

## PREFACE

Alaska's forests are one of its most valuable resources. That's why forestry issues have always been important to the state and its residents. However, forest resource use by households has received little attention, though the issue is undoubtedly interesting and important. "The Tanana Valley Forest Use Survey" (TVFUS) was one of the first attempts in Alaska to gather regional information on household forest resource usage.

TVFUS is a collaborative project of the Alaska Department of Natural Resources (DNR), the University of Alaska Fairbanks and the Alaska Boreal Forest Council (ABFC). It was originally designed as a part of a larger project called "Who is Who in the Woods" gathering information about how the forest is used in the Tanana Valley, by whom and for what purposes (Bates 2001). TVFUS was conducted at two different times, the first survey queried individuals about their forest harvest activity from September 1999 to August 2000 and the second survey covered the period from September 2002 to August 2003. The surveys structure and contents were agreed upon and approved by a steering committee of forestry professionals (for more details contact ABFC).

The research presented here is based primarily on the data collected by the TVFUS-2003, since this latter survey was adjusted to provide fuller and more detailed information that may assist further economic and geographical analysis. TVFUS gathers information about forest use on the level of household units. There were 1,000 surveys mailed out initially to a randomly generated non-stratified sample of households in the Tanana Valley (geographical setting of the region is described further). The response rates for the first and second surveys were 54% and 36%, respectively (excluding the number of undeliverable mail which lowered the original sample by 65 households). The fact that the second survey had a lower response rate increases the sampling error. Based on this second survey response rate and assuming the absence of non-response bias, we can make statistical inference about the entire population of the Tanana River Watershed (36,300 households) with a sampling error less than  $\pm 8\%$  at 95% confidence level (the assumption made based on the sampling recommendations of Salant and Dillman, 1994, pg.55).

The structure of the survey was designed to cover all the uses of forest based natural resources in the Tanana Watershed region. The survey was divided into eight parts:

- I. General Uses of Natural Resources;
- II. Fishing;
- III. Harvesting Wood and Timber Resources;
- IV. Gathering non-Wood Resources;
- V. Hunting;
- VI. Trapping;
- VII. Recreation;
- VIII. About You.

In addition to harvest quantities, households were queried about other important aspects of household forest use. In section I, the household respondents were questioned about the reasons for forest resource use and about their residence in the

Tanana Valley. Sections II through VI are split by species and/or resource category and query the respondent about the quantities harvested as well as issues such as season when the effort was undertaken, areas where the harvest was made, total distance traveled and time spent on the activity, how the harvesting location was reached and how the harvest was used. Questions important to estimating minimum replacement value (MRV) for the harvested resources included what, if any, substitutes exist and whether the harvests were less than desired. Other questions on sections II through VI covered household attitudes towards the activity as well as their evaluation of how the particular activities are managed.

The recreational section of the survey asked similar sets of questions for 25+ different recreational activities. In this study, we did not estimate replacement values for recreational activities because of difficulties in evaluating non-utilitarian uses of natural resources.

The last section “About You” addresses certain socio-demographical data. This data is used in the study for regression modeling in Chapter II (for example, variables such as time of Alaska residence, level of education, income, size of household, etc. (a sample of the TV FUS-2003 is provided in Appendix A).

