in Whangarei equates to just under 50 hectares of manuka forest every year and over the region as a whole between 200 and 300 hectares per year of Northland manuka forest are being converted to fuelwood.

Commercial acacia fuelwood plantations have the potential to take the pressure off the manuka resource except that fuelwood is not necessarily the primary reason for manuka being felled.

Areas in which the study could be further developed include; the impact on biodiversity of the loss of manuka forest, fuelwood consumption patterns and habits in rural Northland, extending the Commercial Survey to cover the other non-Whangarei suppliers to more accurately establish volumes of fuelwood going to Auckland and a survey of Auckland fuelwood merchants to cross check amounts of fuelwood coming out of Northland.

Abstract **Tomorrow's Forests - Today's Fuelwood?**

The domestic fuelwood sector of Whangarei is analysed in terms of percentage of households using the resource, quantities consumed, methods of obtaining it, source of fuelwood, species of trees used, and area of land required for supply. A household survey and commercial supplier survey were undertaken and results were extrapolated for the Northland region. Resource management implications are considered in respect of loss of manuka forest.

Keywords: Fuelwood, domestic consumption, supply, land-use, manuka, conservation.

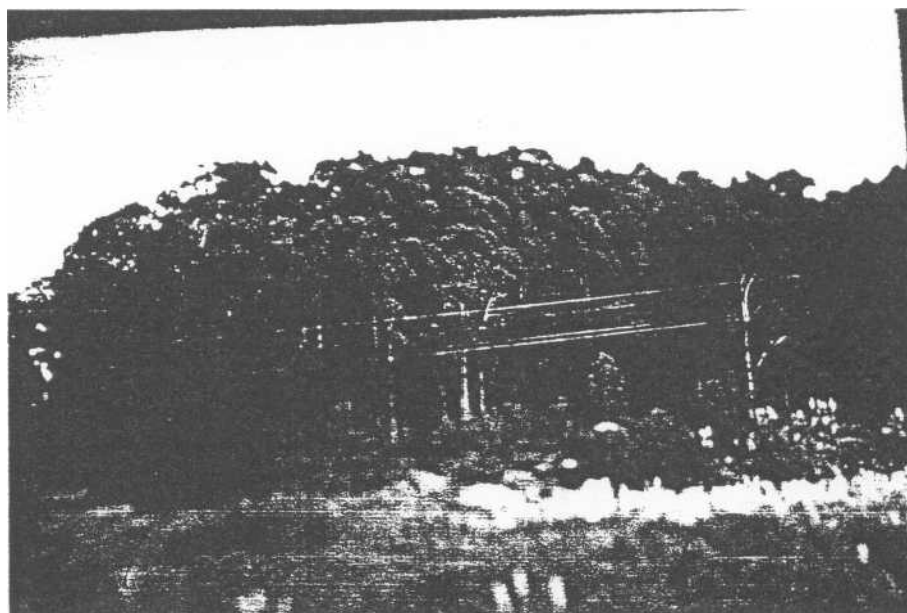


Figure 1 Bush in Northland - Tomorrow's Fuelwood?



Figure 2 Acacia fuelwood - Tomorrow's Fuelwood?

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Tomorrow's Forests - Today's Fuelwood?

The Domestic Fuelwood Sector in Whangarei and Northland and the Role of Manuka as a Fuelwood and a Forest

Introduction

This project looks at the use of fuelwood by householders in Whangarei. The types of fuelwood consumed, the sources of the fuelwood and the amount consumed are considered both on the supply and the demand side. The pattern of fuelwood consumption is considered in respect of location and socio-economic factors. Fuelwood supply is looked at in terms of tree species, volumes and sources. The role of manuka¹, or ti-tree, as a fuelwood is considered, and the level of scrub clearance that is occurring to supply the quantities consumed.

The Fuelwood Context

Fuelwood, humanity's most ancient fuel, has been used for cooking for at least 150,000 years [Smith, 1981]. Most research on fuelwood comes from studies of developing countries [Soussan, 1988], where 40% of total fuel consumption comes from biomass [Smil, 1987] and up to 90 percent of the population rely on fuelwood for heating and cooking [Smith, 1981]. Though fuelwood has been seen as a habit to grow out of as economies develop, it is slowly being seen as having a future as it is a renewable carbon-neutral fuel [Smith, 1981; Soussan, Mercer and O'Keefe, 1992].

