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TANANA BASIN AREA PLAN

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Tanana Basin area plan.
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PHASE I
RESOURCE INVENTORY
August, 1983

FORESTRY ELEMENT

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STATE OF ALASKA
Department of Natural Resources
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FORESTRY
EXECUTIVE SUMMARY

The Tanana Basin includes 21 million acres of land along the Tanana River stretching from the Canadian border on the east to the Yukon River on the northwest. As shown in Figure 1, it includes the most populated area of Alaska's Interior. The area which this plan addresses includes all state selected, tentatively approved and patented land within the Tanana Basin Boundary (exclusive of those areas which have had area plans completed or which do not have state in-holdings.)

1. Sawtimber

The analysis presented here indicates that there are an estimated 1.4 million acres of commercial forest land in the Basin exclusive of the cross-hatched areas shown in Figure 1. Of this, an estimated 431 thousand acres are accessible. The accessible allowable cut in the Basin on state-owned land is estimated to be 28 million board feet of sawtimber.

In contrast, the current demand for both seasoned and green lumber and houselogs is estimated to be 24 million board feet within the Basin. This is expected to increase to 36 million board feet by the end of the century. It is not known how much of this demand is for green lumber and houselogs, which at the current time are the only products available, but it is unlikely that the area would become totally self-sufficient in sawtimber due to some consumer preferences for imported lumber.

This analysis indicates that the current net benefits of sawtimber harvesting on state land in the Tanana Basin are approximately $730,000 per year, or $20 per acre. Lumber and houselog production also generate approximately $3.9 million in income effects and about 115 jobs and have a positive fiscal effect to the local government.

2. Fuelwood

The estimated supply of firewood is 164,000 cords per year. However, since only a small area on either side of the roads is actually accessible for fuelwood harvesting, it is likely that the supply is inadequate to meet the projected year 2000 demand of approximately 63,000 cords per year unless new areas become accessible for fuelwood harvesting.

The net benefits of fuelwood harvesting on state land total about $1.1 million per year, or about $65 per acre. Fuelwood harvesting generates roughly $90,000 in income effects and has a small positive employment effect.

Chapter 1

Introduction

Introduction

This report completes Phase I of the Alaska State Department of Natural Resources Tanana Basin Area planning process. The report inventories and analyzes background information on forestry in the Basin and will serve as the basis for the continuing phases of the planning process.

Phase II will begin in February 1983 and was completed by July 1983. It developed and evaluated a set of alternative scenarios for the management of state land in the Basin. Phase III will result in a Draft Final Plan to be completed by December 1983. The Final Plan will allocate state owned land in the Basin to different uses and will provide management guidelines for each use or combination of uses.

The information in this report is part of a resource inventory of seven resources including fish and game, agriculture, forestry, minerals, outdoor recreation, settlement (land disposals) and water. The information included in this report was gathered by the Tanana Basin Area Planning staff of the DNR Division of Research and Development and the DNR Division of Forestry. People who participated in the production of this report include Susan Todd (Project Manager, Tanana Basin Area Plan); Steve Clautice (Assistant District Forester, DNR Division of Forestry); Dan Wieczorek (Timber Management Officer); and Delores O'Mara (Natural Resource Officer).

There are seven chapters in this report. Following the introduction, the second chapter presents major issues about forestry and land management. The third analyzes the demand for forest products and the fourth discusses the location of forests and estimates the volume of timber available. The fifth chapter examines the benefits and costs of forestry in the Basin and the sixth compares demand and supply. Finally, the seventh chapter makes recommendations concerning state land allocations which would be preferable from an forestry standpoint.

Chapter 2

Issues and Local Preferences

ISSUES CONCERNING STATE LAND MANAGEMENT

I. Introduction

Issues and local preferences are important pieces of information which must be incorporated into the planning process. Issues concerning the use of a specific resource provide a focus and framework for the planning process; local preferences show how the public feels these issues should be resolved. In this section of this report, issues and local preferences are documented for incorporation in the planning process through the work of the Planning Team Members.

The issues identified in this chapter were collected and summarized from three sources. The statewide plan was the first source used. The Alaska Statewide Plan was done by DNR to inventory the reosurces and concerns surrounding state lands in Alaska. The issues included the statewide plan were identified by the division or agency within the state responsible for managing a specific resource.

The Tanana Basin Plan sketch elements were a second source used to identify issues. The sketch elements were developed in 1981 to provide a starting point for the Tanana Basin Area plan. The issues from the sketch element are more tailored to the Tanana Basin than the issues in the statewide plan. The issues identified in the sketch elements were based on conversations with agencies, resource experts and public interest groups.

The public meetings that were held in the Tanana Basin during the spring of 1982 was the third source of issues used for this chapter. Planning team members, after reading the comments from the public meetings developed a series of issues concerning the resource they represent.

Local preferences about how these issues should be addressed were determined from various sources. One of the sources which will be used in the planning process for developing local preferences is a series of community originated land use plans. Several communities are currently working on proposed plans for state land in their area; others have already submitted proposals to DNR. These local land use plans provide a clear indication of what a community prefers. This is particularly true when a proposal receives endorsement of village councils, city councils, native corporations, and other interest groups in the area.

The possibility of doing land use plans was mentioned at the public meetings and in a newsletter that was sent to all communities. Only a few of the communities, however, have decided to submit proposals. Most of these proposals will not be completed until February, but some have been on file with the State Department of Natural Resources and are included in this report.

The Tanana Basin Public Meetings are the other source of information on local preferences. Public meetings were held in all communities in the Basin in the spring of 1982 to discuss the Tanana Basin Area Plan. The notes from these meetings were then given to members of the planning team who then developed the summaries included here. The summaries represent the planning team members' understanding of how residents want state land in their area managed for a specific resource.

ISSUES CONCERNING FORESTRY

The following issues concerning forestry were drawn from the public meetings, sketch elements and interviews with agency representatives:

ISSUE 1. The amount of state land classified and managed primarily for forestry.

ISSUE 2. Cooperative forest management.

ISSUE 3. The use of forest resources on agricultural land.

ISSUE 4. Development of transportation to forest lands.

ISSUE 5. The level of fire protection to be given to different forest areas.

ISSUE 6. The effects of land disposals on forestry.

ISSUE 7. The effect of agriculture on forestry.

ISSUE 8. The effects of mineral exploration and development on forestry.

ISSUE 9. The effects of land classified for habitat on forestry.

ISSUE 10. The effects of recreation activities and classifications on forestry.

ISSUE 11. The effects of forestry on land disposals.

ISSUE 12. The effects of forestry on mineral development.

ISSUE 13. The effects of forestry on fish and game resources.

ISSUE 14. The effects of forestry on recreation.

ISSUE 15. The effects of forestry on agriculture.

LOCAL PREFERENCES - FORESTRY

The following comments summarize forestry concerns expressed at a series of public meetings on the Tanana Basin Area Plan held in spring of 1982. Comments are transcriptions from the meetings.

ANDERSON **5 persons in attendance**

It's too much hassle to get houselogs permits.

It is important to have timber near remote disposals.

We don't have enough woodcutting areas. 75% of the houses here burn 10 cords/per year.

Disposals eliminate woodcutting areas.

This area could support a sawmill if the trees were for sale.

CANTWELL **6 persons in attendance**

We need to drive 25-30 miles for fuel wood.

I would not like to see state forest land. These forests are not of commercial quality.

There should be an option to harvest timber but state forests aren't necessary to allow this option. There will be enough land leftover that isn't disposed of that can be used for forestry.

People, mostly from McKinley, keep coming to Ahtna asking to cut firewood. Let them go to state land. Tell them to cut BLM and state land.

I would like to see more money for management in forestry and range management.

DELTA **9 persons in attendance**

Timber appropriate for lumber, and commercial value needs to be sold.

Inventory - There is some discrepancy between what forestry and timber operators think are commercial stands. Some people bought timber based on Division of Forestry forecasts but the buyers were misled; they couldn't recoup their expenses. Other stands the Division of Forestry says are "commercial stands" never are bought. Buyers couldn't harvest the timber".

DELTA (cont)

If timber on land disposals isn't sawtimber, let parcel owner use the resource for posts, and firewood, as they wish.

Firewood is largely used as heating supplement in Delta. I'd say much more than 10% burn wood ONLY. But 90% probably have standby.

Firewood is becoming less available in the area.

The wood supply fluctuates. Some people advertise and let people cut on their land.

Some people are going 30-40 miles away to get firewood, but most people don't go that far.

DOT LAKE **6 persons in attendance**

Forestry and habitat play hand and hand with subsistence. All three of these can be compatible.

HEALY **5 persons in attendance**

Comments from the Healy meeting did not include forestry concerns.

LAKE MINCHUMINA **18 persons in attendance**

Since 1979, the Association members have been much concerned that the forest classification, which we need to protect noncommercial woodlot use by local residents, has not yet been approved. We are hereby urging that the areas thus marked on the enclosed map receive this classification, in order to be assured of a continuing supply of heating and cooking fuel.

Forest and habitat are the key concerns here.

MANLEY HOT SPRINGS **8 persons in attendance**

I personally think it's a good idea of the State Forest Resource Management areas. They will stop disposals and protect trapping.

Firewood is likely to be a problem in the future.

Give preference to small scale forest operators, not large commercial ventures. Firewood should be a consideration. 90% or more of the people here heat with wood.

MANLEY HOT SPRINGS (cont)

Encourage small commercial sawmills that can help provide building materials, firewood and sawlogs for local use.

Make it easy to get through the bureaucracy to get small commercial permit. With one guy in Manley it took so long the guy had to fold. The state shoved him out of business. The state should give people a chance.

Firewood, people cut where they want. It makes a mess of things. It'd be better if they did it in one area, but, you know if there aren't areas designated, well . . . .

Is there a source for getting tree seedlings for private people to use in the area? Get answer from DNR in Fairbanks.

MENTASTA LAKE **5 persons in attendance**

We don't want a sawmill up Bone Creek or Lost Creek. Leave the wood there for firewood. We wouldn't like to see development of a timber industry.

Make forest areas up in the hills from Clearwater.

MINTO **40 persons in attendance**

Forest areas - leave alone.

State is rich enough. Why develop timber and forests. Just leave them.

Don't cut timber. We know where to get wood. No need to set wood areas aside.

I don't have nothing against timber if it's going to keep disposals out of here.

NENANA **26 persons in attendance**

Would like firewood cutting area nearby for long-term.

Use timber cleared off agricultural land.

Would like to see a plywood mill.

State should make forest land available for private use.

NENANA (cont)

Need more access to timber.

Timber sales should be regulated so that individuals can compete with business for personal use timber.

Need more personal use permits for houselogs and fuel wood.

Maintain timber industry jobs.

Fuel wood not a serious problem.

Don't clear cut forest areas.

Encourage tree farming.

Sell timber and utilize forest products on agricultural sales.

Don't classify lands only forest without leaving options open.

No problems with Fahrenkamp's forestry bill.

Local input should be gathered on decisions concerning specific parcels of forest land.

NORTHWAY **27 persons in attendance**

Hang on to land with forest potential.

Woodcutting pushes game out but the game comes back in later years, so it must be okay.

Firewood is a problem. Ninety percent of the people burn wood here and it may become hard to find enough.

Utilize timber where it is close and accessible.

We're getting wood now as close as possible.

TANACROSS **2 persons in attendance**

I haven't got too much against them.

If a big logging mill starts up it depends on how close it is to our land as to how much it will affect us and what we feel about it.

TANANA **5 persons in attendance**

No problem yet getting firewood. Things are not to the point where we see "no trespassing" signs pop up.

I would like the state to lease land if there is enough good timber. One of the ideas we've had is to set up a sawmill here.

How do you get to cut logs for a home on state land? There's no office up here or anything.

We don't have a real problem getting firewood and house logs. We just go get it along the rivers mostly.

A small sawmill could make it out here -- but NO way could a big operation.

State should cooperate with us in leasing wood sales.

We'd like to cut all our own lumber locally. Someone woud start a little mill. We had a request from villages (down river) to sell a bunch of lumber. Also, the city could use only locally cut lumber. Someone's got to try it, someone should set it up; I'm sure they could make it work.

TETLIN **5 persons in attendance**

Forestry might be OK in the area.

Some timber in certain areas is OK.

Good timber areas shouldn't be burned but game areas could be.

Take a little timber.

TOK **12 persons in attendance**

I'd like to see a state forest in the whole area.

Forests are compatible with fish and game. Local mills can get enough timber and still fish and game can be protected.

People are going 30 miles for sawlogs, houselogs and firewood. People need areas identified closer.

Make forested areas forests; don't include little bitty areas, or areas with little trees/black spruce, swamp, muskeg.

TOK (cont)

Don't look only at areas with big trees but also areas with potential for growing and developing stands; spruce, birch, aspen.

The only feasible size for forests in this area are large ones -- so that you have a large enough volume of wood.

Forests lands should allow for multiple use.

Get coordinated with timber and highway departments. Let people utilize timber on new construction sites.

FAIRBANKS - GENERAL **23 persons in attendance**

With people buying land in immediate area and the population increasing, and a continued reliance on firewood I see a real crunch on firewood coming. Also a lot of the good wood lots are being sold to private owners. The State Forest and Resource Management Areas are a good idea, and a step in the right direction to meeting future needs.

Manage forest land on a sustained yield basis. Legislate the areas, don't just classify them. Forest areas need more protection than classification. State Forest Resource Management Areas are far superior to classification.

If it is viable - I support mandatory reforestation. Land shouldn't be let go, and remain unproductive.

Problem I have with reforestation is that all the same size trees grow up with no underbrush, and that isn't good for wildlife.

Sustained yield, has to be done on forest lands.

Consider impact of forest development on fish and game and recreation.

In Fairbanks we are having a real difficult time coming up with firewood. Gas, hydro and electrical power is not that cheap. I think the demand for firewood in Fairbanks will continue in the future. We need lands for that.

We need to ensure a continual supply of fuel wood.

We need to allow for reforestation.

FAIRBANKS - GENERAL (cont)

A forest products based industry is more suitable than many others as far as having a lot of potential in the area. Much of our forest resources are being wasted - as in the agriculture developments.

The forest products industry deserves to get more attention.

Forestry can be compatible with trapping in many cases (as well as other traditional uses such as trails).

We need to determine a priority - export or local use if there is not enough for both.

At least personal uses should be allowed for.

Forestry is a very compatible way of managing other uses and developments, but the Division of Forestry needs a bigger staff to handle any increased activities.

Many of the Native Corporations feel that forestry is a good way to manage their lands but there should be cooperation between Native Corporations and the State for joint sales.

Don't maintain logging roads.

The state should tear up logging roads after area is logged to limit access which affects fish and game.

Logging roads are OK but don't improve them.

Clear cutting shouldn't be allowed.

Replant trees and take care of animals (mink and marten).

Fuel wood should be available near town, a sustained yield.

Use forest lands for sawmill lumber and manage it on a sustained yield basis.

Develop off-site facilities for processing wood.

Use winter roads in forest areas.

Respect trappig rights when logging.

FAIRBANKS - GENERAL (cont)

Heavy timber is not good habitat for fur. Opening it up helps trapping.

We need selective cutting and selective access to heavy timber.

Patch cuts are better for moose.

I support State Forests Resource Management Areas.

No permanent roads or trails should be established for logging without a public hearing.

Don't use area for agriculture once trees are cut down. Reseed with seedlings.

FAIRBANKS - FORESTRY **11 persons in attendance**

Comments from public meeting on Forestry held at the Department of Natural Resources, Fairbanks on April 29, 1982, in connection with the Tanana Basin Area Plan.

You must define agriculture.

The state sells agricultural land and then tells you must cut the trees. I could have a good wood lot if they would let me. If farming won't be feasible for five years, might as well use the agricultural disposal as a woodlot in the meantime.

Clearing the land also costs too much to do it all at once. It's a waste to cut wood when it's growing beautifully.

Whatever land is feasible for a woodlot you should have the right to leave it in wood lot. I'm a farmer, but I need wood, too.

This way of managing a farm for both agricultural and woodlots would make the farm more profitable. The demand for firewood off private land is very high and farmers could meet this off their wood lots and it would be profitable. Why isn't raising trees considered an agricultural use? More people will be wanting to raise Christmas trees, fuelwood, and saw timber on their land as the price of these increases.

Don't give just agricultural rights - we need the right to buy and sell the land fee simple title.

FAIRBANKS - FORESTRY (cont)

I'd like to see spots of native grass in the Interior left for grazing through our forestry department. We can work out a multiple use deal between forestry and grazing.