## **Acknowledgments**

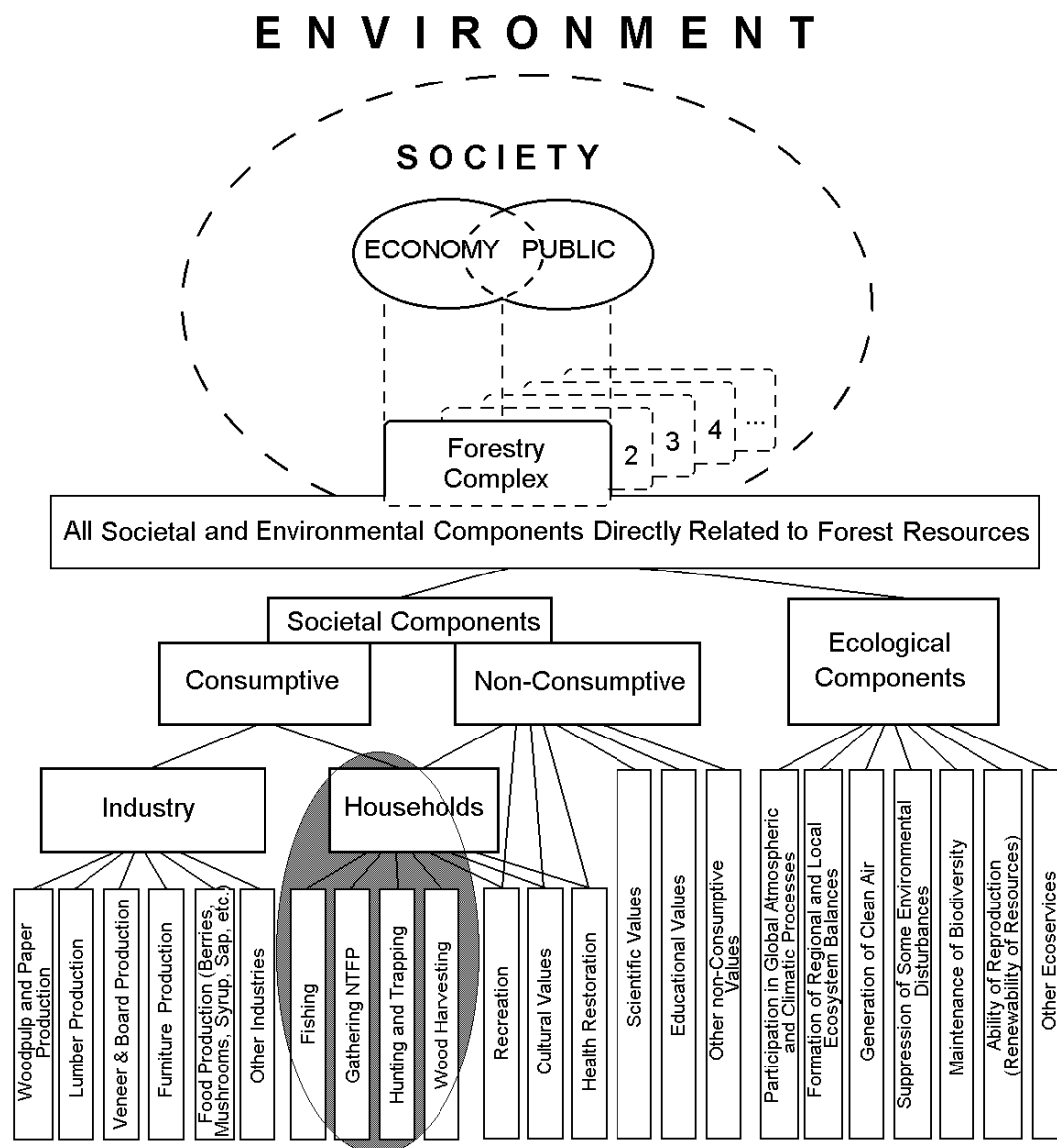
I'd like to express my deep thankfulness to my academic advisor Dr. Joshua Greenberg. His experience and knowledge in the field became a great contribution to this research and to formation of my own professional views. I am really grateful to the staff of the Alaska Boreal Forest Council, in particular to Dr. Janice Dawe and Mr. Scott Bates. Those people inspired me in my work on forestry issues and provided me with the necessary Survey data. One more person I would like to mention gratefully is another member of my advising committee Dr. Douglas Reynolds. His input is also highly appreciated.

Special thanks to my family: my wife Olga, my son Andriy Jr., my mom Maria, my dad Oleksiy, grandpa and brothers. Without them this project wouldn't exist.

## 1.0. Introduction.

### 1.1. Subject and Objectives of the Study.

The subject of this research is the consumption of forest resources by households of the Tanana Valley. It is one of the societal components of the forestry complex of the region. We define the forestry complex as all societal and environmental (ecological) components directly related to forest resources. The relationship of this study to the forestry complex, as well as the position of the forestry complex itself within society, is illustrated in Figure 1. The focus of this study is circled in grey. Dashed rectangular contours labelled 2, 3, 4, ... symbolize other complexes of societal origination. They are based on the issues directly related to other natural resources (groups of natural resources) (Agricultural Complex, Building and Construction, Metallurgical Complex, etc.).