New Zealand research into the sources of domestic fuelwood and the environmental implications of its harvesting is rare despite the fact that it provides the primary heating source for nearly half (45.2%) of all New Zealand households. It borders on the informal economy as much fuelwood is collected directly by the consumer especially in rural regions, and many suppliers are only semi-commercial [Chandler Fraser Keating, 1989].

Much of the developed nations interest in fuelwood has been for large scale, high-tech fuel systems [Read, 1991] such as the potential for methanol production [Chandler et al, 1983] and not the domestic sector. Other New Zealand studies have looked at the potential for greater usage of wood wastes [Chandler et al, 1989], increasing the prevalence of woodstoves [Brown, Copeland and Co. Ltd., 1984] and the potential for

¹ Manuka, *Leptospermum scoparium*, and kanuka, *Leptospermum ericoides* are sold as ti-tree throughout Northland and the terms manuka and ti-tree are used interchangeably herein. Generally manuka is used for the standing trees, including kanuka and ti-tree is used when referring to fuelwood.

commercial production of fuelwood in coppices [NZFS, 1986, Hosking, 1982]. There has also been a study in Christchurch in relation to air pollution [Kennedy et al, 1974].

Some overseas studies have addressed the sustainability of the fuelwood sector in a regional context in developed countries, for example in south Norway, [Lumen, 1985] and Australia [Wall and Reid, 1993]. Such studies are increasingly important as the role of fuelwood as a sustainable renewable resource [Fitzsimons, 1985] that can replace fossil fuels and so reduce greenhouse gas emissions is recognised. Though wood may only have the potential to contribute 10% of the total future global energy supply, this would still significantly increase the potential of renewable energy sources [Smith, 1981].

Clearance of scrub, especially manuka, for fuelwood is leading to loss of biodiversity and erosion [Chapple, 1992]. Manuka is a popular, hot burning fuelwood. It is also one of the main pioneering natives, being tolerant of a wide range of environmental conditions including nutrient deficiency, drought, waterlogging and soil toxicity [Cockayne, 1958], is a frequent and important habitat for the kiwi [Ogle, 1982] and is a good nursery for future forests. It plays a significant role in reducing erosion [Bergin, Kimberley and Marden, 1993] but is considered by some to be a major weed [Grant, 1967] which has led to an underestimation of its role in the ecosystem.

Around a quarter of Northland is covered in bush, scrubland and native forests. A further tenth of the land is under commercial exotic forest and this amount is expanding. There are substantial areas of poor quality pasture that are reverting to scrub [DSIR, 1990, MAF, 1991, Page, 1988].