Some forest practices are good for some wildlife and bad for others. This should be studied before forest management practices are determined for an area. Are fish affected by forest logging in the interior? I think its a problem on the whole, except the Upper Chena perhaps.

There has been little active role on the part of forestry to manage for recreation in forests. I think this would be advisable in a forest management plan for picnics and campgrounds. This would be active management for multiple use.

The forest should be managed basically for the primary use. It isn't necessary to actively manage for secondary use.

If there's a fire or whatever, it is hard to handle if you have recreationists in there.

It isn't as important how it's classified but how it's managed. If you just put a line around an area, you'll go just to primary uses - we need more multiple use areas.

If you want more than one use, you should reorganize state government to do it.

Land and agriculture disposals are the only two uses which are incompatible with other uses. I'd like to see the disposals clustered near roads and settlements and not out in remote areas. State forests allow for the most uses hunting, trapping, fishing and timber cutting.

Farmers agree - they'd rather have farms near roads. The reason farms are located farther away is population density. As Fairbanks grows, it's necessary to go farther and farther. You should let a guy have 40 acres for forestry. There should be areas set aside for woodcutting.

Recreation areas should be left close to the road. Small areas close to town should be primary uses, but large areas far from town should be multiple use and allow other purposes.

Chena recreation area should be open for other uses besides just recreation. The forest division should have a hand in managing it for logging, trapping, etc. We don't want to see intensively developed recreational areas. I don't like to see big trees going to waste.

Birch trees go to waste in a lot of areas out Chena Hot Springs Road. We do not manage these now. Parks won't even allow you to remove these, but they need to be removed selectively.

If you're going to mine in forest areas, you should harvest the area first - then there won't be a problem.

A disposal could be used as a tree farm.

Fish and game should be secondary to forestry.

It's possible to have it both ways - in some areas, forestry could be secondary to fish and game, in other areas it should be the other way around.

Let the farmer manage part of his land for forestry.

If the state wanted someone to get into the private forestry business, they should allow someone to develop 180 acreas or more for forest land. Lots of farmers in this area would like the timber rights in addition to agriculture rights.

If you let the small guy develop 40 acres for forestry, it would be much more efficient timber production than large forest industries.

We have a forest industry staring us in the face and nobodies doing anything about it. They want industry, but they can't see that forestry would be the answer.

All the other uses should be allowed on private forest such as trapping, etc.

Maybe the state should consider some sort of leasing program for forest development.

Forests should be managed for local use only because there isn't enough for both local and export.

We don't even have a kiln here to dry wood and we don't nearly meet local demand and this is because the state stops the small guy from getting into business. Meanwhile, the trees are rotting in the woods.

Leasing forest land would be horrible. The bank would never give you a loan for that.

I disagree. Anyone can get a load on leased land.

Private ownership leads to loss of many uses due to trespassing. Leasing could maintain land in forest production.

If the best use is to subdivide, great, so be it. Don't we trust private enterprise?

I endorse the idea that private ownership is a bad thing in remote areas. If 40 acre tracts were leased, people wouldn't manage for forestry after all. I'm not anti-development or anti-agricultures, but I think those ought to be concentrated. How else are we going to pay all these bureaucrats?

I'd rather see the state manage the timber, but if they do sell it, I'd rather see small woodcutters own it.

Exports should be emphasized for state balance of payments, but I't rather see the local people get their wood first.

I'd like to see natural fires burn unless there's commercial timber in the area. If there's only a few cabins out there, let them burn.

Do away with remote parcels and fire won't be a problem.

Let people take care of themselves. If a fire comes - he takes his chances.

I wouldn't want a subdivision in forest areas because the services aren't there that people are looking for. Don't put a large number of houses in a good forest area.

Utilize forests even around disposals.

Let private enterprise develop subdivisions and roads.

FAIRBANKS - FORESTRY (cont)

Logging roads should be closed to other uses until the logging is done.

After the plan is prepared, the Commissioner should appoint a Citizen's Advisory Council to ensure implementation.

Chapter 3

Demand for the Resource

Introduction

This chapter discusses the current production and consumption of wood products in the Tanana Basin and forecasts the demand for these products to the year 2000. It is based primarily on the Forestry Paper prepared for the Interior Transportation Study (Todd, 1982).

PART I

CURRENT PRODUCTION AND CONSUMPTION OF WOOD IN THE INTERIOR

Currently, timber is used to produce a wide variety of wood products in the Tanana Basin. The major products in terms of volume are lumber, houselogs, and fuelwood. Other products, such as hardwood lumber for furniture, paneling, and many crafts, are produced on a smaller scale. Roundlogs and cants have been produced for export in the past few years from Fairbanks and Nenana, but no long-term export agreements have been signed.

I. Lumber and Houselogs

A. CURRENT PRODUCTION OF LUMBER AND HOUSELOGS

Eight commercial sawmills are currently operating in the study area. These are located in Nenana, Tok, Delta Junction, Manley Hot Springs, and Fairbanks (where there are four sawmill operations). There is also a privately-owned mill in Tanana.

In those villages in the Doyon region which do not have a sawmill, TCC provides a portable mill for short-term use. Four sawmills are operated on this basis in the region. Since Tanana Chiefs instituted the program in 1975, interest in sawmilling has increased dramatically and the number of village owned mills in the Doyon region has doubled. The director of the Tanana Chiefs program expects that each Native village in the Basin will have at least one sawmill by 1985.

Estimated average production of the principal sawmills in the Tanana Basin is shown in Table 3.1

Table 3.1
Estimated Average Production of Sawmills in the Tanana Basin[1]
(Thousand Board Feet)

	MBF	Employment in Mill and Logging Person years[2]
Delta Junction	300	5
Fairbanks		
Northland	3,000	30
Four-Star	1,000	12
Gustafson		5
Olson		4
Hall	500	4
Eberhardt		1
Polan		3
Chena Hot Springs		1
Fairbanks Subtotal	4,800	65
Manley Hot Springs	15	2
Nenana	200	4
Tanana	30	1
Tok	200	4
Total	5,245	76

[1]These figures were provided from interviews with local suppliers. Round logs are not included in the calculations.

[2]Many of these jobs may actually be seasonal.

Source: Todd, S. 1982 Demand and Supply of Forest Products in the Interior. (Interior Transportation Study).

B. CURRENT CONSUMPTION OF LUMBER AND HOUSELOGS

Due to the lack of data, total consumption can only be approximated for the study area. Therefore, per capita consumption estimates were used to derive an estimate of total demand.

In 1971, the U.S. Forest Service estimated national per capita consumption of lumber to be 189 board feet (USFS, 1971). This study also indicated that the long term trend in per capita consumption had declined fairly steadily since World War II. Factors involved in this decline included the increase in substitutes such as plywood and aluminum sheathing and the change in lifestyle from single family homes to apartments.

In Alaska's Interior, the per capita consumption of lumber and houselogs is likely to be higher than the national average for three reasons: 1) fewer substitutes are available; 2) single family homes remain by far the most common; and 3) a large portion of homes, especially in the villages, are log houses which require higher volumes of wood than frame houses of the same size (excluding plywood).

As a result, the per capita consumption of lumber and houselogs in the Basin was estimated to be substantially higher than the national average. These consumption figures were based on the estimated current consumption in Delta, Tok and Fairbanks. The local suppliers in Tok and Delta estimated total consumption for those areas at 500thousand board feet. In Fairbanks, several suppliers were interviewed. Their estimates for total Fairbanks consumption (excluding trans-shipments) varied from 20 to 25 million board feet per year, thus bringing the per capita consumption estimate to about 400 board feet per year.

This per capita estimate was used to approximate the consumption of lumber and houselogs in the study region. The results shown in Table 3.2 indicate that current consumption in the study area is in the range of 24 million board feet, most of it in the Fairbanks North Star Borough. Almost 25 percent of this consumption is now produced locally, while the rest is imported from Canada and the Pacific Northwest. These figures do not include plywood consumption.

The estimates of current annual consumption represent average levels. For each village, they will vary substantially from year to year depending upon the number of houses constructed. Therefore, these figures should be used as the average over several years or in the aggregate for the study area.

C. POTENTIAL MARKET AREAS FOR LUMBER AND HOUSELOGS

There are three potential markets for lumber, timbers, and houselogs from the Tanana Basin. First, there is a substantial local demand which could absorb much more local production than is currently available. Second, there may be a market outside the region in the villages of

Table 3.2
Estimated Annual Consumption of Lumber and Houselogs in the Tanana Basin
(both Locally-Produced and Imported) in Thousand Board Feet Rounded to Nearest 5 MBF

Community	Estimated Consumption
Anderson	205
Cantwell	40
Delta Junction/Ft Greely/Delta	1,145
Delta Junction/Delta	490
Dot Lake	25
Fairbanks North Star Borough	21,595
Healy	160
Lake Minchumina	10
Livengood	5
Manley Hot Springs	30
Mentasta Lake	25
Minto	60
Nabesna/Northway	75
Nenana	190
Tetlin	45
Tanacross	45
Tanana	155
Tok	235
Total	24,540

Source: Todd, 1982.

the Yukon and Kuskokwim deltas where timber supplies are scarce. Third, there is a market for local wood products in oil, mining, and agricultural developments both within the region and on the North Slope and western coast of Alaska. The Anchorage area is also a potential market.

The local market has the greatest potential for growth. There is at present more demand for rough, green lumber than local producers can supply. In addition, a large market for surfaced and seasoned spruce continues to expand and may be captured by local producers if an assured source of timber is available.

Currently, most of the locally milled material is sold rough-surfaced and green. There are only a few planers being used and a small amount of their output is air-dried. If dried long enough, air-dried material can achieve the same quality and moisture content as kiln-dried lumber. However, much of the lumber produced locally is not dried long enough, particularly when the weather is cold or humid. Despite this variation in quality, local suppliers are able to sell all they can produce.

According to local suppliers, over half (or more than 10 million board feet) of the lumber and houselogs used in the Fairbanks market is spruce. There is also a large market in Anchorage where suppliers estimate that 40% of all lumber and houselogs sold are spruce. This represents a dramatic change from the recent past when Douglas fir was the preferred building material. Spruce is usually less expensive than fir and, though not as strong, it is easy to work with and is a very acceptable substitute for most purposes.

Large amounts of Canadian spruce are currently supplied to Alaskan markets for two reasons. First, there are inadequate timber supplies for local producers to meet the demand for spruce. Second, for some uses, lumber must be dried to a specified moisture content, which is controlled easily in a kiln. Since locally produced, air-dried lumber is not graded for quality control, graded kiln dried spruce is obtained from Canada. If local lumber were graded, there would be considerable potential for producers in the Basin to capture part of this expanding market.

In addition to the local market for spruce, there may be a market for interior lumber and houselogs in the villages of the Yukon delta. This area has little or no forest resources and the more than 5,000 residents rely on imports for most of their building needs. If low-cost transport rates were available, a major market could develop for lumber and houselogs produced on the upper Kuskokwim, middle Yukon, and the Nenana areas. This market could absorb more than 1.5 million board feet per year if the residents have similar per capita consumption rates.

Finally, a market exists for timbers and some lumber in developments such as the North Slope oil fields and mining ventures. Two to three million board feet of large timbers are shipped to the North Slope by truck from Fairbanks and many miners also obtain their timbers from Fairbanks. Any large mining venture would require large volumes of timbers and these would probably be supplied from the Fairbanks-Nenana area.

Agricultural developments may also increase the demand for lumber and fence posts and these materials would probably be supplied from a nearby source such as Delta or Nenana. It should be noted that there are problems in treating spruce with creosote without a pressurized system. Currently such a system is uneconomical in the Interior, but surface treatment of poles and timbers appears to be sufficient for most purposes in this climate. It should also be noted that agricultural development potentially reduces the forest base while increasing the demand for forest products.

In summary, the market for Interior lumber and houselogs is much greater than the current supply. The local market alone could absorb much more locally produced green, air-dried, and graded material and there are also good prospects in the nonforested deltas as well as in large-scale mining and agricultural developments. The limiting factor on production is not the size of the market, but rather the quantity of long-term timber supplies.

D. CURRENT TRANSPORT OF LUMBER AND HOUSELOGS

The transportation of lumber and houselogs is a two-step process. First, the raw material must be taken to the mill. In the Fairbanks area, timber can be trucked from as far away as Delta Junction. Generally, the distance does not exceed 40 miles, however, and the price of stumpage depends principally on the transportation required to convey the logs to the mill. Stumpage in the Delta area may sell for as little as $16 per thousand board feet, while logs near a road in the Fairbanks area may go for over $100 per MBF.

In the Fairbanks region, the logs are trucked to the mills and the finished products are usually trucked to market. Two to three million board feet go by truck to the North Slope each year and an unknown amount of lumber is shipped by barge or by plane to the villages of the interior. Exports to Japan were shipped by rail to tidewater.

In the villages located off the main roads, rivers become the major arteries. Some fuelwood, house logs and saw timber is rafted downriver to the villages. A riverboat is used to guide the raft rather than pull it, and in this way, 40 to 50 logs can be transported. If the logs are used for saw timber, they are debarked first by hand (which is easily done early in the spring) before floating. Peeling the logs helps to prevent silt from becoming embedded beneath the bark and ruining the saw blade. (Silt does penetrate the wood to some extent anyway.) A major supplier in Fairbanks felt however that the silt problem would not prevent him from floating unpeeled logs. He believes that he would use this means of transport if roads were not available.

II. Current Production and Consumption of Fuelwood

In the past, fuelwood was a major source of energy in the Basin and, during the gold rush, the effects of harvesting more than the sustained yield of fuelwood were evident as the forests receded. Fortunately, coal was available from the Healy area to supplement the dwindling supply of fuelwood.

Today people are once again using large quantities of fuelwood as the price of heating oil rises. However, the total volume of fuelwood used is difficult to determine, particularly for the Fairbanks area.

There are two sources of information concerning fuelwood consumption in the Fairbanks area. First, the State Department of Natural Resources provides permits to obtain fuelwood on state land. The number of permits increased 700 percent from 1976 to 1981. During the same period, the population actually decreased by about 5 percent, indicating that many households must have converted to fuelwood.

Records on the amount of fuelwood collected by each permit holder are not available. However, a DNR survey of permit holders indicated that an average of 4 cords were taken. This would indicate that about 12,000 cords were obtained by 3,000 permit holders in 1981 from the state lands alone.

Another survey of fuelwood use indicates that much greater quantities may be utilized in the Fairbanks area. The results of the survey indicate that a total of 69,000 cords are utilized for fuelwood in the Borough and that 25% of the households burn wood (Laroe, 1982). However, this would mean that each of these households use over 20 cords a year, which is extremely high.

For the purposes of this analysis, it was assumed that 30 percent of Borough residents use wood and that they burn 8 cords per year. In fact, many more households may use small amounts of wood in fireplaces or to supplement other fuels, but on the average, this estimate is reasonable. These assumptions indicate that slightly more than 32,000 cords are utililized in the Borough. Some 12,000 to 15,000 cords of this may be obtained from state land while the rest is obtained from private land and discarded lumber.

The use of fuelwood in the other Basin communities depends on the accessibility of the village for imports of alternative fuels. The percentage of fuelwood users in each type of community is based on informal personal interviews. In villages not connected to the road system, it was found that approximately 90 to 100% of the households burn wood. Villages at the ends of the road system which are not mining towns have approximately 70 to 80% of their households burning wood. Mining communities and those connected by minor roads have 50 to 70% of the households burning wood, and in communities with highway access, 10 to 30% of the households burn wood. Those households which use wood are estimated to burn an average of 8 cords per year. The resulting fuelwood consumption estimates are shown in Table 3.3. They are intended to indicate only the order of magnitude of fuelwood use in the Basin.

Future fuelwood consumption depends on a number of factors including: (1) the price of alternative fuels; (2) personal income and population; and (3) the availability of fuelwood.

Coal and heating oil are the principal alternative fuels in the Interior. Coal is relatively inexpensive for communities along the railbelt and if a coal deposit is developed in the Delta area (Jarvis Creek), the communities along the Alaska and Richardson Highways will also have a ready source of coal. Heating oil is now produced in the Fairbanks area, but this has not yet had a major impact on the increasing demand for fuelwood. Other possible alternatives include geothermal energy and biogas generation. Finally, there is potential to use wood in wood gasification or steam generation. Wood gasification is being considered in Eagle and Nulato (outside the Basin) but it is still in an experimental stage.