**Figure 1.** Forestry complex and the subject of the study.

The questions of main interest to this study are: How, why and where do Tanana Valley households harvest regional forest resources? Also important are the types of resources harvested, the quantities harvested, and the value of these resources. In order to address these questions the following objectives for this study were determined:

- To reveal factors influencing intensity of Tanana Valley forest use by households and provide a brief analysis of the prominent factors influencing forest use for the region;
- To estimate minimum replacement value for the forest resources harvested in the Tanana Valley by its households in 2002-2003;
- To compare various types of the forest resources in terms of their estimated minimum replacement value;
- To provide better visual representation of the quantities and structure of the harvest within the study region *and* to investigate possible resource allocation rules;
- To find relationships between the intensity of household use of various categories of the Tanana Valley forest resources *and* certain socio-demographic and economic characteristics of the households;
- To prepare research-based conclusions and recommendations that could better inform managerial decision-making process in the Tanana Valley region and contribute to the future academic studies on the Tanana Valley forestry issues.

The study's objectives were discussed at the second Tanana Valley Forest Use Survey steering committee meeting (August 27, 2003, Alaska Boreal Forest Council). They are also consistent with state forest regulations and strategies: Alaska Statute 38.05.112(c) defines the main uses of the forest, according to which the DNR prioritises its forest management policies and planning. Among these priorities are "harvesting of forest products for personal use," "uses of forest lands for non-timber purposes, including: recreation, tourism and related activities, ..., uses of fish and wildlife," etc. (Tanana Valley State Forest Management Plan Revision 2001).

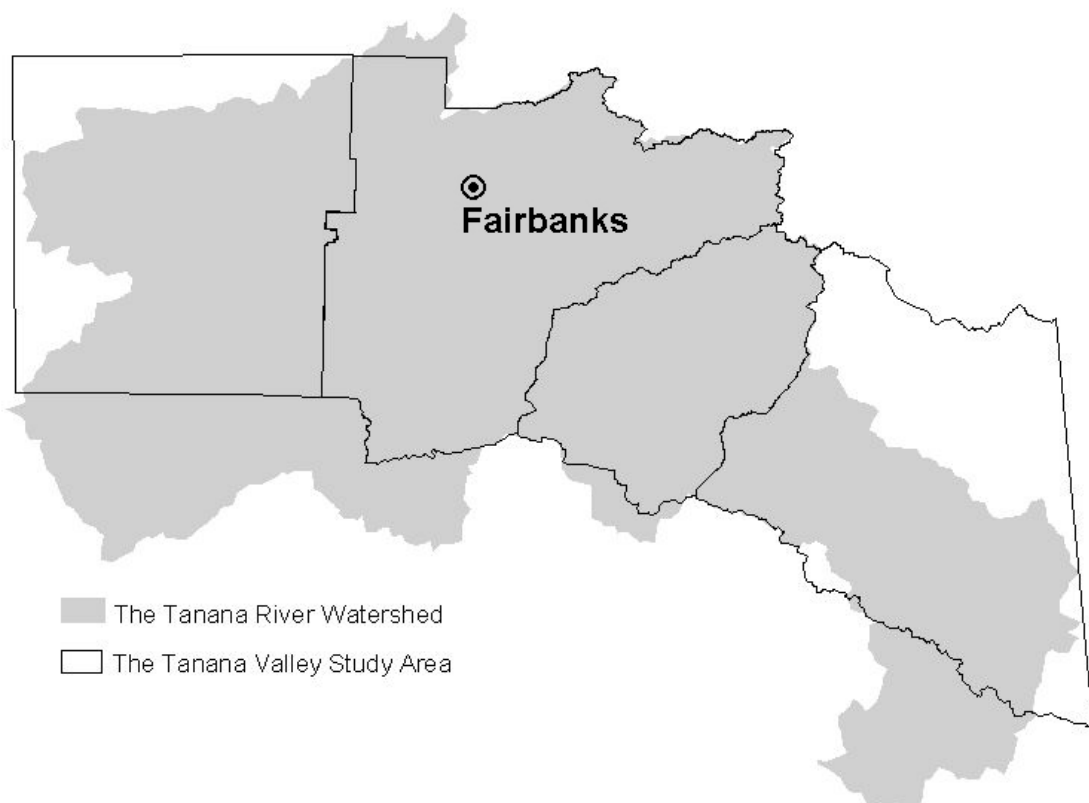
The thoughts and ideas introduced in this project originate from a variety of sources. The study author spent two years interacting with numerous forestry stakeholders and experts through a number of forums. These include the Northern Forest Cooperative Initial Meeting (May 29, 2003, Fairbanks), two annual workshops "Goods from the Woods" (September 27-28, 2003 and September 18-19, 2004, Grand Rapids, MN), international conference "Climate Disturbance Interactions in Boreal Forest Ecosystems" (May 3-6, 2004, Fairbanks), and 2003 and 2004 summer internships with the Alaska Boreal Forest Council.