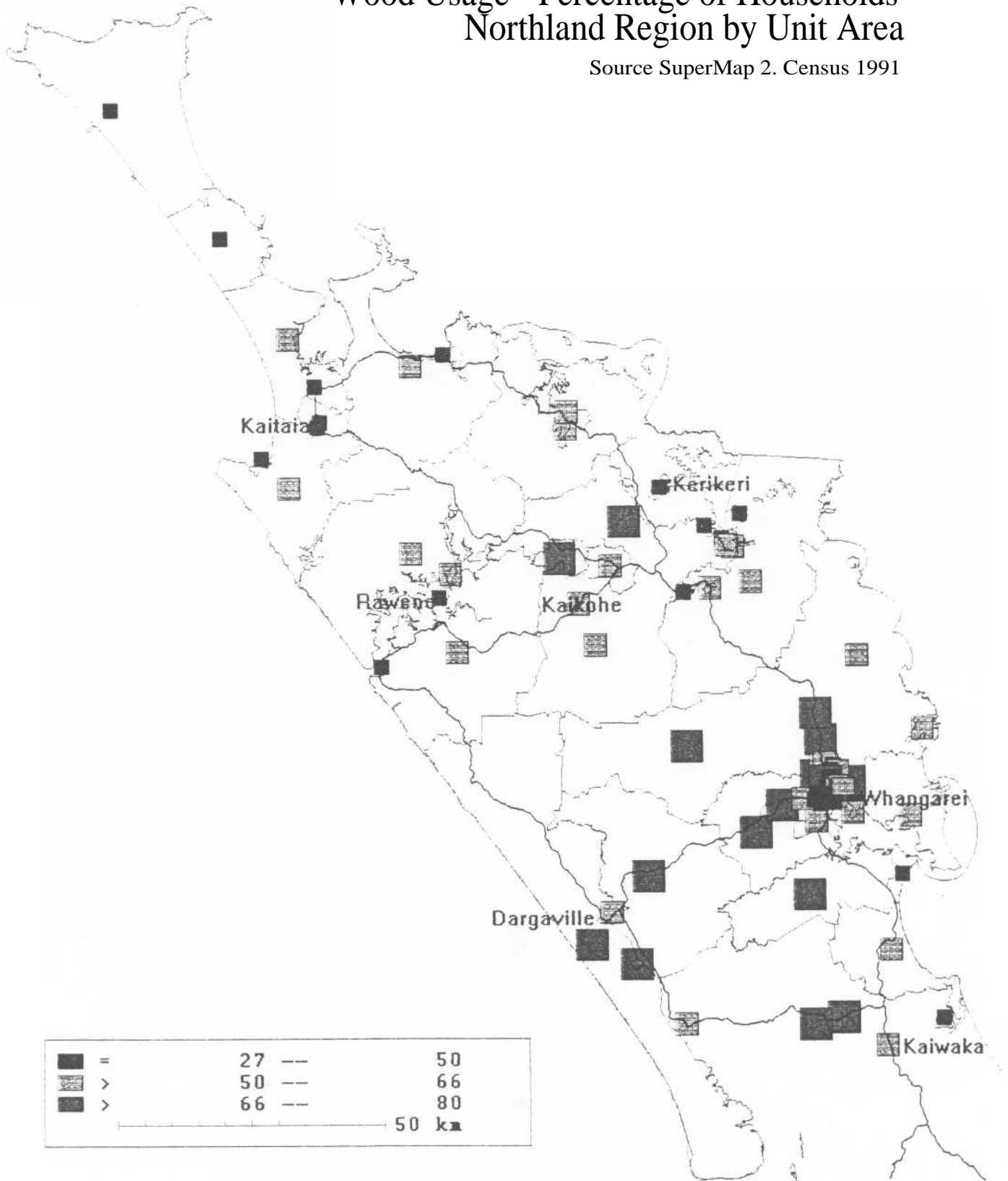
The regions warm climate means homeowners have not invested in efficient woodburners nor in other forms of winter heating to the extent that the rest of the country has. Grouped with Auckland, Waikato and Coromandel, it has slightly below average numbers of fuelwood users (49.9% as opposed to a national figure of 56.8%), but a higher proportion of them use wood as their main source of heat than other regions, 84.1 % as opposed to 79.6%. This gives a figure of 42% of all North North Island (N.N.I.) households relying on wood as their main source of heating. The national figure was 45.2%.

Only 27.7% of N.N.I. domestic fuelwood consumers purchased their fuel, the rest obtained it from free sources - most often their own or others'

Figure 3

Wood Usage - Percentage of Households Northland Region by Unit Area

Source SuperMap 2. Census 1991



properties. The national figure was 36.3% [Chandler et al, 1989] (Refer Appendices).

Regional variation in fuelwood usage patterns can be seen in Figure 3. A decreasing frequency of use from south to north can be observed which may be due to climatic factors, resource availability and socio-economic considerations. There is also a 'cool' region in the centre of Whangarei.

Hypotheses

This research project set out to look at the current patterns of fuelwood consumption in Whangarei and in Northland. It was expected that fuelwood consumption in Whangarei and Northland would be more prevalent than the mega-regional figure in the CFK report (Chandler Fraser Keating, 1989) due to proximity, accessibility and abundance of resource. The CFK region includes the conurbation of Auckland, a city of over a million where fuelwood consumption would be expected to be lower than average due to access, cost and lifestyle.

It was also expected that manuka would be a major fuelwood species and that clearance of manuka forest could be affecting the overall quality of Northland's environment.

Methodology

To establish the above hypotheses the research needed to;

- determine household consumption of fuelwood in Whangarei
- estimate total fuelwood consumption in Northland
- identify the sources of the fuelwood and the varieties and proportions of tree species used

The first phase of this investigation involved three stages. Firstly questions were contributed to the household survey undertaken by the students on the Auckland University Geography fieldtrip for the paper 20.315 in Whangarei, May 1994, to establish the quantity of fuelwood used and the source of the fuel. This survey aimed to conduct a 4% sample of most urban areas, by assigning groups of students to specific areas, with a target number of interviews to conduct. The houses were to be chosen by taking every fourth house in randomly chosen streets in the specified area.

Questions covering the quantity of fuelwood consumption and sources of fuelwood were incorporated in the survey². Those regarding types and proportions of wood burnt and proportions obtained from different sources were not accepted. Some of this information was obtained on the supply side.