Table 3.3
Estimated Annual Fuelwood Consumption
(Rounded to Nearest Five Cords)

Community	Fuelwood Use Factor[1]	Cords Used
Anderson	.3	310
Cantwell	.1	20
Delta Junction	.3	735
Dot Lake	.9	120
Fairbanks NSB	0.3	32,390
Healy	.3	240
Lake Minchumina	.9	40
Livengood	.1	5
Manley	.7	115
Mentasta Lake	.9	105
Minto	.8	240
Nebasa/Northway	.9	335
Nenana	.4	375
Tetlin	.9	195
Tanacross	.5	120
Tanana	.9	695
Tok	.4	470
	Total	36,510

[1] Percent of households using wood

Source: Todd, 1982.

Personal income is another factor. If their income allows, people often switch to highly convenient fuels such as heating oil. This is modified to some extent by the value people place on obtaining their own firewood and the aesthetics of a wood fire.

The availability of fuelwood is also a major factor. In the Fairbanks area, the allowable cut on state land may be reached in 1982 if permit holders collect the maximum allowance of 10 cords. However, there is a "break-even" point for each community where the cost of going further to obtain wood equals the cost of an alternative fuel. After this point, people would be expected to convert to the alternative. In the Fairbanks area, many people may convert to coal, despite its relative inconvenience, if wood supplies become more difficult or expensive to obtain. More dunnage (pallets and crates) and discarded construction materials can also be expected to be used as substitutes for cordwood.

Fuelwood is transported principally by truck or raft. In theFairbanks area, logging roads have been constructed by the state at a cost of $8,000 per mile and by the borough at a cost of up to $50,000 per mile for the principal purpose of providing access to fuelwood cutting areas. Much of the fuelwood is hauled at least 40 miles, though some loads have been transported over 100 miles from Delta to North Pole.

III. Cant and Roundlog Export

Currently there are no exports from the region of either cants or roundlogs. Exports from the Basin have occurred only when the demand in Korea and Japan was unusually high, as costal areas of Alaska are more likely to be the major sources of supply under normal demand conditions. Until the spring of 1981, Toghotthele Corporation in Nenana had a contract to export 30 million board feet of round logs to Japan at the rate of 5 million board feet per year. About 15 million board feet were exported before the contract was terminated; the termination due to both a decline in Japan's demand and a dwindling supply of local timber.

In the countries of the Pacific Rim, demand for imported round logs is increasing slowly. Japan is the currently the major market for Alaskan sawtimber, but the demand in Japan is not expected to increase significantly in the foreseeable future. This is due to Japan's policy of increasing reliance on domestic timber production, a decrease in their per capita wood consumption, and a declining housing market (USFS, 1982).

If there are future exports of cants or round logs, their effect on the transportation system would depend on their location. If timber in the Healy Lake area were exported, it would probably be shipped by truck to Anchorage or Valdez. Other areas in the Basin would be more likely to ship by truck to Nenana or Fairbanks and from there by rail to Anchorage.

IV. Hardwood Lumber and Paneling

There are two principal outlets for hardwood lumber in Alaska: Poppert Milling in Wasilla and Mastercraft Kitchens in Anchorage. The owner of Poppert Milling processes a little more than 20 MBF per year of birch and cottonwood. He pays about $150/MBF delivered and has some difficulty obtaining enough timber. He produces hardwood flooring and tongue and groove paneling. He can sell all he produces but has no plans for expansion.

Mastercraft Kitchens in Anchorage processes approximately 290 MBF per year of Alaskan hardwood and spruce. They obtain green hardwood lumber from a nearby sawmill and produce kitchen cabinets, hardwood flooring, and some paneling. They sometimes have difficulty obtaining the raw material. Their principal market is Alaskan homeowners, but they have shipped several loads of birch lumber and cabinets to Washington state. They are not sure how large the Washington market is, but would be interested in expanding if adequate raw materials could be obtained.

Northland Wood in Fairbanks will custom saw birch and cottonwood. A few years ago they sent more than 40 letters and samples to wholesalers in the contiguous U.S. to promote the sale of birch lumber but they did not receive a single reply. They were able to offer a competitive price due to a negotiated freight rate to Seattle on the Alaska Railroad, but even so, the wholesalers were apparently uninterested. This is the only large-scale marketing research which has been done for hardwood products and the results are rather discouraging.

Yellow birch, however, which grows in the upper midwest of the U.S. and makes a very attractive veneer, is becoming difficult to obtain. Therefore, a market may open for paper birch as asubstitute. For the near future however, exports are unlikely to be significant. This analysis will therefore concentrate on the Alaskan market for hardwood lumber, paneling, and cabinets. Northland Wood believes that the Interior market for these products is too small to warrant a large-scale operation, but smaller ones, such as Mr. Poppert's mill, would be conceivable.

V. Prefabricated Housing

Two lumber yards in Fairbanks are importing spruce lumber from Canada and the Pacific Northwest for use in producing prefabricated houses. One lumber yard is just completing a major expansion to increase its capacity to produce the kits. The market for these house kits is principally in the villages along the Yukon. The kits are normally shipped by truck to Nenana and by barge from Nenana to the villages. One supplier shipped 10 houses to villages along the Yukon. He estimated that the total shipped from all prefab suppliers was 40 houses in 1981.

Prefabricated house production has considerable potential. Due to the new availability of loans for nonconforming houses, many more people will be able to finance homes in the villages. Also, the demand for community halls, post offices, schools and other public buildings has increased. One supplier expects his demand to double in 1982 compared to last year. The suppliers also indicated that they would prefer to use local, graded lumber rather than imported material if it were available.

VI. Other Potential Products

There are several other potential products which might be produced in the area. Wood chips, pulp, particle board, and plywood are not considered feasible at this time. (Reid, Collins Alaska, Inc., 1980 a.) Other products such as biogas generation, are still in an experimental stage. Therefore, these products will not be analyzed in detail in this report.

PART II
FORECAST DEMAND FOR WOOD PRODUCTS

I. Forecast Demand for Lumber and Houselogs

The demand for lumber and houselogs depends on many factors. Product prices, the price of substitutes, income, housing starts and interest rates are some of the most significant variables affecting the demand for these products. However, there is very little information available to determine the trend of these factors over time in Interior Alaska. For this reason, the model presented here relies on estimated per capita consumption rates.

As discussed in Part I of this chapter, the per capita consumption of lumber and houselogs in the Interior is estimated to be 400 board feet. During the next few decades this factor will tend to rise with increasing real personal income, but decrease as the number of multiple-family dwellings increases. The net effect of these factors is not expected to be significant and therefore the same per capita consumption factor was used to forecast demand. Population forecasts were obtained from the Socio-economic Paper of the Tanana Basin Area Plan.

The forecasts are shown in Table 3.4. These indicate that demand for lumber and houselogs within the region is likely to increase by over 75% in the next twenty years to a total of over 42 million board feet. Most of this demand will be centered in the Fairbanks North Star Borough.

In addition to the demand within the region, there are also potential markets in the Yukon Delta and the North Slope oil fields. The Delta's 5,200 residents would currently require 1.5 million board feet (2,500 tons) if their consumption rate is similar to that estimated for the Tanana Basin. By the year 2000, this demand will have increased to 2.2 million board feet if the Delta population increases as projected in the Western Arctic Alaska Transportation Study (Louis Berger and Assoc., 1982).

Another major demand center is the North Slope oil field developments, which have been using two to five million board feet of timber per year since 1975. This demand is expected to increase slightly during the Kuparuk oil field development and then level off at 3.5 million board feet per year.

II. Demand for Fuelwood

There is a significant demand for fuelwood in the Interior. Many households depend exclusively on wood, while others use it in combination with other fuels.

As discussed in Part 1 of this chapter, the demand for fuelwood permits from the State Department of Natural Resources has increased dramatically over the past five years in the Fairbanks area. The rest of the region also exhibited large increases in fuelwood consumption.

The large increase was due largely to people converting from oil to wood stoves in response to the large increase in the price of oil. Now that oil prices have stabilized a bit and the price of fuelwood is rising, some people may convert to coal, but this is not expected to have a significant effect on total fuelwood demand because many consumers find coal very inconvenient to use. Therefore, the demand for fuelwood is expected to stabilize over the next several years. Consequently, the "fuelwood use factors" discussed in Part 1 are expected to remain relatively constant.

The expected demand for fuelwood is shown in Table 3.5. Population forecasts were obtained from the Socio-economic Forecasts of Tanana Basin Area Plan and an average household of four was assumed. It was also assumed that 8 cords per year were used per household.

III. Demand and Supply of Cants and Roundlogs from the Interior

Japan has been the major market for cants and roundlogs from the Interior. This market has been very volatile, however, leading to a rather erratic pattern of exports from the railbelt area.

In the future, Japan is not expected to be importing significant quantities from the study region on a steady basis. From records of Alaska's exports to Japan, it appears that Japanese demand peaked in 1973 and has slowly declined since (USDA Forest Service, 1982). The Japanese policy of increased self-sufficiency in timber supplies and the growing popularity of multiple-family dwellings in Japan indicate that this trend will continue.

Other Pacific rim countries such as Korea and Mainland China may take up some of the gap left by Japan's declining demand. However, this is not expected to result in a steady flow of timber from the basin. Shipments of as much as 8,500

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tons per year (over 5 million board feet) can be expected in certain periods, but are not likely to last more than a few years. For this reason, no major new transport corridors would be warranted and most of the production would be confined to the railbelt area.

IV. Other Potential Products

Wood gasification and hardwood lumber are two potential products which may come on line during the forecast period. However, these products are not expected to utilize significant quantities of wood relative to sawtimber and fuelwood requirements and are therefore not analyzed in detail.

Other products, such as particle board, wood chips, etc. have been analyzed several times for their viability in the Interior. These are unlikely to be feasible within the forecast period (Reid, Collins, Alaska, Inc. 1981).

Table 3.4
Forecast Demand for Lumber and Houselogs in the Tanana Basin
(In thousand board feet, rounded to nearest 5 MBF)

Community	Year 1980	1985	1990	1995	2000
Anderson	205	240	280	305	340
Cantwell	40	45	55	65	75
Delta Jct/Ft. Greely/Delta	1,145	1,295	1,465	1,630	1,770
Delta Jct/Delta	490	625	780	925	1,045
Dot Lake	25	30	35	40	45
Fairbanks North Star Borough	21,595	26,600	29,760	33,080	36,560
Healy	160	205	275	380	540
Lake Minchumina	10	15	20	35	40
Livengood	5	10	10	15	15
Manley Hot Springs	30	50	60	75	80
Mentasta Lake	25	25	25	25	25
Minto	60	60	65	65	65
Northway	75	90	100	115	130
Nenana	190	240	300	355	400
Tetlin	45	45	45	50	50
Tanacross	45	55	60	60	70
Tanana	155	160	165	165	170
Tok	235	320	460	600	695
Subtotal	24,540	30,105	33,960	37,985	42,115
North Slope Oil Fields	4,000	3,500	3,500	3,500	3,500
Yukon Delta Communities	1,500	1,675	1,850	2,025	2,200
Total	30,040	35,280	39,310	43,510	47,815

Source: Todd, 1982.

Table 3.5
Forecast Annual Fuelwood Demand
(Rounded to Nearest 5 Cords)

Community	(% of households using wood)	Year 1980	1985	1990	1995	2000
Anderson	30	310	360	415	460	505
Cantwell	10	20	25	30	35	40
Delta Jct/Delta[1]	30	735	935	1,170	1,385	1,570
Dot Lake	90	120	140	160	185	205
Fairbanks N.S. Borough	30	32,390	39,900	44,640	49,620	54,840
Healy	30	240	310	415	570	810
Lake Minchumina	90	40	65	100	150	190
Livengood	10	5	5	5	5	5
Manley Hot Springs	70	115	170	210	260	285
Mentasta Lake	90	105	110	110	115	115
Minto	80	240	250	255	260	270
Northway	90	335	400	460	520	575
Nenana	40	375	480	600	710	805
Tetlin	90	195	200	205	215	225
Tanacross	50	120	135	150	155	170
Tanana	90	695	715	735	750	770
Tok	40	470	705	920	1,200	1,395
Total		36,510	44,905	50,580	56,595	62,775

[1] Ft Greely was excluded as it is not expected to utilize significant quantities of fuelwood.

Source: Todd, 1982.

Chapter 4

Supply of the Resource

I. Introduction

This chapter discusses the supply of timber in the Basin. The chapter is divided into two subsections--the first is "Physical Capability" and the second is "Suitability". Physical capability concerns the supply of the resource without reference to ownership, access, or land use policies. It represents the ability of the land to "produce" a particular resource.

Suitability refines this capability by taking such things as land ownership, accessibility/economic feasibility, and minimum parcel size into account.

PART I. PHYSICAL CAPABILITY

I. CRITERIA USED TO PRODUCE THE MAPS OF PHYSICAL CAPABILITY

The maps showing lands of high, medium and low value for sawtimber and fuelwood were based on a vegetation map of the Tanana Basin. The vegetation map used was produced by Ray Kreig and Associates under contract to the Division of Geological and Geophysical Surveys in the fall of 1982. The vegetation map is based on information avaivalble to date. The different sources used to produce this vegetation map are as follows:

- Viereck, L.A., Dyrness, C.T., and Batten, A.R., 1982, Preliminary Classification System for Vegetation in Alaska, 64 p.
- Vegetation maps and reports.
- U.S.G.S. 1:250,000 topographic quadrangle.
- LANDSAT imagery.
- Aerial photography.

For a detailed discussion of the method used to integrate this information, refer to Appendix 4A and to the Susitna River Basin Automated Geographic Information System; Land Capability and Suitability Analysis, published by Environmental Systems Research Institute in 1981. This document explains how maps were developed for the Susitna River Basin, and the process used to produce the vegetation map for the Tanana Basin was the same.

The basic vegetation map identifies coniferous, deciduous, mixed forests and scrub vegetation. Each of these categories is subdivided to indicate whether the trees are tall, intermediate or dwarf, and whether the vegetation makes a closed or open canopy cover. Also included in the map are areas that are primarily one type of vegetation (50-75%) but also have 25 to 49% of the area covered with a secondary type of vegetation.

Before the vegetation map is of use in the planning process, these various vegetation types contained in the map legend must be categorized as to their value for firewood or sawtimber. This was done by both Division of Forestry and Resource Allocation Section personnel.

The rankings of primary and primary-plus-secondary vegetation types are shown in Tables 3-1 and 3-2 for sawtimber and fuelwood, respectively.

Table 4-1

Criteria for Sawtimber when both Primary and Secondary Vegetation are Present

Primary Veg. Type	SECONDARY VEGETATION TYPE							
	Conifer Tall	Conifer Inter-mediate	Mixed Tall	Deciduous Tall	Deciduous Inter-mediate	Regrowth Cutting/ Areas	Conifer Dwarf	Scrub
Conifer Tall Closed	H	H	H	H	H	H	M	M
Conifer Tall Open	H	H	H	H	H	H	M	M
Mixed Tall Closed	H	H	H	H	H	H	M	M
Mixed Tall Open	H	H	H	H	H	H	M	M
Conifer Tall Woodland	M	M	M	M	L	H	L	L
Mixed Tall Woodland	M	M	M	M	L	H	L	L
Conifer Tall or Inter-mediate Regrowth Closed	H	M	H	M	M	H	L	L
Deciduous Tall Closed	H	M	H	M	M	H	L	M
Deciduous Tall Open	H	M	M	M	M	H	L	L
Deciduous Inter-mediate	M	M	M	M	M	H	L	L
Scrub and Conifer Dwarf	L	L	L	L	L	L	U	U
Conifer Inter-mediate Regrowth Open	M	M	M	M	M	M	U	U

H = High; M = Medium; L = Low; and U = Unsuitable for sawtimber.

Table 4-2

Criteria for Determining Fuelwood if both Primary and Secondary Vegetation are Present

Primary Veg. Type	SECONDARY VEGETATION: Conifer Tall	Conifer Intermediate	Mixed Tall	Deciduous Tall	Deciduous Intermediate	Cut Areas	Conifer Dwarf	Scrub
Conifer Tall Closed	M	M	M	M	M	M	L	L
Conifer Tall Open	M	M	M	M	M	L	L	L
Mixed Tall Closed	H	H	H	H	H	L	L	L
Mixed Tall Open	H	H	H	H	H	L	L	L
Conifer Tall Woodland	M	L	M	M	M	L	VL	VL
Mixed Tall Woodland	M	L	M	M	M	L	VL	VL
Conifer Intermediate or Regrowth	L	L	M	M	L	L	VL	VL
Deciduous Tall Closed	H	H	H	H	H	H	M	M
Deciduous Tall Open	H	H	H	H	H	H	M	M
Deciduous Intermediate	M	L	H	H	M	M	VL	VL
Scrub or Dwarf Conifer	L	L	M	M	L	L	VL	VL
Conifer Intermediate or Regrowth	L	L	M	M	L	L	VL	VL

H = High; M = Medium; L = Low, VL = Very low value for firewood.