## **1.2. Geographical Setting**

The study region is the Tanana Valley located in the Alaska interior. This region to a large extent coincides with the geographical boundaries of the Tanana River watershed (Figure 2). The DNR-Division of Forestry defines the Tanana Valley as an area extending from the Alaska Range to the south, to the Tanana River and upper Yukon River divide in the Tanana Yukon Uplands to the north (Crimp et al. 1997).

The Tanana River and its tributaries flow northwest from the Alaska-Canada border to its confluence with the Yukon River at the village of Tanana. General latitude of the Tanana Valley ranges from less than 62° North to slightly more than 65° North; longitude ranges from just east of 141° West (east of the US – Canada border) to 153° West (Kuskokwim Mountains). Land within the Tanana Valley is a part of the westernmost extension of the North American boreal forest ecosystem (Tanana Valley State Forest Management Plan Revision 2001).

The total area of the study region is 115,790 km<sup>2</sup> (28.61 million acres); the area of the Tanana River watershed is 116,361 km<sup>2</sup>. Absolute elevations range from less than 275 feet along the Tanana River below the Kantishna River confluence to over 5,000 feet in the Alaska Range west of the Glenn Highway, south of Tok (Tanana Valley State Forest Management Plan Revision 2001).

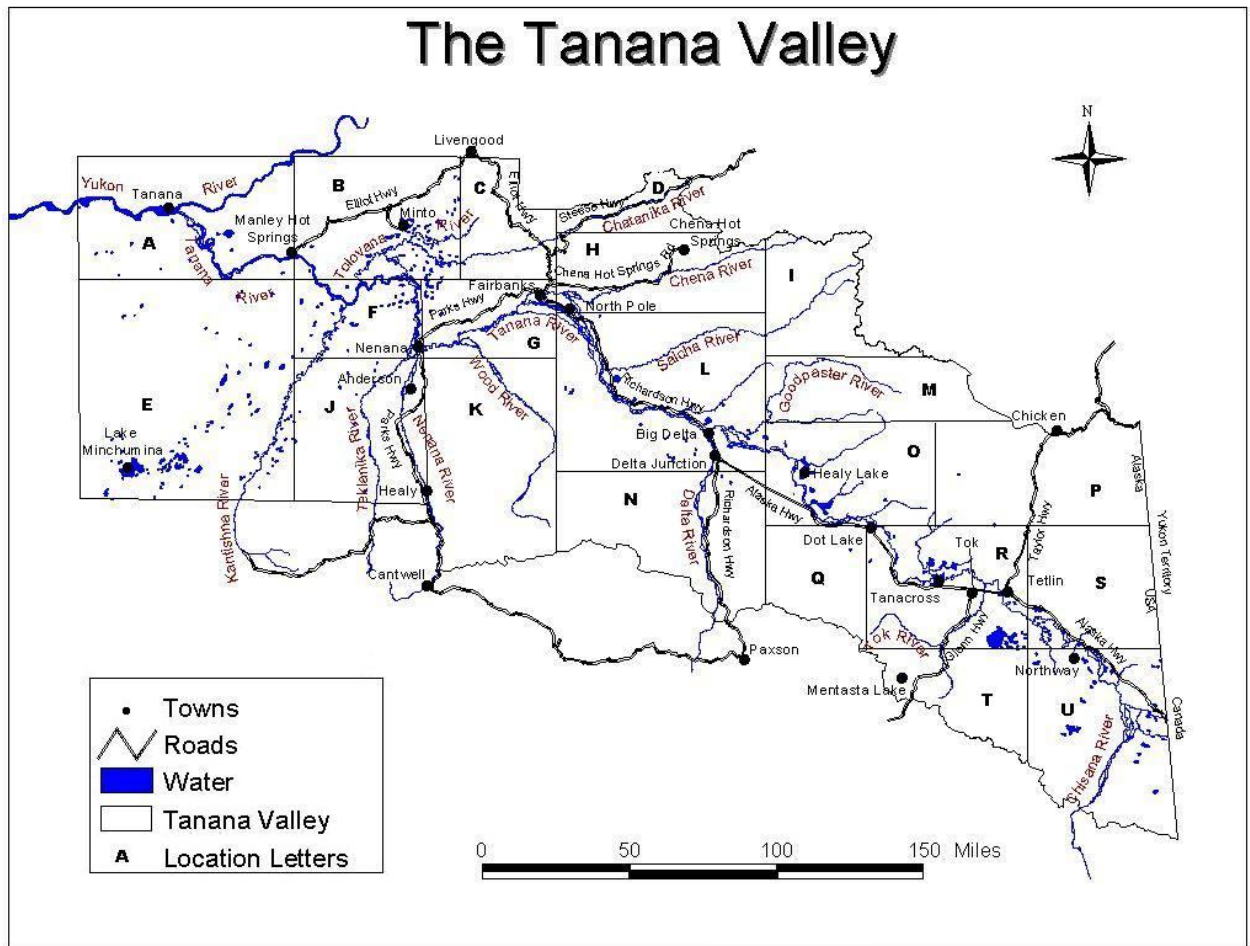


**Figure 2.** The study area and the Tanana River watershed.

Much of the Tanana Basin has never been glaciated and has thick wind or river deposits with silt-rich soils that are relatively productive. Low wet areas and north facing slopes typically have permafrost at shallow depths. South slopes and areas subjected to flooding are permafrost-free or have deep unfrozen soils over permafrost.

The study region includes four forest management areas designated by the DNR-Division of Forestry in Interior Alaska (Figure 2). These are (from west to east) the Kantishna, Fairbanks, Delta and Tok areas. Each area is characterized by a unique

pattern of topography, weather, vegetation and soils. In Figure 3, the region was further broken into 21 areas for more precise identification of the location of the sites where households harvested the forest resources. They are labelled “A” to “U” in the figure.



**Figure 3.** The Tanana Valley study area.

### 1.3. Factors Influencing Regional Forest Resource Use

The quantity of forest resources used by different people depends on a variety of factors. These factors can be divided into two principal categories: factors that determine resource abundance (column “A” in Table 1) and factors that determine the willingness of people to use these resources (column “B” in Table 1). Column “A” is composed mainly of environmental factors outside the direct control of local communities. In contrast, column “B” contains many factors that are more readily coordinated by society (local communities). However, it should be noted that the line between the two categories is somewhat arbitrary since some factors (such as Forest Fires, Pollution) can be partially coordinated.