Secondly fuelwood suppliers in Northland were identified through local papers, Yellow Pages and noticeboards and a telephone survey of the Whangarei suppliers was undertaken to establish how much they sold, what type of trees were used, what environments the fuelwood came from and whether the fuelwood was used locally or exported to Auckland.

Thirdly people in key institutions were identified and interviewed on the subject of the fuelwood resource, including Department of Conservation, Northland Regional Council, the local branch of Royal Forest and Bird Society and forestry consultants.

The data collected was analysed in conjunction with secondary data obtained from the Department of Statistics 1991 Census and the Chandler Fraser Keating (1989) report on *The Production, Utilisation and Cost of Wood Residues as an Energy Source*.

² The actual questions are included in the Appendices.

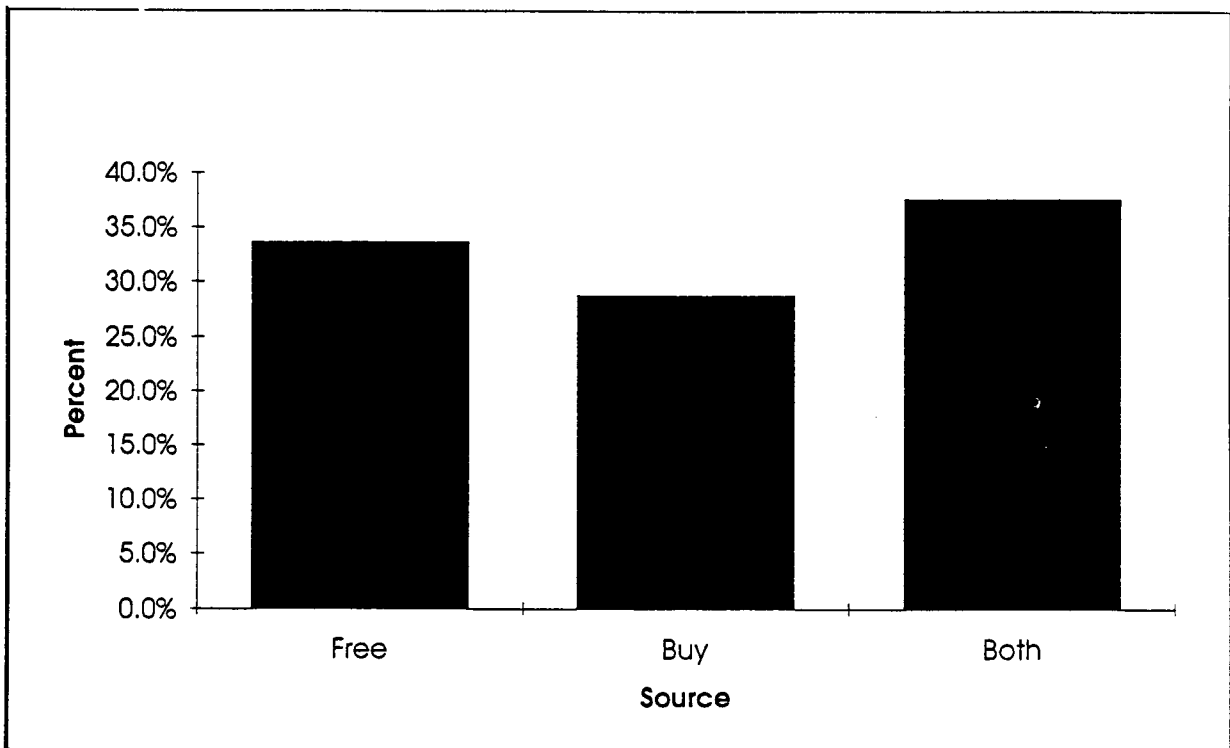
The Urban Survey - Results and Interpretation

The 440 responses gave an aggregate 2.97% sample, though area samples ranged from 4% down to 2%. Some areas, and hence sample sizes were very small making those results unrepresentative.

The Urban Survey showed 226 of the 440 respondent households used fuelwood for heating. This 51.4% compares with 46.5% from the 1991 Census for the same areas, and 49.9% for the North North Island in the Chandler Fraser Keating survey.