PART 2. SUITABILITY

This portion of Chapter 4 is divided into two sections: 1) criteria used to determine suitability and 2) a summary of the acreage and estimated supply of the resource by planning unit.

I. CRITERIA USED TO DETERMINE SUITABILITY

A. Sawtimber

Criteria used to determine suitability of land for sawtimber include accessibility and ownership. As discussed in Chapter 5, sawtimber can be transported economically from up to 246 miles from the mill assuming travel on surfaced roads or up to 82 miles from the mill by dirt or winter roads. The sawtimber access map takes into account combinations of paved and unpaved roads, where combined travel costs for each portion do not exceed the maximum feasible transport cost for sawtimber. It is assumed that a logging road up to a maximum of 10 miles in length can be built off the established paved and dirt roads if there is at least 1 million board feet of timber available at the location. This is currently the case in the Fairbanks area (D. Wieczorek, ADNR, Division of Forestry, personal communication, 1982).

The second criterion of suitability is ownership. Only the acres owned or selected by the state are included in the acreage summaries of suitable areas (other landowners have not been included due to the difficulty of determining acreage through manual processing).

These two criteria were combined with information on the physical capability of the land for sawtimber production to arrive at supply figures for each subunit. Lands with high or medium potential for sawtimber were counted.

In order to estimate the actual volume of timber available on these areas, it was necessary to estimate the allowable cut. There are several ways to estimate the allowable cut, which is simply the sustainable yield. The preferred approach to calculating the allowable cut is to take into account the age of the timber; if all of the timber is mature, a faster cutting rate should be used than if most of the stand is of sapling or pole size. However, because age-class information is not available to relate to the timber type map, it was necessary to use a simpler estimate of allowable cut which is the average productivity in cubic feet per acre per year.

To obtain this estimate, the timber type map prepared by this plan was compared to the timber type map of the Fairbanks area by the Division of Forestry (DOF) for which the productivity of "high" and "medium" value stands is known. The two timber type maps were shown to have a high degree of correlation, with an R^2 of 0.71 (see Appendix 4B). Because of this close similarity between the two maps, it was reasonable to use the productivity estimates established on the DOF map of high and medium value

areas which correlate with like timber types on the Tanana Basin map. The DOF has estimated that high value areas have an average current productivity of 20 cubic feet per acre while medium value areas produce an average of 12/cf/acre/year. This is lower than their potential -- due probably to poor stocking, fire damage, and /or overmature stands -- but it does provide a reasonable estimate of the current allowable cut.

Areas of "low" value on the physical capability map are principally black spruce which not only has very poor productivity, but also is of poor quality for use as sawtimber. Therefore, these areas were not included in the supply estimates.

Table 4-3 shows the acreage and total timber volume summaries for state TA'd and patented land. The summaries are presented by subunit.

This information indicates that 1,377,600 acres of high and medium value sawtimber are TA'd or patented and lie within the area covered by the Tanana Plan. The estimated allowable cut on this area is 91.5 million board feet, about a third of which is likely to be spruce sawtimber. This includes an allowable cut of about 164,000 cords of fuelwood and roughly 23 million board feet of spruce sawtimber. Of this area, an estimated 431,000 acres of land are actually accessible at the current time, and the allowable cut on these areas for all products is estimated to be 27.8 million board feet (see Appendix 4C for the allowable cut calculations by subunit).

Table 4-3
Supply by Subunit
Supply Totals by Unit

UNIT	STATE OWNED					STATE OWNED AND ACCESSIBLE				
	ACRES thousands		ALLOWABLE CUT thousand BF			ACRES thousands		ALLOWABLE CUT thousand BF		
Patented and TA'd	high	med.	high (a)	med. (b)	TOTAL	high	med.	high (a)	med. (b)	TOTAL
I	115.9	91.5	9318	4415	13,733	0	2.6	0	125	125
II	109.4	84.7	8795	4081	12,876	6.4	3.2	516	154	670
III	37.1	37.8	2983	1824	4,807	14.7	23.7	1185	1144	2329
IV	30.8	60.8	2466	2931	5,397	21.1	25.6	1688	1235	2923
V	9.0	12.8	720	617	1,337	9.0	12.8	720	617	1337
VI	SUSITNA AREA PLAN									
VII	9.0	64.6	720	3117	3,837	4.5	31.3	360	1512	1872
VIII	260.5	62.1	20,944	2996	23,940	33.3	1.2	2677	58	2735
IX	73.0	30.1	5869	1453	7322	71.1	30.1	5716	1453	7169
X	8.3	20.5	668	989	1,657	4.4	4.5	354	217	571
XI	0	0	0	0	0	0	0	0	0	0
XII	126.6	133.1	10,179	6422	16,601	53.0	78.7	4262	3797	8059
XIII	0	0	0	0	0	0	0	0	0	0
TOTAL	779.6	598.0	62,662	28,845	91,507	217.5	213.7	17,478	10,312	27,790
Selected										
I	16.0	16.6	1287	801	2088	0	0	0	0	0
II	12.1	8.2	979	400	1379	0	0	0	0	0
III	18.6	35.2	1495	1698	3193	8.3	26.3	668	1269	1937
IV	6.4	22.4	516	1079	1595	6.4	19.8	516	956	1472
V	7.0	22.4	566	1079	1645	7.0	21.8	566	1050	1616
VI	SUSITNA AREA PLAN									
VII	4.4	10.3	360	495	855	.6	1.3	51	63	114
VIII	27.5	16.0	2211	772	2983	9.6	7.7	772	371	1143
IX	12.8	3.8	1029	183	1212	12.2	5.2	981	250	1231
X	0	0	0	0	0	0	0	0	0	0
XI	9.0	0	724	0	724	1.9	0	153	0	153
XII	33.9	61.9	2723	2994	5717	23.7	47.2	1903	2285	4188
XIII	0	1.9	0	92	92	0	0	0	0	0
TOTAL	147.7	198.7	11,885	9593	21,483	69.7	129.3	5610	6244	11,854
TOTAL ALL	927.3	796.7	74,547	38,438	112,990	287.2	343.0	23,088	16,556	39,644

(a) Assumes 20 cubic feet per acre allowable cut and 4.02 board feet/cubic foot.
(b) Assumes 12 cubic feet per acre allowable cut and 4.02 board feet/cubic foot

Chapter 5

Benefit - Cost Analysis

PART 1. METHODS

I. GENERAL APPROACH TO ECONOMIC ANALYSIS

Before discussing in detail the method used to evaluate forestry some background is necessary on the general approach to the consistent evaluation of all of the land management alternatives and the reasons for examining the economic value of these alternatives.

There are three basics reasons for examining economic value. First, economic information complements the physical information presented in Chapter 4 of this report and gives perspective on both what is happening now in the Basin and what the potential is. Secondly, economic data supply important information concerning the profitability of resource development; if a resource cannot be developed profitably, it probably will not have a lasting effect on the economy. Finally, because two objectives of the state are economic development and diversification, economic information is needed to make decisions which may benefit the economy.

The economic value of a resource has several meanings. Economists define economic value as the worth of an item or activity to society. This value can be measured in monetary prices in the market place or it can be non-monetary. In the case of a business, its economic value can be measured in a relatively straight-forward way, in the form of a financial analysis of the profitability of the enterprises. In other cases, such as recreation or hunting activities, there are economic values to the society which are not measured directly in monetary terms, but are imputed in people's behavior and spending patterns.

Economic analysis attempts to measure people's values, or the worth they place on different things, in the terms of their behavior. It assumes that if people cherish something their economic behavior will reflect this, and thus their behavior can be used to indicate the worth which the people attach to something. In this respect, economic analysis is analogous to an attitude survey which attempts to measure people's values.

For example, a view of Mt. McKinley may be considered a priceless experience. However, many people place a great deal of worth on this experience and expectedly, this worth is reflected in their economic behavior: the prices of homes with a good view of Mt. McKinley are significantly higher than those without such a view. Thus, the difference in the value of these homes compared to others of similar quality can indicate the minimum worth which people attach to the view. If the view were obstructed by some development, the property value decreases significantly.

A. Evaluation Techniques

There are two common methods available for determining the economic effects of public policy decisions. The first is referred to as cost-effectiveness and the second is benefit-cost analysis.

Cost-effectiveness is simply a method for finding the least cost alternative for meeting a single objective. For example, if the objective is to improve public health there may be several alternative ways to meet this: more hospitals, better health instruction in schools, etc. Each approach would be costed out and the least cost alternative would be chosen. Unfortunately, this method is not of use in choosing between objectives. If there is not enough money to meet all objectives, then choices between objectives will have to be made and this method will not be of assistance.

For this purpose, benefit-cost analysis has long been the preferred approach. First developed by the Corps of Engineers in the 1930's, the method has become increasingly common to all types of public policy decisions. In the 1950's, it was adapted to private sector decision-making and is now used by most of the major corporations to make investment decisions.

It is not a panacea, but it does provide a systematic approach and there is extensive literature which documents the ways in which benefit-cost analysis has been used to examine a vast variety of public policy questions. Therefore the benefit-cost approach is used in this report.

B. Benefit-Cost Analysis Applied to Land Management Alternatives

The approach used below determines net benefits (benefits minus costs) of each of six alterntive ways to manage land (mineral development, recreation, agriculture, fish and game, settlement and forestry). Each of these alternatives is examined separately at this stage, and combinations will be discussed during the next phase (Alternative Development) in order to evaluate the benefits of multiple use.

First it is necessary to define who gains and who loses from a particular land management alternative. Three groups are generally identified: producers, consumers and government. Producers are those who provide goods and/or services for a monetary return. Consumers purchase these goods and services. The government often incurs a cost for any land management approach and this is often offset by revenues received from user fees. For each of these three groups, it is necessary to know what their situation is now and what the effect of a change in land management policy would have.

For example, recreational users are receiving some benefit from the use of state land. What effect would a decrease in the amount of state land open to recreation have on these "consumers"? Likewise, what would be the effect on local sawmills of an increase in the state's allowable cut? Also, how much would it cost the state to increase the amount of land disposals and what would be the return to producers and consumers of doing so? Benefit-cost analysis attempts to answer such questions.

The results of the analysis are aggregated over a period of 20 years. This period of time was used for three reasons. First, the time horizon of the plan is twenty years. Secondly, forecasting for a period beyond 20 years is very speculative and thirdly, the operation of the time value of money renders cash flows after 20 years insignificant. For example, $1000 received 40 years from now is worth only $22 today at a discount rate of 10%.

The net benefits of any action must be discounted to arrive at their present value. The need to discount the net benefits arises from the fact that a dollar received several years from now is not worth as much as a dollar received today. Before the dollars received in different years can be added together, they must be converted to today's dollars by discounting. This process is similar to converting measurements in yards and feet, into inches before adding them together.

The discount rate is generally set at the interest rate on borrowed funds. For this study, a discount rate of 10% was used which is the average interest rate charged on agricultural loans. Because it is important to be consistent, this rate was also used for the other resource evaluations.

Each major step of the analysis is described below. Producers, consumers and the state government are examined separately first and then the results are totaled.

1. NET BENEFITS TO PRODUCERS

First it is necessary to define who the producers are. In this study, they are defined as those who expect to make a financial return on the use of a resource. For many resources, more than one product may be involved, in which case the producers of each product are examined separately first and then the results are summed. For example, there are producers of lumber and producers of fuelwood. The profits of each are examined separately and then the results are summed.

For each type of producer, net benefits are measured as profits.[1] The profits of an operation, such as a sawmill or farm, are measured in purely monetary terms. The first step in the analysis, is to determine if the resource development is financially feasible. If the development has been taking place for many years, this step is very straightforward: what are the estimated profits of the venture right now and what is the capacity for expansion?

If, however, there is no current operation or if the development is expected to expand beyond current capacity, then a detailed financial feasibility analysis must be done to determine if the venture would be financially profitable.

For example, if local sawmills have been turning a profit for many years, they can be assumed to be feasible. The next step is to determine the likely timber supply if all available forest land were managed for timber. If the sawmills can already handle this increase in supply, then it is simply necessary to estimate profits. If they could not handle the supply, then it would be necessary to do a financial analysis of the expected costs and revenues to a new sawmill.

A brief summary of the financial analysis required for each resource is given below:

Settlement is unique as the purchase of a homesite is assumed to be "financially feasible". It is assumed that a person would not buy a parcel for more than its financial value to him.

With forestry, preliminary estimates indicated that current capacity is likely to be able to handle the foreseeable increase in timber supply and therefore no detailed financial feasibility analysis was necessary. Only current and projected profits of existing operations were used.

With fish and game, the producers were defined as those whose "principal" objective was financial return (guides, commercial fishermen, and trappers). These ventures are expected to be able to handle the foreseeable supply and therefore no detailed financial feasibility analysis was necessary. Only current and projected profits of existing operations were used.

[1]The analysis is complicated by the fact that a producer may also be contributing to the economy by such things as hiring people who may otherwise be unemployed. Due to limited time and data, these opportunity costs were not evaluated in this study.

In mineral development, some types of minerals may be developed or expanded and a preliminary financial feasibility analysis was performed to estimate the likely returns to this industry.

With agriculture, the Delta farming area is now operating so it is assumed to be feasible for present operators. Other areas in the Basin may not be feasible so it was necessary to perform a detailed financial feasibility analysis.

For recreation, there is currently no large group of producers dependent on state land for recreational enterprises. There is some interest in commercial alpine skiing ventures, and a preliminary examination of the financial feasibility of this type of venture has been included.

2. NET BENEFITS TO CONSUMERS

Consumers also stand to gain or lose due to changes in public policy. Consumers are defined in this study as those who purchase goods, services or "experiences" (as in the case of hunting or recreation). Benefits to consumers arise from two factors: 1) a decrease in the price of a good or an experience and 2) an increase in the quantity available of the good or of the experience. As in the analysis of producers, it is necessary to determine the status quo and/or potential and then the effect of a change in policy on consumers.

The benefit to consumers is an increase in the welfare or standard of living of the State's citizens (benefits and costs to non-Alaskans have not been counted in this analysis since state policies are generally aimed at only the citizens of this state). If a state policy changes either the price of a good or experience or the quantity available, then the welfare of the consumers is affected.

The analysis of consumers' net benefits requires an understanding of the demand curve for a resource. As an example, consider the market for fuelwood in Fairbanks. You may find someone who would be willing to pay $120 per cord for a few cords because it is that valuable to them. Someone else might pay up to $110 per cord for a few cords, but if the price went any higher, they would burn another fuel. Yet another person would consider $90 their upper limit. If you could find each of these people and graph their maximum willingness to pay against the cumulative number of cords they would buy, the curve might look like the one shown in Figure 1. If the supply were 20,000 cords, then all of the people who would pay $70 or more would have purchased wood. The person who considered the wood to be worth only $69 per cord would not buy wood until the supply expanded and the price fell to what she considered the wood to be worth.

The most difficult aspect of the analysis of the benefit to consumers is to estimate the demand curve. Ideally, information could be obtained on different people's willingness-to-pay (their upper limit) and this would be graphed against the quantity of the good or experience which they purchase. However, in many cases this information is not available.

Willingness to pay information is generally obtained from one of two sources: (1) through direct questions in a statistical survey and (2) indirectly through records on how much people actually paid for different quantities.[1] No accurate survey of the willingness-to-pay was available for any of the resources. However, it was possible to estimate the willingness-to-pay for hunting in the Basin through analysis of fish and game records.

For the other resources, a less desirable but necessary substitute was used, called replacement cost. This technique assumes that people would be willing to pay an amount equal to the cost of the next best alternative. For example, if no firewood were available, people may have to switch to fuel oil and the cost of an equivalent amount of heat in the form of oil could be used as a proxy for the willingness-to-pay.

This technique is less than ideal for two major reasons. First, it will underestimate what some people would be willing to pay. Someone may want to burn wood for aesthetic reasons and they will pay a lot for this pleasure. The willingness-to-pay approach should reflect such lifestyle or asthetic values which people obtain from a resource. The replacement cost method assumes that only financial reasons are involved in the value consumers place on an activity or item, and is therefore a less desirable approach.

Secondly, the replacement cost value is not accurate for those who would not switch to the assumed alternative but who would use some other replacement. Therefore, the replacement cost is not a precise estimate of the true benefit to consumers (which is reprented by triangle ABD in Figure 2). However, it is often the only alternative short of a detailed and expensive survey and it has been used in this study to estimate the benefits to consumers for each resource except fish and game (which adequate data available to use the willingness-to-pay approach).