In Table 1, various factors are further categorized by whether they are internal or external to the region either in origination and/or coordination. It can be noted that in column B, factors specific to state coordination and regulation of forest resources are

represented as internal to the region. This inclusion reflects the fact that Alaska has organized its regulatory and management processes to encourage local input and involvement in natural resource policy determination. Of course, the extent of local involvement varies across natural resource issues and in many cases local entities have little control over state natural resource policies.

This study focuses primarily on Internal Economic and Socio-Political factors that can be influenced locally. Environmental factors listed in column “A” are discussed in more detail in subsection 1.3.1. Socio-political and economic factors (column “B”) are discussed in subsection 1.3.2.

**Table 1.** Factors influencing regional forest resource use.

	A	B	
	Environmental	Economic	Socio-Political
<b>Internal</b> (local origination and/or coordination)	1) Type of Local Ecosystems 2) Hydrological Regime 3) Type of Soils 4) Stand Conditions 5) Biodiversity 6) Elevation 7) Forest Fires 8) Pollution of the Forest	1) Characteristics of Local and State Market (processors and producers, store network, presence of substitutes, etc.) 2) Infrastructure (transportation corridors, recreational, social) 3) State Economic Processes and Regulations (income, subsidies, unemployment, etc.)	1) State Forest Regulations 2) Forest Lands Owners 3) Demographic Characteristics 4) Cultural Lifestyles and Personal Preferences 5) Level of Education 6) Time of Residence
<b>External</b> (out of region origination and/or coordination)	1) Geographical Setting 2) Climate and Weather – Seasonality 3) Global Ecological Interactions and Processes	1) Federal Economic Policies and Regulations 2) Interregional and International Economic Relations	1) Federal Forest Regulation 2) Federal Strategic Priorities 3) International Interactions and non-Economic Cooperation

### 1.3.1. Environmental Setting

The region’s geologic and glacial history has greatly influenced the composition and diversity of the region’s plant communities and, therefore, the type and range of various forest resources available for harvest. Most of the plant species found in the region today are characterized by long-distance dispersal and wind pollination. Most of the Tanana Watershed area is forested. The principal tree species within the forest are Alaskan birch, quaking aspen, balsam poplar, black spruce, white spruce and



tamarack. Almost 7% of the Tanana Valley State Forest is shrubland, chiefly willow (Crimp et al. 1997).