Figure 4

**Sources of Fuelwood
for Whangarei Fuelwood Consumers**



Responses were analysed³ by source of fuelwood, see Figure 4, and are included in more detail in the Appendices. Of the 226 fuelwood consumers 28.8% bought all their fuelwood (ALL BUY), 33.6% obtained all their supplies for free (ALL FREE) and the remaining 37.6% bought some and got some free (BOTH). If we allocate⁴ the group BOTH between the other

³ Where more than one source of either bought or free firewood was mentioned, the respondent was allocated proportionately between them [i.e. if a respondent said they bought from merchants and from family then a half was recorded in both categories.

⁴ This allocation method is approximate and arbitrary. It would be preferable to use the proportions of fuelwood obtained from different sources and by tree type as specified by householders, unfortunately these questions were not accepted for the Urban Survey.

two groups according to the ratio ALL BUY : ALL FREE, i.e. 28.8 : 33.6, then we get 46.2% ALL BUY and 53.8% ALL FREE. A total of 66.4% of Whangarei fuelwood consumers bought at least some of their fuelwood. This compares with 27.7% of domestic fuelwood consumers in N.N.I. in the CFK report who purchased their fuel, the rest obtaining it from free sources - most often their own or others' properties. This is a substantial difference and requires some discussion.

The CFK report had 81% of all purchased wood being bought by urban dwellers and if this ratio is indicative of Northland then the proportion buying would be expected to be higher in Whangarei than for the wider region. A variation does exist between urban and rural areas if we compare Census figures for fuelwood users in the Whangarei area covered by the Urban Survey (46.5%) to that of the Northland region excluding the survey area (56.0%).

Also the CFK report makes no mention of consumers who both bought and obtained fuelwood for free and it is thus not clear whether the 27.7% figure is for those who buy all their fuelwood or those who buy at least some.

The average consumption of fuelwood by users was 3.71 m^3 . If this figure is representative then the fuelwood demand of Whangarei is $29,973 \text{ m}^3$ [$3.71 \text{ m}^3 \times 51.4\% \times 15,718$ occupied dwellings]. The national figure from the CFK report was 3.89 m^3 .

If our figure is extrapolated for the whole of Northland then the regional consumption would be $84,151 \text{ m}^3$. This will be an underestimation of the regional figure due to an anticipated higher consumption level in the rural areas. The Census figures quoted above do show a higher proportion of users in the rural environment. Differences between rural and urban, such as the rural population having marginally larger households (2.8 as against 2.7 people per dwelling for Whangarei), fewer alternative fuel options (Whangarei has reticulated gas), greater proximity, abundance and availability of fuelwood in the countryside, and possibly more time spent at home in winters and evenings all suggest that levels of consumption would also be higher.

The spatial pattern of fuelwood consumption by percentage of households in Whangarei from figures in the 1991 Census is shown in Figure 5. While it would be preferable to use the Urban Survey results the

small size of some of the samples would distort the picture as some results of 0% and 100% were obtained. The percentages for both sets of data are shown in the Appendices.

The Urban Survey results were divided into Small, Medium and Large sample groups, and the difference between the Urban Survey and the Census percentages of households consuming fuelwood were divided into Good, Poor and Terrible. The resultant 'table of fit' is shown in Table 1. It quite clearly shows that Large achieved much better fit than did the Medium or Small.

Table 1 Degree of Fit between Urban Survey Data and Census

Degree of Fit	Size of Sample			Total
	Large 40 - 20	Medium 20 - 10	Small 10 - 0	
Good +/- 0-10%	7	6	1	14
Poor +/- 10-20%	2	0	0	2
Terrible +/- >20%	1	4	5	10
Total	10	10	6	26

Figure 5 shows a 'hot' band of fuelwood users around Whangarei, with a much 'cooler' belt running through the middle. This pattern had been anticipated due to the increased proximity of urban fringe dwellers to the fuelwood resource, however it was decided to see if there may be any obvious socio-economic factors at play. A SuperMap image of Median Income for Whangarei (Figure 6) was created and a strong similarity was observed, though in the north of Whangarei, Springs Flat and Hikurangi, fuelwood use increases relative to income and this could be due to the proximity to fuelwood resources. It had been expected that low income families were likely to be frequent users of fuelwood due to the potential to get it for free or through family contacts. Analysis of the volumes of fuelwood consumed by area, as revealed in the Urban Survey, and comparing with income patterns may have verified this, as might an analysis by area of free fuelwood compared to purchased fuelwood. The problem of the small sample sizes for some areas would have to be borne in mind for both of these suggestions.

Figure 5

Fuelwood Consumption Percentage of Households - Whangarei

Source: SuperMap 2, Census 1991