[1] This occurs only when people pay different amounts to obtain the same good, service or experience, as in the case of hunting or recreation when non-residents generally pay much more to enjoy the same experience which Alaskans can enjoy everyday.

3. NET BENEFITS TO THE STATE

The net benefit (or net cost) to the state was also estimated in order to give decision-makers an indication of what it costs the state, if anything, to provide benefits to producers and consumers.

The net return to the state from the land disposal program, for example, is determined from the revenues obtained from the sale of land less the costs of administering the program and surveying the land.

If the costs of a program exceeded the revenues to the state, then the decision maker should examine the total net benefits or costs (the sum of net benefits to producers, consumers and the state) to determine if the program has a positive effect overall.

C. Other Important Indicators of Economic Effects

Although benefit-cost analysis is the most thorough single method available for determining the benefits and costs to society, it does not cover all of the important economic effects which decision-makers need to consider in allocating land to different uses. Other important measures of the economic impact of resource use are also evaluated in this study in order to give a more complete picture of the contribution of each resource to the economy.

1. INCOME EFECTS

Income effects are an important measure of the impact of a particular industry on the economy. These effects are important for the economic development of a region, which in many cases is an objective for the management of a resource. Therefore, these effects have been estimated for each resource.

2. EMPLOYMENT EFFECTS

Another concern of many decision-makers is the effect on employment of a change in policy. Estimates of these effects are therefore included in the evaluation of each resource.

3. NET FISCAL EFFECTS ON LOCAL GOVERNMENT

Although this study focuses on the benefits and costs to Alaskan consumers and producers, the effects of state decisions are also felt by local governments. Increases or decreases in tax revenue to local governments, balanced against changes in costs due to the policy, give an indication of the net fiscal effects to local governments.

4. EXTERNAL COSTS AND BENEFITS

External benefits and costs are defined here as those social, environmental and economic effects which are not quantifiable but which are very important to decision-making.

No analysis is ever truly complete in documenting every possible effect and evaluating each of them in some standard unit of measurement. This inadequacy is nowhere more evident than in the evaluation of external costs and benefits. These include the effects which even the most sophisticated analysis cannot quantify with ease. Yet they are as important, if not even more important, than the effects which are more easily quantified.

This study includes qualitative discussions of some of the possible effects of resource use which must be considered by decision-makers in determining land use allocations. These discussions are inevitably inadequate because the effects cannot be measured in dollar terms and therefore it is not possible to indicate their magnitude relative to the effects discussed earlier. Also, it is not possible to predict all of the possible external effects of resource use.

However, we have attempted to document what some of the possible non-quantifiable social, environmental and economic benefits and costs may be for each resource and we hope that this serves at a minimum to indicate the importance of these considerations.

II. APPLICATION OF THIS METHOD TO FORESTRY

Forestry is defined here as the management and harvesting of trees for human use. Forests have many other uses, including watersheds, fish and wildlife, and recreation, but these multiple uses are being examined in separate elements first and they will be combined at a later stage to show the potential effects of multiple use.

The first step in the application of the method to forestry is to determine which products should be analyzed in detail. From the chapter on current and projected use (Chapter 2 of this report), the principal products from the Basin are likely to be sawtimber and fuelwood for local use. The log export market is likely to be small and volatile, and capital intensive developments, such as pulp mills and particle board plants, are very unlikely in view of the great distance from potential markets, the low productivity per acre in the Interior compared to areas such as the southeast U.S., and the high cost of production in the area. Therefore, sawtimber and fuelwood are analyzed in detail and the results for these two products are shown separately.

The discussion for each product is divided into two sections: current benefits and potential benefits. The first section deals with the status quo. The purpose of this section is two-fold: it estimates the current contribution which the forest products industry is making to the local economy and secondly it serves as the baseline which will assist in estimating impacts of proposed land classifications during the next phase of the Tanana Basin Area Plan (the Alternative Development Phase).

The second part deals with the potential contribution of forestry to the economy of the Basin. This section estimates the effects of doubling the amount of state land classified for forestry and also looks at the potential effects of cooperative agreements with private landowners to increase the total timber supply.

A. Application of the Method to Sawtimber

1. NET BENEFITS TO PRODUCERS OF SAWTIMBER

The first step is to define who the producers are. In this case, they are defined as sawmill owners who sell their products commercially. Producers also include gypo loggers, but in the Basin, sawmill owners do their own logging for the most part or have it done on contract and therefore loggers and sawmill operators are treated together.

Net benefits to producers are defined as net profits after taxes and no allowance was made for the opportunity cost of inputs such as labor or machinery. Analysis of current operations was used to estimate annual profits and these were discounted over 20 years to get net benefits to producers.

2. NET BENEFITS TO CONSUMERS OF SAWTIMBER

Consumers are those who purchase lumber and houselogs from the producers. Their benefits would ideally be estimated from the demand curve as explained in the previous section. However, a lack of data necessitated the use of the replacement cost approach instead. Consumer benefits are defined as the difference between what consumers would have to pay if no local products were available and what they are actually paying for local lumber and houselogs.

The personal use permit program for sawtimber and houselogs was not analyzed here because the volume sold under this program is insignificant relative to that sold for commercial use.

3. NET BENEFITS TO THE STATE

This section delineates how much it costs the state to administer the sawtimber management program, exclusive of fire protection costs, and how much revenue this program provides.

4. TOTAL NET BENEFITS

The sum of net benefits to producers, consumers and the state represents the net benefits to society as a whole from the sawtimber management program.

5. INCOME EFFECTS OF SAWTIMBER

Another measure of the benefit to Basin residents from sawtimber is the amount of money that circulates in the economy as a result of local sawmill production (the income effects of locally produced wood products). To determine the income effect, it is necessary to know what the gross revenues are for the industry. From gross revenues, it is possible to estimate the indirect income effects of the industry. These indirect effects are due to both the purchases which the industry makes from local suppliers and the value added to the economy from secondary manufacturing (such as cabinet making). To determine indirect effects, it is necessary to carefully study the amount purchased by each industry from all other industries per dollar of revenue. The result of such a study is a set of "multipliers" for each of the principal industries in the economy. Total revenues for an industry are then factored up by the multiplier to give an estimate of the total direct and indirect income effects.

Such a study of the Alaskan economy was conducted in 1975 (Logsdon, et. al., 1977). This was a preliminary examination and, because it uses the state as a whole as its boundary, it is not perfectly applicable to Alaska's Interior. However, due to the lack of alternative information, this study was used to provide an estimate of the income effects of the lumber industry in the Tanana Basin.

6. EMPLOYMENT EFFECTS OF SAWTIMBER

The employment effects of an industry include both the employees hired directly by that industry and those hired "indirectly" by related industries. For example, if one company builds a factory in town, the companies which sell products to the new factory will add personnel as will secondary manufacturing companies and retail services. Thus the employment effect is "multiplied".

7. NET FISCAL EFFECTS ON LOCAL GOVERNMENTS

Local governments incur both revenues and costs due to new developments. Property taxes and other sources of revenue can increase total receipts, but developments can also increase expenditures in the form of schools, roads or other services.

Fiscal effects have been estimated from the property tax records of the Fairbanks North Star Borough.

8. EXTERNAL BENEFITS AND COSTS

External effects are those which are difficult to quantify but which need to be considered by decision makers. A qualitative discussion of the potential social, environmental and economic effects of both the current and potential timber harvest has been included.

B. Application of the Method to Fuelwood

The analysis of fuelwood is complicated by the fact that there is a substantial personal use program as well as a commercial program. These two fuelwood programs were therefore analyzed separately.

Current and potential effects are estimated for fuelwood but due to both the importance of the price of oil in determining fuelwood demand and the difficulty of predicting oil prices, only a very preliminary estimate of the potential benefits of fuelwood is presented.

1. PERSONAL USE PERMITS

a. Net Benefits to Producers

There are no commercial producers of personal use firewood due to the regulation that wood collected on such a permit cannot be sold.

b. Net Benefits to Consumers

Consumers are defined as those who purchase and use personal use firewood permits. Due to lack of information on consumer willingness to pay for the wood collected, it was necessary to use the replacement cost approach as a proxy for willingness to pay. In this case, the next best alternative was assumed to be fuel oil. This assumption was necessary because it is not known which alternative fuel these people would utilize if the firewood were not available. This provides an order of magnitude estimate of the benefit to consumers.

c. Net Benefits to the State

Estimated as discussed under sawtimber.

d. Total Net Benefits

Estimated as discussed under sawtimber.

e. Income Effects

A very rough estimate of income effects can be determined by approximating the number of dollars spent by fuelwood collectors on chain saws, gasoline, etc. Using the multiplier for the trade industry, an estimate of the number of dollars circulated in the economy due to fuelwood collecting can be made.

f. Employment Effects

It was not possible, given the data available, to estimate employment effects.

g. Fiscal Effects

Because the fuelwood cutting program evaluated here occurs only on state land, it was assumed that the program has no direct effect on local government revenues and costs.

h. External Effects of the Fuelwood Permit Program.

A qualitative discussion of the social/life-style, environmental and economic effects of the personal use program is included.

PART 2. RESULTS

As discussed in Chapter 2 (Demand for Forest Products), there are likely to be two major products from the Interior forest -- sawtimber and fuelwood (recreation and other multiple uses are discussed under those elements). Therefore, this analysis examines the effects on producers and consumers of sawtimber and on producers and consumers of fuelwood.

I. CURRENT SAWTIMBER HARVESTING

Sawtimber is used throughout the Basin to produce a wide variety of products, including lumber and houselogs. Although there are several small private sawmills in the Basin, most of the production comes from the thirteen commercial sawmills located in Delta (1), the Fairbanks area (8), Nenana (1), Manley Hot Springs (1), Tanana (1) and Tok (1).

A. Current Net Benefit to Local Producers

Currently, the thirteen commercial sawmills in the basin produce approximately 5.2 million board feet (MMBF) of lumber and houselogs annually. At the present time, the only long-term source of timber in the area is State land, although village corporations in Healy Lake, Nenana and Tetlin have sold some timber in the last several years. (see chapter 2)

To determine the current benefit of this sawtimber supply to producers, it is necessary to determine the net profit after taxes of all the producers. Due to a lack of information on the profits of each producer, it was necessary to assume that the estimated profits of one of the most efficient mills are fairly representative of all producers' profits.

Currently, the largest mill in Fairbanks is selling spruce lumber for an average of about $400 per MBF. Their costs for milling (including overhead) average about $150 per MBF and for stumpage, approximately $65 per MBF (J. Flodine, Northland Wood, and Dan Wieczorek, personal communication, August 1982). Logging costs averaged $43.50 per MBF in 1979 and transport costs averaged $40 per MBF (A. Richmond, U. of A. graduate student, personal communication, August 1982). At an assumed rate of price increase of 7 percent per year, between 1979 and 1982, current logging costs would average $53 per MBF and transport costs would average $48 per MBF. Total costs are therefore approximately $315 per MBF leaving a net profit of $85 per MBF. Total production of 5,245 MBF would then yield approximately $446,000 net profit before taxes. The after

tax cash flow should be approximately $326,000 (assuming total taxes of approximately $70,000 and adding noncash charges for depreciation of $50,000) or $31 per MBF. This is a rough approximation of the annual benefit to producers. The present value of 20 years of this annual cash flow (the average life of a mill) would be approximately $2.8 million using a discount rate of 10%.

As discussed in Chapter 3, there are about 16.5 board feet allowable cut per "commercial" forest acre in the Fairbanks area ("commercial" forest acres are those which are capable of producing at least 20 cubic feet per acre per year). If this ratio is fairly constant throughout the Basin, then about 315,000 commercial forest acres would be needed to sustain the current harvest of 5.2 MMBF indefinitely. The net present value of the producers profits would then be about $9 per acre.

B. Current Net Benefit to Consumers

The principal benefit of local sawtimber supplies to consumers would arise from a lower priced but equivalent quality product to what consumers could obtain in the absence of a local supply. However, in the case of lumber produced locally, the product is not of perfectly equivalent quality to imported graded lumber. Locally produced lumber is not graded, much of it is rough sawn and often it has a high moisture content. Also, the price of local products is only slightly less than imported products. In 1980, local air-dried lumber sold for 8% less than imported lumber (M. Hartman, Northland Wood, December 1981).

However, in those cases where the higher quality product is not desired, consumers are saving about $32 per MBF (prices fluctuate seasonally so these estimates apply to only one point in time). The savings to consumers for the entire annual harvest is then roughly $170,000/year.

C. Costs to the State of Sawtimber Management

The state currently manages forests for sawtimber and fuelwood and it is also responsible for forest fire management. These management tasks overlap, making it somewhat difficult to allocate expenses to any one of these three activities. However, an estimate can be made by allocating the costs and revenues which are principally due to sawtimber management.

In calendar year 1981, the state received $167,911 in revenues from the sale of 4.25 MMBF of sawtimber stumpage. State expenditures on salaries, equipment and travel to administer these sales and manage the forests average $54,000 per year. (D. Wieczorek, Alaska DNR, Division of

Forestry, personal communication, Sept. 1982). This leaves a net return to the state of $113,911.

If this continued every year for 20 years, the state's direct return from sawtimber management would be $970,000 at a discount rate of 10%.

D. Current Income Effects of Local Production

Currently, the gross revenues of the industry are on the order of $2.1 million (5,200 thousand board feet at $400 per MBF). According to Logsdon, et. al., the income multiplier for the lumber industry is 1.87 (Logsdon, et. al., 1977). This would mean that the industry is indirectly generating $1.8 million for a total income effect of $3.9 million. This figure is low relative to total Basin income, but in the smaller communities, the income effects may be very significant.

E. Current Employment Effects of Local Production

According to Logsdon, the employment multiplier for the lumber industry is 1.47. As shown in Table 5-1, the 76 direct jobs result in approximately 114 total jobs for the Basin as a whole due to the lumber industry. (see Chapter 3.) This is less than 1% of the total estimated employment in the Basin of 22,355.

In populated areas, such as Fairbanks and Delta, the jobs in forest production make up only a small percentage of total jobs in the community. However, in certain small villages, such as Manley and Nenana, the percentage of jobs contributed by sawmills relative to the total number of jobs in the community is much larger.

F. Current Local Fiscal Effects

Sawmills in the Fairbanks North Star Borough contributed $10,000 to the tax base, as a result of property taxes (FNSB Assessors Office, Sept. 1982). Borough expenditures for services associated with timber harvesting and local sawmills are not likely to be significant relative to total Borough expenditures. Thus, the current net fiscal effect on local governments is roughly $10,000.

G. External Benefits and Costs

One of the principal external benefits of the lumber industry is import substitution. Currently, the industry is supplying about one-fifth of the total amount of lumber and houselogs consumed in the Basin. This is a significant percentage particularly since increased self-sufficiency is one of the state's objectives for forestry.

Table 5-1
Estimated Employment Effects of the Lumber Industry in the Tanana Basin (Both Woods and Mill Operations)

Community	Estimated Total Employment All Sectors	Lumber Industry Employment			% of all Employment
		Direct	Indirect[a]	Total	
		— Person Years—			
Delta	600	5	2	7	1%
Fairbanks (8 mills)	21,200	62	28	88	<1%
Nenana	141	4	2	6	4%
Manley Hot Spgs.	39	2	1	3	8%
Tanana	115	1	-	1	1%
Tok	249	4	2	6	2%
Total	22,355	76	35	111	1%

[a]Using an employment multiplier of 1.47 from Logsdon, et al, Input-Output Tables for Alaska's Economy: A First Look. U. of Ak. Agricultural Experiment Station, 1977.

The industry also has social benefits in that it is easy to enter the industry (the set-up costs are not exorbitant for small sawmills) and therefore it allows many people to become self-employed as small sawmill operators. This in turn can have significant positive impacts on the local employment situation in the smaller communities.

The possible environmental costs include site degradation, stream siltation and aesthetic costs due to poor transportation planning and silvicultural applications.

See Table 5-4, page 5-26, for a summary of current economic effects.

II. POTENTIAL FUTURE EFFECTS ON PRODUCERS AND CONSUMERS OF STATE SAWTIMBER SUPPLIES.

A. Potential Net Benefit to Local Producers

To determine the potential of the forest products industry in the Basin, it is necessary to examine three principal constraints to expansion: 1) the timber supply; 2) the demand for the products and 3) the financial feasibility of expansion.