Under natural conditions, widespread disturbances occur from wildland fire, flooding and erosion. Endemic populations of insects occur throughout the forest and local outbreaks occur periodically. On a smaller scale, tree mortality from storms and snowfalls contribute to coarse woody debris in the ecosystem (Tanana Valley State Forest Management Plan Revision 2001).

Annual temperature ranges in the Tanana Valley and upper Yukon Valley are the most extreme in the state. Many of the climatic conditions are detrimental to forest productivity. For example, persistently low summer temperatures can cause decreases in local forest resource availability (such as berries, mushrooms and others). Low temperatures during some periods of the year can also force animals to temporarily migrate from their common feeding areas, which affect hunting and trapping opportunities.

Generally, frost-free days occur from the first part of June to the end of August. Extreme temperatures range from (-65) °F to 99 °F. Average temperature and precipitation records for seven interior Alaska weather stations during the period 1995-2000 are provided in Table 2.

Examination of Table 2 reveals that the lowest average January temperatures occurred at Northway (for both, average maximums and average minimums). The highest January temperatures were observed in Big Delta, with an average maximum Jan. temperature of 3.1°F and average minimum temperature (-11.4)°F.

Summer temperatures have a more direct impact on the abundance of forest resources than winter temperatures, since they occur in the growing season and the principal harvesting season. In general, summer temperatures vary less than those in winter. In July, during the afore mentioned time period, average minimum temperatures ranged from 43.1°F in Tok to 51.8°F in Fairbanks. Average maximum July temperatures ranged from 65.5°F (Northway, Big Delta) to 73.1°F (Circle City).

Another environmental characteristic that is important to the availability, quantity and quality of forest resources is precipitation. A good example of this relationship is provided by the summer of 2004 when record low precipitation and high temperatures led to very poor berry and mushroom production in the Fairbanks area. Normally mean annual total precipitation in Interior Alaska ranges from about 8.2 inches (Circle City) to 11.9 inches (Eagle) (Table 2). Greater precipitation occurs in the summer. For example, July precipitation ranges from 1.24 inches (Circle City) to 2.65 inches (Big Delta). In January precipitation ranges only from 0.27 inches (Northway) to 0.59 inches (Fairbanks).

An important issue to the region that has recently gained increased prominence is that of global climate change. There is a general consensus among scientists that we are experiencing a period of global climate change and that circumpolar regions are particularly vulnerable. (MacDonald et al.1990, Chapin et al. 2001, Hardy 2003, Kondrat'ev et al. 2003). Since the 1950s, average annual temperature in Alaska increased 4°F (2°C); the greatest warming, about 7°F (4°C), occurred in Interior

Alaska in the winter. The growing season in the state has lengthened by more than 14 days since the 1950s. Furthermore, it is expected that any global climatic changes will have larger effect on the boreal forests, such as the Tanana Valley State Forest, than on temperate forests to the south (Tanana Valley State Forest Management Plan Revision 2001).

**Table 2.** Interior Alaska weather station climate temperature summary, 1995-2000.\*

<b>Weather Station</b>	<b>Average Max Temp (°F)</b>	<b>Average Min Temp (°F)</b>	<b>Average Total Precipitation (inches)</b>	<b>Average Total Snow Fall (inches)</b>	<b>Average Snow Depth (inches)</b>
<b><u>Fairbanks</u></b>					
January	-1.5	-19.3	0.59	10.8	18.0
July	72.5	51.8	1.79	0.0	0.0
Annual	36.7	16.7	10.46	68.2	8.0
<b><u>Nenana</u></b>					
January	-0.4	-19.0	0.54	7.9	19.0
July	70.7	47.6	2.16	0.0	0.0
Annual	35.6	14.3	10.80	45.6	8.0
<b><u>Tok</u></b>					
January	-7.4	-25.8	0.31	4.4	14.0
July	72.9	43.1	1.98	0.0	0.0
Annual	35.8	10.5	8.91	33.2	6.0
<b><u>Northway</u></b>					
January	-10.8	-27.5	0.27	5.4	15.0
July	69.5	48.1	2.37	0.0	0.0
Annual	32.8	11.4	9.44	36.9	6.0
<b><u>Big Delta</u></b>					
January	3.1	-11.4	0.34	5.6	8.0
July	69.5	50.5	2.65	0.0	0.0
Annual	36.7	19.1	11.64	43.8	4.0
<b><u>Circle City</u></b>					
January	-9.2	-25.0	0.47	6.5	17.0
July	73.1	49.6	1.24	0.0	0.0
Annual	31.4	9.8	8.16	46.6	8.0
<b><u>Eagle</u></b>					
January	-4.5	-22.4	0.51	6.9	17.0
July	79.9	46.9	2.16	0.0	0.0
Annual	35.8	12.7	11.86	55.4	8.0