Information concerning the timber supply in the Basin is limited at best (see chapter 4). The only detailed inventories conducted on the resource have been done by Tanana Chiefs for village corporations and this information is proprietary. Other inventories, conducted by the Forest Service, have been done on a very large scale without taking accessibility or land ownership into account. The information currently being collected for the Tanana Plan will add to our knowledge of the vegetation and soils of the Basin and this can be used to estimate the productivity of the forests. However, this information will not be available until December of 1982.

1. PROPOSED STATE FOREST SCENARIO

In the interim, a rough estimate of the allowable cut on the proposed state forest was used to estimate the state timber supply in the basin. This estimate was prepared by Joe Wehrman of the DNR Division of Forestry as part of the Division's proposal for a State Forest System in Interior Alaska. Through examination of aerial photographs, he estimated the allowable cut in the Tanana Basin to be 15 million board feet per year. This is probably a conservative estimate, but until better information is available, this estimate will indicate the likely range of economic effects.

The estimated demand for lumber and houselogs (see Chapter 3) is well above the 15 million board foot supply on the State forest. Currently, demand exceeds 24 million board feet and by the year 2,000, this demand is likely to exceed 42 million board feet. Since the demand for wood products is greater than the supply, the local supply is currently the limiting factor on expansion of the lumber industry.

Local producers and existing facilities could possibly expand to process 15 million board feet, because current capacity of local producers is on the order of 15 million board feet. If Northland Wood in Fairbanks added an extra shift, they could expand to 6 million board feet of producton and this alone would increase total production to 8.2 million board feet.

Assuming that about 8 MMBF in the State forest is currently accessible and that current costs and revenues remained constant per MBF, then the annual benefit to producers would increase from $446,000 to roughly $680,000 before taxes.

2. COOPERATIVE MANAGEMENT SCENARIO

If a cooperative agreement were made with Native Corporations, and forested lands that belong to the corporations were used for timber production, it is conceivable that the allowable cut could be increased within the near term to 15 MMBF. If this amount were accessible at current costs, the profits to producers before taxes would increase to roughly $1.3 million per year. The present value of this harvest to producers over 20 years is $11.1 million. This volume could be handled if the 6-8 MMBF of unused capacity existing in Nenana were put into production and if Northland operated a double shift. No additional costs would accrue to the state, since private lands would be expected to provide the additional volume.

This value assumes that the products that are produced from native and state land would be sold green or air dried and that local products would substitute for some of the currently imported supply. This assumption is tentative because it is not known how much green and air dried, non-graded lumber the market can absorb. However, all local producers interviewed indicated that they believe they could double or triple production of green and air dried lumber and still sell all they produce.

B. Potential Net Benefit to Consumers

Because the total quantity of lumber on the market in the region is not expected to change (instead, local producers would simply produce a larger share) the price is not expected to be significantly affected. Consequently, the benefit to consumers is assumed to be in the range of the current benefit at about $30/MBF.

C. Cost to the State of Sawtimber Management

If the harvest expanded to 8-9 million board feet, the state would have to add about 20 man-months to manage this increase in production (based on the current staffing to production ratio), thus increasing state costs to $108,000 per year. Revenues would increase to about $240,000 if the average stumpage cost were $30/MBF (assuming that much of the timber would sell for $3/MBF due to its remote location and some would sell for $65-75 due to its proximity to the mill). The net revenue to the state would then be $132,000 per year.

In the "Cooperative Management" scenario, the above costs and revenues would also apply since the difference in harvest is assumed to come from non-state lands.

D. Potential Income Effects

As shown in Table 5-2, the total income effects of expansion of the industry would increase 62% to $6.3 million if 8.2 MMBF were produced or 172% to $10.7 million if maximum expansion took place.

E. Potential Employment Effects

As shown in Table 5-3, the total industry employment would increase 13% (to about 129 jobs) due to expansion of the industry if 8.2 MMBF were produced or 39% (to 188 jobs) if maximum expansion took place.

F. Potential Fiscal Effects

Currently, a mill the size of Northland Wood (capable of producing 3 to 6 MMBF) pays $7,000 in property taxes. If two more mills of this size were added to the current estimated $10,000 in property taxes which are paid by sawmills to the Borough, local fiscal effects could total $24,000. Borough expenditures for services to local producers are not expected to increase significantly. (see Table 4)

G. Potential External Benefits and Costs

The principal external benefit of a larger lumber industry would be the import substitution effects. If the industry supplied 8 million board feet by the year 1985, the region would be approximately 26 percent self sufficient in lumber and houselogs.

If the industry produced 15 million board feet by the year 1985 (and assuming that the market could absorb this much ungraded lumber), then the region would be 50 percent self-sufficient in lumber and houselogs.

The potential social benefits of increased production would be due to the possible lifestyle benefits of operating a sawmill.

Potential environmental costs include site erosion and disruption of scenic views. (The costs in terms of other foregone resource developments will be examined during the alternative stage.)

Table 5-2
Estimated Potential Income Effects of Development Scenarios For the Lumber Industry in the Tanana Basin
(Both Woods and Mill Operations)

Development Scenario	Estimated Gross Revenues	Estimated Indirect Income Effects[a]	Estimated Total Income Generated	% Change From Existing
	Millions of Dollars			
Current Operations (total production 5.2 MMBF)	2.1	1.8	3.9	
Proposed State Forest (total production 8.2 MMBF)[b]	3.3	3.0	6.3	62%
Cooperative Management (total production 15 MMBF)[b]	5.7	5.0	10.7	172%

[a]Using an income multiplier of 1.87 from Logsdon, et al, 1977.
[b]Assuming all timber is accessible and land owner policies favor harvesting.

Table 5-3
Estimated Employment Effects of Develoment Scenarios
For the Lumber Industry in the Tanana Basin
(Both Woods and Mill Operations)

Development Scenario	Estimated Direct Employment	Estimated Indirect Employment[a]	Estimated Total Employment	% Change From Existing
	Person Years			
Current Operations (total production 5.2 MMBF)	78	36	114	
				13%
Proposed State Forest (total production 8.2 MMBF)[b]	88	41	129	
				39%
Cooperative Management (total production 14.2 MMBF)[b]	128	60	188	

[a]Using an employment multiplier of 1.47 from Logsdon, et al, 1977.
[b]Assuming that all of the timber is accessible and that land owner policies favor harvesting.

TABLE 5-4
CURRENT AND POTENTIAL ECONOMIC EFFECTS OF THE LUMBER AND HOUSELOG INDUSTRY

SCENARIO	NET BENEFITS								VALUE PER ACRE	DIRECT & INDIRECT INCOME EFFECTS	DIRECT & INDIRECT EMPLOYMENT EFFECTS	NET FISCAL EFFECTS ON LOCAL GOVERNMENTS	EXTERNAL COSTS AND BENEFITS
	TO PRODUCERS		TO CONSUMERS		NET RETURN TO THE STATE		TOTAL						
	$/YEAR	PRESENT VALUE OVER 20 YRS	$/YEAR	PRESENT VALUE OVER 20 YRS	(+) $/YEAR	(+) PRESENT VALUE OVER 20 YRS	$/YEAR	PRESENT VALUE OVER 20 YRS	$/ACRE	$/YEAR	PERSON YEARS	(+) $/YEAR	
Current Production	446,000	3,800,000	170,000	1,447,400	(+) 113,900	(+) 969,800	730,000	6,214,000	20	3,900,000	114	(+) 10,000	Lifestyle benefits (+)
State Forest Scenario	680,000	5,800,000	246,000	2,094,400	(+) 132,000	(−) 1,123,900	1,058,000	9,008,000	n/a	6,300,000	140	(+) 10,000	Import substitution (+) Possible erosion and scenic costs (−)
Cooperative Management Scenario	1,300,000	11,100,000	450,000	3,831,000	(+) 132,000	(+) 1,123,900	1,882,000	15,346,000	n/a	10,600,000	188	(+) 24,000	

III. CURRENT FUELWOOD HARVESTING

Fuelwood is an extremely important source of energy in the Interior. Many of the smaller villages burn wood almost exclusively, but due to its large population, the FNSB uses almost 90% of all the fuelwood used in the Basin (see Chapter 2 for a discussion of the estimated demand).

State lands are the source of much of the fuelwood in the Basin. The state offers personal use contracts which allow a person to harvest up to 10 cords of wood. In addition, the state offers commercial firewood sales to firewood cutters. This analysis will examine the benefits of personal use contracts and of commercial firewood sales separately.

Due to both the large proportion of total usage which occurs in the Fairbanks area and the lack of information on the total amount of harvesting which occurs just on state lands in the Basin as a whole, this discussion is limited to the Fairbanks area. It is possible that the benefit in the surrounding area is similar on a per cord basis, but the predominance of the Fairbanks area in total fuelwood consumed make this simplification a reasonable approximation.

A. Personal Use Contracts for Firewood in The Fairbanks Area

There are no producers under this category because it is illegal to sell personal use firewood commercially and this analysis defines producers as those who use a resource commercially.

1. NET BENEFITS TO CONSUMERS

Consumers benefit from state land being managed and used for firewood cutting if the existence of that land and opportunity to get firewood allows them to save money. The money they save is an indication of the value of the land to consumers. If you add up the total dollars saved by each person who uses state land for firewood, and then distribute those dollars over each acre of land managed for firewood, you get an indication of the value of each acre of land to the consumer.

For example, if 20 people cut wood on 10 acres of land, and save $10 each by doing so, then the net consumer benefit of those 10 acres is $200. Furthermore each acre of land is worth $20 to the consumers. This is the type of analysis used in the following section to determine

the net benefit of an acre of state forest land to the consumer. The analysis requires the following steps:

1) Determine the current value of the total number of cords of wood cut on state land (its replacement cost).

2) Determine the amount of money the consumer and state spent to obtain that total value.

3) Determine the net value of the wood as the replacement value less the cost to the consumer and to the state.

4) Calculate the net value of the harvest per acre.

The state offers personal use permits throughout the Basin, but the vast majority of these are offered in the Fairbanks Working Circle (the area within 60 miles of Fairbanks). The permits are sold for $10 each and allow a person to harvest up to 10 cords of wood. As discussed in Chapter 4, the number of permits sold increased an average of 48 percent per year from 1976 to 1981. During the same period, the population actually decreased by about 5%, indicating that many households must have converted to fuelwood.

Records on the amount of fuelwood collected by each permit holder are not available. However, a DNR survey conducted in both 1980 and 1981 indicated that an average of 4 cords were taken by each permittee. (DNR, Division of Forestry, Unpublished Report) This would indicate that about 11,000 cords were harvested by 2861 permit holders in 1981.

This figure underestimates the total harvest because firewood theft on state lands occurs both in the Fairbanks area and throughout the Basin. However, only the documented average harvest of permit holders was used to estimate benefits below.

For this analysis, it is assumed that 100% of the permit holders would switch to fuel oil in the absence of personal use permits. This is an oversimplification, but there is no information on the most likely alternatives people would choose.

To estimate the replacement cost, it is first necessary to convert the cords used into energy equivalents, or BTU's. Allowing for a stove with 55% efficiency, if one-half of the wood is spruce and one-half birch, the average net BTU's per cord is approximately 9.25×10^6 (Gasbarro and Fox, 1980). Then 2861 permitees harvesting 4 cords each would obtain a total of 105,860 million BTU's.

The cost per million BTU averages $16.62 in the Fairbanks area (Fairbanks North Star Borough Energy Report (1981)). The cost of personally collected fuelwood is approximately $8.88 per million BTU assuming use of a pickup truck @ $0.30/mile, averaging 48 miles round trip capable of hauling 3/4 cord of wood, chain saw costs of $7/cord of wood cut and labor costs of $7/hour for 8 hours.

The total replacement cost of the 105,860 MMBTU's of fuelwood harvested on state land through personal use permits would then be equal to the value of an equivalent amount of oil (105,860 @ $16.62/MMBTU = $1,745,210) less the amount saved by not collecting fuelwood (105,860 @ $8.88/MMBTU = $940,000) or $805,000 per year.

This value does not include the recreational enjoyment which the fuelwood collector may obtain from the experience. Each individual places a different value on this. Some say that only the first cord is recreational, but other hardy souls insist that there is nothing they would rather do on a weekend. This report has attempted to evaluate the "average" person who feels that the experience is partly recreational, but who has some opportunity cost for his or her time.

2. NET COST TO THE STATE

The costs to the state DNR, Division of Forestry, of providing this fuelwood include road construction costs, equipment costs and salaries. During the past two years the state Division of Forestry has constructed over 30 miles of logging roads in the area for the purpose of fuelwood collection at an average cost per year of $125,000. Equipment costs are low or insignificant since the same equipment is also used for several other tasks. Therefore, equipment costs were not included. Salaries include two technicians at $2700/month for eleven months per year and one at $3150 also for eleven months for a total of $94,050. Total costs for roads and salaries are then $219,050 per year. These are offset by permit fees of $28,610 for a net cost to the state of $190,400 per year and by multiple uses of the roads for recreation, mineral development, etc.

a) Net Present Value Per Acre.

The net present value per acre was determined from the number of acres which would be required to produce the 1981 estimated harvest of 11,444 cords on a sustained yield basis. According to the allowable cut analysis done by the Division of Forestry, 31,000 cords could be cut on a sustained basis from 242,500 acres of commercial forest land within the Fairbanks Working Circle (Wieczorek, 1980). This is an average of 0.1278 cords per commercial forest acre. Thus, if 11,444 cords were to be produced each year, 89,550 acres would need to be managed for firewood production. If $805,000 is saved each year, but it costs the state $190,400 to fund the program, then the total net benefit is $614,600 per year. The present value over twenty years is $5,230,000, or about $60 per acre. Because most of the stands in the Interior produce both firewood and sawtimber, this value per acre reflects only one of the two products and is not indicative of the total value per acre.

3. INCOME EFFECTS

There are income effects to the retail trade and service industries due to purchases made by consumers (chainsaws, equipment repair, gasoline, etc. are purchased). Excluding labor costs, consumers spend about $2.83 per cord (see above section). For 11,444 cords, the consumers would spend $32,400, which becomes income to the trade sector. The multiplier for this sector is 1.69 which means total income effects are in the range of $55,000.

4. EMPLOYMENT EFFECTS

These effects were not evaluated due to the lack of information.

5. FISCAL EFFECTS TO LOCAL GOVERNMENTS

These effects are probably not applicable to the state fuelwood program.

6. EXTERNAL COSTS AND BENEFITS

There are many social and "lifestyle" benefits of firewood harvesting. To many people, collecting fuelwood is intrinsic to the Alaskan way of life. These values are very difficult to quantify, but are nonetheless very important.

The environmental costs due to the air pollution from wood stoves have likewise not been evaluated quantitatively in this report. However, these are very real costs particularly in areas where steep inversions augment the problem.

There are also the potential environmental effects of improperly-thinned stands (since people do not always confine their cutting to the trees which are supposed to be removed) and some erosion due to skidding the logs and building and using roads to access the stands.

B. Potential Effects of Firewood Harvesting

The benefit of an increase in the fuelwood harvest is difficult to determine due to the volatile nature of oil prices. If these prices decline, then the value of fuelwood will also decrease, as will demand.

If the population grows as projected in the Socio-economic Background Report (DNR, Division of Research and Development, 1982) and if oil prices remain stable, then fuelwood demand is likely to double by the year 2000. (see Chapter 3.)

If this occurred, then the value to consumers is likely to remain on the order of $200-300 per person per year (the amount saved in heating bills compared to burning oil). However, it is likely that people will have to go further for wood. The allowable cut in the area within 60 miles of Fairbanks is 31,000 cords and this limit may be reached within the next few years. This additional travel cost may eliminate some of the benefit of fuelwood harvesting.

Due to the speculative nature of projecting any value which is directly related to oil prices, this analysis has not examined the potential effects of fuelwood harvesting.

C. Commercial Sales of Firewood

1. CURRENT NET BENEFIT TO PRODUCERS

There are currently three people employed full-time in commercial fuelwood production and another 15 employed part-time.Total person-months of part-time employment was estimated at 47 for part-time workers and 30 for full-time workers (Dick Jackson, Division of Forestry, Personal Communication). This is equivalent to just over 6 person-years.

The average firewood producer may be making about $20 per cord. In 1982, 9,070 cords were harvested and in 1983, 8,000 cords were cut by commercial operators. This is an average of about 8,535 cords, and at $20 per cord, the current producer benefits are roughly $170,700.

2. NET BENEFIT TO CONSUMERS

The benefit to consumers of commercial firewood sales are nearly equivalent on a unit basis to that of personal use permits. As noted in the previous section, the cost per cord of gathering wood is approximately $8.88 per million BTU's when labor costs are added. According to Fairbanks North Star Borough, Energy Report, the cost of delivered wood is about $8.72 per million BTU's, which is essentially equivalent given the margin of error.

Therefore, it can be assumed that the value per cord is similar for wood purchased commercially. In the last section, the value was estimated at $805,000 for about 11,500 cords, or about $70 per cord compared to buying the same amount of heat in the form of fuel oil.

In 1981, 7,455 cords (5,648 hardwood and 1,807 spruce) were sold by commercial operators from fuelwood sales on state land (Wieczorek, personal communication). At $70 savings per cord, this amounts to a total savings of about $521,900 in heating bills each year.

3. INCOME EFFECTS

If producers spend $2.83 per cord in equipment and operating costs, then the direct income effect to retail shops, etc., would be about $21,000. Direct and indirect effects would then be about $36,000 per year.

4. EMPLOYMENT EFFECTS

As mentioned above, there are approximately 6 person- years of employment due to commercial firewood operations and this is not a significant amount relative to the 21,000 person-years of employment in all industries in the Fairbanks area.

5. FISCAL EFFECTS

It is likely that no direct fiscal effects stem from this industry.

6. EXTERNAL COSTS AND BENEFITS

Commercial firewood operations are one of the enterprises in the Interior which is very important to the producers from a lifestyle point of view. Although the financial rewards may not be particularly appealing to some, for others, the independence and the enjoyment of working outdoors is enough to compensate for the small financial return. These effects have not been included in this analysis.

Possible environmental costs of these operations include the air pollution effects discussed earlier as well as the potential for site erosion in cutting areas.

PART 3. CONCLUSIONS

As shown in Table 6, the Total Present Net Benefits of the sawtimber and fuelwood programs are on the order of $13,500,000. The forest products industry also contributes almost $4 million to the local economy each year and 120 jobs. There is also a positive fiscal effect of about $10,000 per year to the Fairbanks North Star Borough.

Possible external benefits include import substitution and lifestyle benefits. External costs may include air pollution, erosion, scenic costs, and poor stand management if the general public is allowed to do the cutting.

TABLE 5-6
SUMMARY OF CURRENT ECONOMIC EFFECTS OF FORESTRY

PRODUCT	NET BENEFITS									DIRECT & INDIRECT INCOME EFFECTS	DIRECT & INDIRECT EMPLOYMENT EFFECTS	NET FISCAL EFFECTS ON LOCAL GOVERNMENTS	EXTERNAL COSTS AND BENEFITS
	TO PRODUCERS		TO CONSUMERS		NET RETURN TO THE STATE		TOTAL		VALUE PER ACRE				
	$/YEAR	PRESENT VALUE OVER 20 YRS	$/YEAR	PRESENT VALUE OVER 20 YRS	(+) $/YEAR	(+) PRESENT VALUE OVER 20 YRS	$/YEAR	PRESENT VALUE OVER 20 YRS	$/ACRE	$/YEAR	PERSON YEARS	(+) $/YEAR	
Sawtimber	466,000	3,800,000	70,000	1,447,400	(+) 113,900	(+) 969,800	730,000	6,214,000	20	3,900,000	114	(+) 10,000	Import Substitution benefits Lifestyle benefits Possible erosion and scenic costs Access to new areas
Fuelwood	n/a	n/a	1,326,900	11,298,000	(−) 190,400	(−) 1,621,000	1,136,500	9,676,200	65	91,000	6	n/a	Lifestyle benefits Air pollution costs Possible erosion Possible improper stand management Access to new areas
Total	446,000	3,800,000	1,496,900	12,745,400	(−) 76,500	(−) 651,200	1,866,500	15,890,200		3,991,000	120		

Chapter 6

Demand vs. Supply

I. SAWTIMBER

As shown in Table 6-1, demand for lumber and houselogs is forecasted to increase from 35,280 MBF in 1985 to 47,815 MBF in the year 2000. Demand includes figures for communities in the Tanana Basin as well as figures for the North Slope oil fields and the Yukon Delta communities.

The table shows the estimated allowable cut of accessible, state owned or selected timber compared to demand. This supply does not consider land use regulations which may restrict timber harvesting; it assumes that all of the allowable cut would be available for harvest. The supply is also limited to state lands, although federal, borough, and private lands could also contribute to the sawtimber needs of the Basin.

As shown in Table 6-1, it is possible that there will be a surplus of timber in the Basin if the State receives most of the forested land it has selected and if there are few restrictions on timber harvesting.

This is especially true if the demand for upgraded products is taken into account. Currently, local mills do not produce graded lumber and, due to the expense of having the lumber graded, it is unlikely that local products will be graded in the foreseeable future. Although the quality of local products may be equivalent to that of imported, graded materials, some contractors insist on graded lumber.

At the current time, the limiting factor on local productions is the supply of timber. However, if the state increases the supply, local mills are likely to encounter a new limitation: the demand for upgraded lumber. This demand cannot be determined at the current time, but it is almost certain to be lower than the total lumber demand. Therefore, it is conceivable that the supply of state owned timber will be adequate to meet the forecast demand.

Table 6-1
Sawtimber Supply Compared to Demand

Year	Accessible Timber Supply			Projected Demand in the Basin (b)- Both Local & Imported Products (MBF)
	on Stated Selected Land (a) (MBF)	on Patented or TA'd Land (MBF)	Total Supply (MBF)	
1985	40,000	28,000	68,000	35,280
1990		(c)		39,310
1995				43,510
2000				47,815

(a) See Chapter 4, page 4-7
(b) See Chapter 3, page 3-16
(c) The amount of state selected and state-owned timber will change as the land is conveyed. How much will actually be state-owned cannot be predicted at this time.

II. FUELWOOD

The supply of fuelwood is estimated to be about 164,000 cords per year in the Basin. However, only a portion of this is accessible at the current time and therefore the available supply is likely to be much lower.

As discussed in Chapter 3, the demand for fuelwood is currently about 37,000 cords and this is likely to increase to over 62,000 cords by the end of the century. If more forest land is made accessible, the available supply should be adequate to meet the demand.

Chapter 7

Recommendations

I. STATEWIDE GOALS AND THEIR IMPLICATIONS FOR FOREST MANAGEMENT IN THE TANANA BASIN

A. Introduction

The preceding chapters describe existing and expected demand for wood products, the availability of forest lands to supply those products, and the economic feasibility of forest development. These analyses, together with the goals for forestry laid out in the FY83 Statewide Natural Resources Plan, form the foundation for the forest management recommendations that follow.

B. Relationship of Statewide Forestry Goals to the Tanana Basin

The Statewide Natural Resources Plan is the broadest of the plans developed by the Department of Natural Resources. It provides the context for the area plans, such as the Tanana Area Plan, setting forth goals and objectives for each resource. The Statewide Plan is used in formulating ADNR's budget and setting inventory and planning priorities.

1. Statewide Goal: Economic Development

> Contribute to Alaska's economy with an integrated forest products industry that provides a range of job opportunities, needed products and increased per capita income, while ensuring that personal use needs of all Alaskans are met within the limitations of the land.

Forests in the Tanana Basin can make a contribution to this statewide goal through both commercial forest development and personal use permits. Forestry currently employs about 100 people and generates more than $4 million in income effects. If a stable land base were available, investment in forestry would increase and likewise the jobs and income which this generates.

Forestry is a competitive industry requiring only a small initial investment, thereby allowing entrepreneurs to easily enter the business. Forestry provides a source of employment in many rural areas where jobs are scarce. Forestry also contributes to economic self-sufficiency by reducing lumber imports.

By ensuring that the personal use needs are met within the limitations of the land, the state's citizens benefit in the form of lower fuel bills and less expensive houselogs. An estimated benefit of $65 is realized for every acre harvested for fuelwood.

In the Tanana Basin, the goal of economic development could be assisted by designating land for forestry use. This is because a stable timber supply is needed to encourage investment in the industry. The State Forest already allocates considerable land for forestry, but it has omitted some excellent timber stands, which should be protected through this plan. Also, the State Forest is not accessible to several communities which could have small forestry enterprises if a stable forest land base were accessible to them.

2. Ensure a Land Base for Forestry

Statewide Goal: Maintain a forested land base in public ownership adequate to meet the economic development goal and dedicated to the production of a full range of forest products and associated resources such as recreation, wildlife, soil, water and range.

Approximately 1.7 million acres of state land in the study area have high or moderate capability for producing wood for personal or commercial use. Of this, roughly 1.26 million have been set aside in the State Forest. Although the State Forest provides for much of the Basin's timber needs, it does not allocate land near all communities nor does it include all of the highest value timber lands for forestry.

The emphasis in the Tanana Basin Plan should therefore be to ensure that some land near communities is allocated for forestry and also to protect the forest values in high value timber stands not included in the State Forest.

3. Manage Alaska's Forest Resources

Statewide Goal: Manage the public and private forested land for long-term productivity and the continuous availability of forest products while maintaining and enhancing other valuable resources and the opportunity to use and enjoy them. Protect the most valuable forest lands and human improvements and all human life from wildfire and other destructive agents.

Active multiple use management of Tanana Basin forests could improve forest productivity, enhance other uses (such as recreation and wildlife habitat) and encourage mining in appropriate areas.

In the Basin, emphasis should be placed on research concerning the costs and benefits of such management practices as planting and thinning. Also, guidelines for other uses of the forests must be established so that the maximum benefit can be derived while minimizing

conflicts with other uses.

Managing the forests also involves protection and wise utilization. A new fire plan should be prepared when the Tanana Basin Plan is completed. In addition timber should be salvaged before converting land to other uses such as agriculture, grazing, mining or transportation or rights-of-way.

Management will also entail both protection of access and development of roads. Logging roads are used for many purposes, including recreation. The Tanana Basin Plan should provide rights-of-way to protect access to all areas designated for forestry.

Another implication of this goal is that the plan should make recommendations regarding cooperative forest management with other land owners. It is likely that Doyon, Toghotthele, Tetlin and Healy Lake Corporations may be interested in such arrangements.

II. MANAGEMENT RECOMMENDATIONS

A. Recommendations for Designations

1. Retain High Value Forest Lands Near Communities

Areas designated 302 on the forest cover map (see Chapter 4 of the Forestry Element), have white spruce and birch greater than 30 feet tall and are located near existing towns fall into this category. Forestry should be at least a co-primary use on these areas. These regions do not include lands already designated in the State Forest. Additional high value areas were added basedon the experience of local foresters. These sites also are located within 25 miles of a community and within 15 miles of a road. The following guidelines are presented for the management of these lands.

a. These areas will be open for commercial and personal use.

b. These lands should also be available for material sales with Division of Forestry consultation. Areas will be open to mineral entry, but the miner will be required to salvage the timber under a negotiated sale.

c. Agricultural sales and leases will not be allowed on these lands. Grazing might be permitted, depending on the specific site and with DOF consultation.

d. New ROW's, utility corridors and trails will be allowed, with DOF consultation.

e. Trapper cabins, commercial leasing and habitat enhancement also would be allowable where compatible with forestry management. However, remote cabin permits and scattered tract disposals would not be allowed.

While the new State Forest provides considerable forest land, it does not include several high value areas. In addition many communities are located too far from the State Forest to use it for a local wood supply.

Twenty-five miles was chosen as a reasonable distance for wood supplies from communities as it is currently the estimated average distance people in Fairbanks travel for personal use fuelwood.

Allocating all of the lands described above to forestry would help to meet the goals of economic development and a stable long-term land base.

2. Retain High Value Forest Lands in Remote Areas

These areas are designated as "302" on the recommendation map but are more than 15 miles from the nearest road or more than 25 miles from the nearest town. These areas should include forestry as a primary or a secondary use. Management guidelines are the same as in those lands in this same category but located nearer to communities or the road system.

These areas are currently fairly remote or inaccessible, but as demand for wood products increases in each community, the need for the resources of these areas will increase. Roads may be extended to many of them by that time and therefore the forest values should be protected.

This recommendation would assist in developing a long-term land base for forestry. These areas are likely to eventually contribute to the economic development goal.

3. Retain Forest Land In or Near Disposals

Some forested lands located near homesteads or large subdivisions which are greater than three miles from a maintained road should be retained in public onwnership as a source of wood products. A land base adequate to supply a specified number of cords/household/year will be identified. This figure will vary from area to area based on local conditions, including type of wood available and anticipated amount of seasonal use. In calculating the available land base, public retention lands within a reasonable hauling distance will be considered as well as the acreage of parcels intended for sale. As a rule no commercial sales would be allowed but the area would otherwise be managed the same as areas under Recommendation 1.

The demand for houselogs and fuelwood has caused a serious wood shortage near many disposals, particularly in remote areas. Many members of the public have expressed concern about the capacity of the forest resources near disposals to meet the demand. Overcutting is likely to be a problem if substantial forest land is not retained, especially in areas designated for homesteads.

This action would assist in meeting the goal of economic development by providing wood for personal use, which provides benefits in the form of greater self-sufficiency and many consumer benefits.

4. Retain Some Forest Land Near Every Community

The above recommendations may still not provide forests near every community, since some towns do not have areas which are of high or moderate value for forestry. However, forests with lower productivity can still be of importance to a community if no other wood supplies are available. The areas need not be classified primary use forestry, but they should be retained in public ownership and include timber and fuelwood harvesting as allowable uses.

These sites should be determined on a case by case basis in cooperation with other resource experts and managed the same as areas under Recommendation #1.

b. Guidelines for Management

Same as Recommendation 2.

B. Other Management Guidelines

1. Multiple Use

To the extent economically feasible, all areas designated for forestry as a primary use will be managed for a variety of compatible uses such as recreation, habitat, mining and watershed protection.

2. Fire Management Plans

A revised fire management plan should be prepared incorporating the recommendations of the Tanana Basin Plan.

3. Protect Access

Access should be protected across and to forest areas. Road development should be coordinated with other resource management interests.

4. Require Timber Salvage

Timber salvage should be required on agricultural land, land to be surface mined and rights-of-way.

5. Consider Cooperative Management Agreements

Opportunities should be esplored for cooperative forest management agreements with other agencies and private companies.

Appendices

APPENDIX 4A

Mapping Procedure: Vegetation will be mapped by stereoscopic photointerpretation of the 1:60,000 CIR photography. Black and white units will be reformatted and delineated on a mylar overlay fixed atop the LANDSAT scene. Site specific projects and the sample plots will be used where available in identifying characteristic signatures. The final vegetation overlay will be rectified and registered to the U.S.G.S. basemap. Waterbodies and urban or disturbed areas will be mapped to smaller resolution consistent with the land use variable.

The classification will be a modified version of L.A. Viereck et al. "Preliminary Classification System for Vegetation of Alaska". Vegetation will generally be mapped to level three of the Viereck system. Black spruce will be mapped where possible. Vegetation complexes will be created for areas where two vegetation groups are mixed and where mapping resolution prohibits the delineation of separate vegetative units. Mapping resolution will be approximately 640 acres.

Any vegetation type which occupies greater than 60% of the relative groundcover for an area with a homogeneous photo-signature will be mapped as a single type with no secondary type identified. Under all other circumstances where two vegetation types occur in more equal proportions, the primary vegetation type is determined on the basis of stature and absolute crown cover, or according to relative crown cover when life forms of similar stature share an area. Thus, in a given area, the primary vegetation is the tallest life form with at least 25% absolute crown coverage (25% of maximum crown diameter coverage). In a situation with life forms of similar stature sharing an area, the primary vegetation will be the life form which has the greatest relative crown coverage (the percentage of the absolute crown coverage).

The secondary vegetation type is determined on the basis of relative crown coverage. Whichever life form has the next highest relative crown coverage is designted as the secondary vegetation type.

Barren or Urban/Disturbed categories are ranked by the total percent of the area which they occupy.

Source: Preliminary Draft of Specifications for Management Resources Mapping Program, DNR, DGGS, 1982.

Definitions:

1. Tall, intermediate and dwarf refer to the height of the vegetation found in that area. The terms are defined as follows:

Tall:	Greater than 10 meters in height
Intermediate:	3-10 meters in height
Dwarf:	Used only for spruce less than 3 meters in height

2. Closed, open and woodland refer to the canopy cover of the vegetation type. The terms are defined as follows:

Closed:	60-100% canopy cover
Open:	25-60% canopy cover
Woodland:	10-25% canopy cover

APPENDIX 4B

Explanation of Regression Equations.

Linear Regression Equations were calculated for 6 different combinations of data. The Software was developed by Hewlett Packard and run on the HP-41C handheld computing system.

Timber typing was done by Kreig Associates Inc. for the Tanana Valley. This same timber typing was accomplished some three years ago by the Forestry staff of the Northcentral District Forestry Office.