\* Source: Western Regional Climate Center, Reno, Nevada: Alaska Climate Summaries.

\*\* Taken from Vogt (2002).

Potential climate change impacts to Interior Alaska include a change in plant community composition and animal habitat, including an expansion of more productive forest into cooler and wetter sites. Other predicted outcomes of climate change are permafrost thawing, an increase in wildfire occurrence and insect and disease problems (Tanana Valley State Forest Management Plan Revision 2001).

### 1.3.2. Socio-Economic Determinants

Human disturbance in the Tanana Valley increased because of logging and human-caused fires. Human presence expanded to this region during the gold rush from 1900 to 1940 (Tanana Valley State Forest Management Plan Revision 2001). Present forest conditions reflect the history of both natural and human-caused disturbances. In combination, they produced the mosaic of vegetation types that are characteristic of the Tanana Valley and support its native plants and animals (Tanana Valley State Forest Management Plan Revision 2001).

Land in the Tanana Valley is owned by the state (about 70%), the federal government, native village and regional native corporations (11.4%), the Fairbanks North Star Borough (0.5%), and private owners (over 1.4%). Review of the preceding statistics reveals several singular characteristics that are true of Alaska in general; government owns the vast majority of the land, regional native corporations own a significant percentage of land in the state, and other private ownership accounts for a very small percentage of total land ownership. An examination of land ownership patterns in the Tanana Valley reveals a mosaic of managing entities comprised of various state and federal agencies, as well as regional native corporations and other private land owners, who manage forest resources within their properties according to jurisdiction and hierarchical subordination.

One of the most important socio-economic factors determining forest resource use in the region is the extent of transportation system development. The transportation system, as used here, includes transportation infrastructure (transportation network coverage, at-the-road services – gas stations, cafes, etc.) and transport vehicles themselves, which represent available modes of transportation. The modes of transportation have become quite advanced and more readily available to the local population. Powerful and maneuverable ATVs, snow machines, boats, and airplanes are affordable to many people and make even places remote from the road system accessible. Transportation infrastructure plays an important role as well. The most popular forest sites in the Tanana Valley are characterized by good road (trail) accessibility and the availability of support services.

The Tanana Valley region can be rated as “poor” in terms of transportation infrastructure development, particularly in comparison to the contiguous United States. While many parts of the region are connected to the highway network, secondary connecting road systems are virtually absent, leaving many parts of the region road inaccessible. The highway network is comprised of the Richardson Hwy, Parks Hwy, Alaska Hwy, Steese Hwy, Elliot Hwy, Glenn Hwy, Taylor Hwy and Chena Hot Springs Rd. The least accessible areas by surface transportation are the far western part of the region ( areas “A” and “E” in Figure 3) and the north-eastern areas (areas “I” and “M” in Figure 3). The best developed areas in terms of road accessibility and transport services is the Fairbanks North Star Borough and adjacent areas (areas “G”, “C”, “L”, “J” on Figure 3).

Recreational and social infrastructure are mostly developed within the region in densely populated areas or areas with high attendance. It is tightly correlated with the level of transportation system development and is determined by the latter.

Employment status is also a significant socio-economic factor that generally affects forest resource use. The relationship between intensity of forest resource use and employment status is not straightforward. On one hand, we may expect greater forest resource use as unemployment rises and people supplement their incomes with forest resources and also as they have greater “free time.” On the other hand, forest resource harvest can be a capital-intensive exercise that requires significant cash investment. Further complicating the relationship between employment status and resource harvest is the prominence of subsistence hunting and gathering in many of the regional communities. Subsistence activities make a major contribution to the local economies, yet participation in these activities is not considered employment according to federal and state definitions, since they occur outside the formal cash economy. In general the relationship between employment status and forest resource harvest, would have to be examined on a resource-by-resource basis and also by specific locality.

The annual average unemployment rate in the Tanana Valley region ranged from 6.9% (Fairbanks North Star Borough) to 12.6% (Southeast Fairbanks Census Area) in 2003. There are also noticeable changes in unemployment rates seasonally, related to the intensification of activities in the summertime (inflow of tourists, increase of fire fighting jobs, construction, etc.). For example, in 2004 from January to July the unemployment rate decreased in the Fairbanks North Star Borough from 8.0% to 5.3%, in the Denali Borough from 18.6% to 1.7%, and in Southeast Fairbanks Census Area from 17.8% to 8.7%.

A variety of demographic characteristics may also influence forest resource use. Notable among these characteristics are the number of residents, density and distribution of population within the region, and number of people/children per household.

The 2003 population of the Tanana Valley region was approximately 89,627 (including military and university students). Most residents (91.3%) live within Fairbanks North Star Borough (Appendix B). The largest cities and communities in the region are Fairbanks (including College and Ester), Eielson AFB, Deltana, North Pole, Tok, Delta Junction, each of which has a population in excess of one thousand. Fairbanks, North Pole and immediately adjacent areas account for the vast majority of the Tanana Valley population. The number of households in the region is about 36,300 (derived using Name and Address Database of Alaska Permanent Fund Dividend Division). The average household size is 2.5 people.

Cultural and personal lifestyles and preferences are also a major issue when considering the forest resource use by households. The United States is very diversified in terms of races, ethnicities, cultural specificities and personal lifestyles. Alaska is also characterized by diverse cultures and lifestyles. The majority of people are white (about 78% in Interior and about 70% in Alaska). Alaska Natives and American Indians are the largest minority group (about 7% in Fairbanks NSB, 12.7% in southeast Fairbanks area, 15.6% in Alaska) (see Appendix C, Table 2). Foreign-born persons comprise almost 6% of the Alaskan population. 14.3% of the population speak a language other than English in their homes (Appendix C, Table 1).

Diversified socio-demographical characteristics of the population find their reflection in the different motives people have toward forest resource use. This is also true of lifestyle choices. As consequence, forest resource use in terms of time committed to resources harvest, quantities harvested and the composition of harvested resources differ greatly both across demographic groups and even within given demographic groups. One example, based on the author's personal familiarity and experience, is ethnic post-soviet groups that reside in the communities of Big Delta and Delta Junction. These groups are, in general, utilitarian in their use of forest resources.

There were a variety of motivations for forest resource use among households reported in the TVFUS. These motivations are presented in Table 3.

**Table 3.** Motivation for different forest resources use by surveyed households of the Tanana Valley

	<b>Harvesting these products is important for ...</b>					
	<b>... Food Production</b>		<b>... Recreation</b>		<b>... Supplement Income</b>	
	<i># of households</i>	<i>% of respondents</i>	<i># of households</i>	<i>% of respondents</i>	<i># of households</i>	<i>% of respondents</i>
<b>Fishing</b>	91	28.3	165	51.4	19	5.9
<b>Harvesting Wood Products</b>	24	7.5	69	21.5	37	11.5
<b>Gathering non-Wood Products</b>	95	29.6	133	41.4	21	6.5
<b>Hunting</b>	100	31.2	114	35.5	37	11.5
<b>Trapping</b>	11	3.4	28	8.7	14	4.4

Survey respondents were asked whether various forest resource-harvesting activities were important to their household. The most common important reason respondents provided across forest resources was recreation. Recreation was particularly prominent for fishing and gathering non-wood products. Food production was also a prominent motive, particularly in hunting, fishing and gathering non-wood products. Supplementing income was most commonly listed as an important motive for harvesting wood products and trapping (since people trap mostly to sell pelts and harvest wood in order not to purchase the corresponding materials).

The information collected from the TVFUS provides insight into the participation rates for different forest resource use activities. The percentage of household respondents reporting any fishing effort in the Tanana Valley in September 2002 through August 2003 is approximately 29%. For this same time period, the percentage of respondents reporting harvesting wood items, gathering non wood products, hunting and trapping is 33%, 46%, 23%, and 4%, respectively.