The purpose of computing the regression equations was to see if there is any consistent coorelation between Kreig acreages and NCD acreages or if it would be a totally haphazard comparison.

Acreages were calculated from both subject maps, categorized and the curve fit program was run. This program uses the method of least squares in attempting to fit a curve to a set of data.

On the printout sheets: T&R = Township & Range, all are in Fairbanks Meridian;
K ALL = Kreigs High, Medium & Low categories
K M&H = Kreigs Medium & High categories
NCD = Northcentral Districts acreage for "Commercial Forest Land" within that particular township & range.

All equations given are for Linear Regressions of the form $Y = a + bX$
in all cases NCD acreages = Y and Kreig acreages = X

The best Curve fit for all data taken as a whole is K ALL vs. NCD with a coorelation coefficient (r^2) of 0.71. The equation is:

NCD = 469.49 + 0.73K ALL

The best curve fit for any portion of the data is for the Chena Compartment K M&H vs. NCD. This data gives a coorelation coefficient (r^2) of 0.84. The equation is: NCD = 779.90 + 0.73K M&H.

The actual curves were plotted also using Hewlett Packard developed software and also on the HP-41C system. They are shown for informational purposes only.

Table 4C-1
SUPPLY BY SUBUNIT
Patented and Tentatively Approved

SUBUNIT	STATE OWNED					STATE OWNED AND ACCESSIBLE				
	ACRES thousands		ALLOWABLE CUT thousand BF			ACRES thousands		ALLOWABLE CUT thousand BF		
	high	med.	high (a)	med. (b)	TOTAL	high	med.	high (a)	med. (b)	TOTAL
UNIT I										
IA	14.1	10.9	1134	526	1660	0	0	0	0	0
IB	12.8	27.5	1029	1327	2356	0	0	0	0	0
IC	89.0	53.1	7155	2562	9717	0	2.6	0	125	125
TOTAL	115.9	91.5	9318	4415	13733	0	2.6	0	125	125
UNIT II										
IIA	42.2	25.0	3393	1206	4599	0	0	0	0	0
IIB	0	1.3	0	63	63	0	0	0	0	0
IIC	11.5	12.8	925	618	1543	0	0	0	0	0
IID	22.4	12.2	1801	589	2390	0	0	0	0	0
IIE	12.8	15.4	1029	740	1769	0	0	0	0	0
IIF	15.4	12.2	1235	587	1822	6.4	3.2	516	154	670
IIG										
IIH	5.1	5.8	412	278	690	0	0	0	0	0
TOTAL	109.4	84.7	8795	4081	12876	6.4	3.2	516	154	670
UNIT III										
IIIA	0	.6	0	29	29	0	0	0	0	0
IIIB	22.4	10.9	1801	526	2327	.6	1.9	48	92	140
IIIC	5.1	15.4	410	743	1153	5.1	15.4	410	743	1153
IIID	9.6	10.9	772	526	1298	9.0	6.4	727	309	1036
TOTAL	37.1	37.8	2983	1824	4807	14.7	23.7	1185	1144	2329

(a) Assumes 20 cubic feet per acre allowable cut and 4.02 board feet/cubic foot. (c)
(b) Assumes 12 cubic feet per acre allowable cut and 4.02 board feet/cubic foot. (c)
(c) Assumes stands of large size classes, principally softwood (pole timber and sawtimber).

Table 4C-1
SUPPLY BY SUBUNIT
Patented and Tentatively Approved

SUBUNIT	STATE OWNED					STATE OWNED AND ACCESSIBLE				
	ACRES thousands		ALLOWABLE CUT thousand BF			ACRES thousands		ALLOWABLE CUT thousand BF		
	high	med.	high (a)	med. (b)	TOTAL	high	med.	high (a)	med. (b)	TOTAL
UNIT IV										
IVA	.6	0	48	0	48	.6	0	48	0	48
IVB	9.0	26.9	720	1297	2017	4.5	11.5	360	556	916
IVC-1	12.2	17.3	978	834	1812	7.0	4.5	560	216	776
IVC-2	9.0	12.8	720	617	1337	9.0	6.4	720	309	1029
IVD	0	.6	0	29	29	0	.6	0	29	29
IVE	0	3.2	0	154	154	0	2.6	0	125	125
TOTAL	30.8	60.8	2466	2931	5397	21.1	25.6	1688	1235	2923
UNIT V										
VA	9.0	12.8	720	617	1337	9.0	12.8	720	617	1337
VB	0	0	0	0	0	0	0	0	0	0
TOTAL	9.0	12.8	720	617	1337	9.0	12.8	720	617	1337
UNIT VI	SUSITNA AREA PLAN									
UNIT VII										
VIIA-1	5.8	13.4	463	648	1111	3.2	8.3	257	401	658
VIIA-2	1.9	.6	154	31	185	0	0	0	0	0
VIIB	1.3	17.3	103	834	937	1.3	13.4	103	648	751
VIIC	0	24.3	0	1172	1172	0	9.6	0	463	463
VIID	0	9.0	0	432	432	0	0	0	0	0
TOTAL	9.0	64.6	720	3117	3837	4.5	31.3	360	1512	1872

(a)Assumes 20 cubic feet per acre allowable cut and 4.02 board feet/cubic foot.
(b)Assumes 20 cubic feet per acre allowable cut and 4.02 board feet/cubic foot.

Table 4C-1
SUPPLY BY SUBUNIT
Patented and Tentatively Approved

SUBUNIT	STATE OWNED					STATE OWNED AND ACCESSIBLE				
	ACRES thousands		ALLOWABLE CUT thousand BF			ACRES thousands		ALLOWABLE CUT thousand BF		
	high	med.	high (a)	med. (b)	TOTAL	high	med.	high (a)	med. (b)	TOTAL
UNIT VIII										
VIIIA	176.0	52.5	14150	2533	16683	15.4	.6	1238	29	1267
VIIIB	51.2	8.3	4117	400	4517	7.0	.6	563	29	592
VIIIC	33.3	1.3	2677	63	2740	10.9	0	876	0	876
TOTAL	260.5	62.1	20944	2996	23940	33.3	1.2	2677	58	2735
UNIT IX										
IXA	22.4	17.3	1801	835	2636	20.5	17.3	1648	835	2483
IXB	50.6	12.8	4068	618	4686	50.6	12.8	4068	618	4686
TOTAL	73.0	30.1	5869	1453	7322	71.1	30.1	5716	1453	7169
UNIT X										
XA	1.9	9.6	153	463	616	.6	0	48	0	48
XB	6.4	10.9	515	526	1041	3.8	4.5	306	217	523
TOTAL	8.3	20.5	668	989	1657	4.4	4.5	354	217	571
UNIT XI	0	0	0	0	0	0	0	0	0	0

(a) Assume 20 cubic feet per acre allowable cut and 4.02 board feet/cubic foot.
(b) Assume 12 cubic feet per acre allowable cut and 4.02 board feet/cubic foot.

Table 4C-1
SUPPLY BY SUBUNIT
Patented and Tentatively Approved

SUBUNIT	STATE OWNED					STATE OWNED AND ACCESSIBLE				
	ACRES thousands		ALLOWABLE CUT thousand BF			ACRES thousands		ALLOWABLE CUT thousand BF		
	high	med.	high (a)	med. (b)	TOTAL	high	med.	high (a)	med. (b)	TOTAL
UNIT XII										
XIIA	10.2	11.5	823	556	1379	10.2	11.5	823	556	1379
XIIB-1	0	0	0	0	0	0	0	0	0	0
XIIB-2	1.9	.6	154	31	185	1.9	.6	154	31	185
XIIC-1	7.7	2.6	617	123	740	7.7	2.6	617	123	740
XIIC-2	15.4	19.2	1235	926	2161	15.4	19.2	1235	926	2161
XIID-1	0	0	0	0	0	0	0	0	0	0
XIID-2	3.2	9.6	257	463	720	3.2	9.6	257	463	720
XIIE	.6	2.6	48	123	171	.6	2.6	48	123	171
XIIF	0	0	0	0	0	0	0	0	0	0
XIIG	.6	.6	48	31	79	.6	.6	48	31	79
XIIH	LITTLE CHENA MANAGEMENT PLAN									
XII I	7.0	10.9	566	525	1091	7.0	10.9	566	525	1091
XIIJ	1.9	11.5	154	556	710	1.9	11.5	154	556	710
XIIK	3.2	4.5	257	217	474	0	3.2	0	154	154
XIIL	4.5	6.4	360	309	669	4.5	6.4	360	309	669
XIIM	CHENA RIVER RECREATION PLAN									
XIIN	70.4	53.1	5660	2562	8222	0	0	0	0	0
XIIO	EIELSON									
XIIP	FORT WAINWRIGHT									
TOTAL	126.6	133.1	10,179	6422	16,601	53.0	78.7	4262	3797	8059

(a) Assume 20 cubic feet per acre allowable cut and 4.02 board feet/cubic foot
(b) Assume 12 cubic feet per acre allowable cut and 4.02 board feet/cubic foot

Table 4C-2
SUPPLY BY SUBUNIT
Selected

SUBUNIT	STATE OWNED					STATE OWNED AND ACCESSIBLE				
	ACRES thousands		ALLOWABLE CUT thousand BF			ACRES thousands		ALLOWABLE CUT thousand BF		
	high	med.	high (a)	med. (b)	TOTAL	high	med.	high (a)	med. (b)	TOTAL
UNIT I										
IA	10.2	8.9	820	429	1249	0	0	0	0	0
IB	1.3	5.8	105	280	385	0	0	0	0	0
IC	4.5	1.9	362	92	454	0	0	0	0	0
TOTAL	16.0	16.6	1287	801	2088	0	0	0	0	0
UNIT II										
IIA	0	0	0	0	0	0	0	0	0	0
IIB	0	0	0	0	0	0	0	0	0	0
IIC	0	0	0	0	0	0	0	0	0	0
IID	4.5	.6	362	29	391	0	0	0	0	0
IIE	7.0	7.0	566	340	906	0	0	0	0	0
IIF	0	0	0	0	0	0	0	0	0	0
IIG										
IIH	.6	.6	51	31	82	0	0	0	0	0
TOTAL	12.1	8.2	979	400	1379	0	0	0	0	0
UNIT III										
IIIA	3.2	3.2	257	154	411	0	0	0	0	0
IIIB	10.9	10.2	876	492	1368	3.8	4.5	306	217	523
IIIC	4.5	21.8	362	1052	1414	4.5	21.8	362	1052	1414
IIID	0	0	0	0	0	0	0	0	0	0
TOTAL	18.6	35.2	1495	1698	3193	8.3	26.3	668	1269	1937

(a) Assume 20 cubic feet/acre allowable cut and 4.02 board feet/cubic foot.
(b) Assume 12 cubic feet/acre allowable cut and 4.02 board feet/cubic foot.

Table 4C-2
SUPPLY BY SUBUNIT
Selected

SUBUNIT	STATE OWNED					STATE OWNED AND ACCESSIBLE				
	ACRES thousands		ALLOWABLE CUT thousand BF			ACRES thousands		ALLOWABLE CUT thousand BF		
	high	med.	high (a)	med. (b)	TOTAL	high	med.	high (a)	med. (b)	TOTAL
UNIT IV										
IVA	3.2	6.4	257	309	566	3.2	6.4	257	309	566
IVB	0	2.6	0	123	123	0	1.3	0	62	62
IVC-1	1.9	5.1	154	247	401	1.9	3.8	154	185	339
IVC-2	0	0	0	0	0	0	0	0	0	0
IVD	1.3	8.3	105	400	505	1.3	8.3	105	400	505
IVE	0	0	0	0	0	0	0	0	0	0
TOTAL	6.4	22.4	516	1079	1595	6.4	19.8	516	956	1472
UNIT V										
VA	7.0	7.7	566	370	936	7.0	7.7	566	370	936
VB	0	14.7	0	709	709	0	14.1	0	680	680
TOTAL	7.0	22.4	566	1079	1645	7.0	21.8	566	1050	1616
UNIT VI	SUSITNA AREA PLAN									
VIIA-1	3.8	7.7	309	370	679	0	0	0	0	0
VIIA-2	0	0	0	0	0	0	0	0	0	0
VIIB	.6	0	51	0	51	.6	0	51	0	51
VIIC	0	1.3	0	63	63	0	1.3	0	63	63
VIID	0	1.3	0	62	62	0	0	0	0	0
TOTAL	4.4	10.3	360	495	855	.6	1.3	51	63	114

(a) Assume 20 cubic feet/acre allowable cut and 4.02 board feet/cubic foot
(b) Assume 12 cubic feet/acre allowable cut and 4.02 board feet/cubic foot

Table 4C-2
SUPPLY BY SUBUNIT
Selected

SUBUNIT	STATE OWNED					STATE OWNED AND ACCESSIBLE				
	ACRES thousands		ALLOWABLE CUT thousand BF			ACRES thousands		ALLOWABLE CUT thousand BF		
	high	med.	high (a)	med. (b)	TOTAL	high	med.	high (a)	med. (b)	TOTAL
UNIT VIII										
VIIIA	14.7	0	1182	0	1182	0	0	0	0	0
VIIIB	4.5	12.8	362	618	980	2.6	7.7	209	371	580
VIIIC	8.3	3.2	667	154	821	7.0	0	563	0	563
TOTAL	27.5	16.0	2211	772	2983	9.6	7.7	772	371	1143
UNIT IX										
IXA	5.1	5.8	410	280	690	4.5	2.6	362	125	487
IXB	7.7	2.6	619	125	744	7.7	2.6	619	125	744
TOTAL	12.8	3.8	1029	183	1212	12.2	5.2	981	250	1231
UNIT X										
XA	0	0	0	0	0	0	0	0	0	0
XB	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	0	0	0	0	0	0
UNIT XI	9.0	0	724	0	724	1.9	0	153	0	153

(a) Assume 20 cubic feet/acre allowable cut and 4.02 board feet/cubic foot
(b) Assume 12 cubic feet/acre allowable cut and 4.02 board feet/cubic foot

Table 4C-2
SUPPLY BY SUBUNIT
Selected

SUBUNIT	STATE OWNED					STATE OWNED AND ACCESSIBLE				
	ACRES thousands		ALLOWABLE CUT thousand BF			ACRES thousands		ALLOWABLE CUT thousand BF		
	high	med.	high (a)	med. (b)	TOTAL	high	med.	high (a)	med. (b)	TOTAL
UNIT XII										
XIIA	1.9	1.9	154	93	247	1.9	1.9	154	93	247
XIIB-1	0	0	0	0	0	0	0	0	0	0
XIIB-2	1.3	0	103	0	103	1.3	0	103	0	103
XIIC-1	0	1.3	0	62	62	0	1.3	0	62	62
XIIC-2	1.3	.6	103	31	134	1.3	.6	103	31	134
XIID-1	0	0	0	0	0	0	0	0	0	0
XIID-2	0	0	0	0	0	0	0	0	0	0
XIIE	2.6	3.8	206	185	391	2.6	3.8	206	185	391
XIIF	.6	0	51	0	51	.6	0	51	0	51
XIIG	3.8	14.0	309	679	988	3.8	14.0	309	679	988
XIIH	LITTLE CHENA MANAGEMENT PLAN									
XII I	2.6	1.9	206	93	299	2.6	1.9	206	93	299
XIIJ	1.9	14.7	154	710	864	1.9	14.7	154	710	864
XIIK	1.9	0	153	0	153	0	0	0	0	0
XIIL	7.7	9.0	617	432	1049	7.7	9.0	617	432	1049
XIIM	CHENA RIVER RECREATION PLAN									
XIIN	8.3	14.7	667	709	1376	0	0	0	0	0
XIIO	EIELSON									
XIIP	FORT WAINWRIGHT									
TOTAL	33.9	61.9	2723	2994	5717	23.7	47.2	1903	2285	4188

(a) Assume 20 cubic feet/acre allowable cut and 4.02 board feet/cubic foot
(b) Assume 12 cubic feet/acre allowable cut and 4.02 board feet/cubic foot

Table 4C-2
SUPPLY BY SUBUNIT
Selected

SUBUNIT	STATE OWNED					STATE OWNED AND ACCESSIBLE				
	ACRES thousands		ALLOWABLE CUT thousand BF			ACRES thousands		ALLOWABLE CUT thousand BF		
	high	med.	high (a)	med. (b)	TOTAL	high	med.	high (a)	med. (b)	TOTAL
UNIT XIII	0	1.9	0	92	92	0	0	0	0	0

(a) Assume 20 cubic feet per acre allowable cut and 4.02 board feet/cubic foot
(b) Assume 12 cubic feet per acre allowable cut and 4.02 board feet/cubic foot

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