THE FOREST ECONOMY OF HAINES, ALASKA

A Study of Current Forest Utilization,
Forest Management and Utilization
Alternatives and Economic Impact

by

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and

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PREFACE

The Institute of Social, Economic and Government Research of the University of Alaska carries on a series of study programs supporting the development of the state's natural resources. One such program is directed at improving the utilization of Alaska's valuable forest resource, with particular emphasis on expanding the role played by Alaska's timber industry.

A Survey of the Alaskan Products Industry, published in 1966, provided a review and analysis of the growth and development of the pulp and lumber industry. Marketing Hardwoods from Alaska's Susitna Valley (1966) was the first in the Institute's study series on "Marketing Alaska's Timber Products" and focused attention on utilization in a particular geographic area, with emphasis on investigation of markets and marketing procedures.

This report completes Phase II of the Institute's marketing series. It examines the timber resources and current utilization activity of the Haines area and utilizes the potential for pulp chip production. Other possible manufacturing alternatives are also investigated. Particular attention is paid to the role of the forestry sector in the community's economy. Phase III of the "Marketing Alaska's Timber Products" series is entitled "Analysis of Integrated Forest Utilization in the Railbelt Area of Alaska." The study, currently underway, is evaluating alternative methods of integrated utilization of forest land and timber in the railbelt area.

Dr. Michael R. C. Massie has primary responsibility for the Institute's forestry research program. He was assisted in this study by Dr. Robert C. Haring, Head of the University of Alaska's Department of Business Administration. The study was financed by McIntire-Stennis cooperative forestry research

monies and State of Alaska matching funds, with additional support for this project from the Institute of Northern Forestry, Forest Service, U.S. Department of Agriculture.

The analyses, conclusions, and recommendations of this report were reviewed by professionals and technical specialists in industry, government, and university research; their criticisms and helpful suggestions were most helpful and thoroughly appreciated. It is recognized that some of the issues dealt with are somewhat controversial and that not everyone may be fully satisfied by the findings of the authors. The purpose of the study has been to take a comprehensive and objective look at forest utilization in one area of the state, and any disagreements engendered are likely to result from differing opinions and points of view. In any case, the important consideration must be the extent to which a report such as this contributes to better understanding and future progress. It is our belief that on these counts the Haines study makes a major contribution to more effective utilization of Alaska's forest resources.

Victor Fischer
Director, I.S.E.G.R.

February, 1969

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The cooperation and assistance of a great number of other individuals, firms and agencies in contributing information was appreciated. Interviewees are listed at the end of the bibliography. Agencies and firms that assisted directly are listed below and deserve special recognition.

Alaska Division of Lands
Office of the State Forester, Anchorage
Office of the Area Forester, Haines

Bureau of Land Management
State Office, Anchorage

U.S. Forest Service
Office of the Regional Forester, Juneau
Institute of Northern Forestry, Juneau

Alaska Forest Products Company, Inc.
Haines, Alaska

Schnabel Lumber Company, Inc.
Haines, Alaska

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INTRODUCTION

This report is the result of two forestry economics research programs at the University of Alaska's Institute of Social, Economic and Government Research. The first research program, initiated in mid-1966, estimated the amounts of timber presently and potentially available for pulpchips in the Haines Area of Alaska and evaluated chipping alternatives that would complement available and potential timber residues and utilization. The costs of establishing particular kinds of chipping facilities at Haines were also estimated.

The second research program, was started in late 1966. It continued and expanded the Haines investigation and was primarily intended to identify current utilization in Haines and to suggest possible new utilization alternatives. A major portion of the research was also directed at investigating the overall economy of the Haines Area of Alaska, and particular emphasis was placed on the role of the forestry sector in the local economy.

The scope of the research was intended to be extensive in nature, although intensive sampling and investigation was used at two key points in order to provide the background information necessary to proceed with suggestions on utilization alternatives. Information on the forestry sector and its role in the community's economy were heavily supplemented by interviews. Since the principal investigator spent some two months, the associated investigator one week, and the three research assistants between two and three months in the Haines Area, which has a limited population, nearly all employers and a majority of employed persons were interviewed at one time or another. Formal interviews are listed in the Bibliography.

The organization of the report follows the order of placing the "Summary, Conclusions and Recommendations" in the front of the report. The chapters which follow logically proceed from a description of the forest resource through current utilization to utilization alternatives. The remainder of the report discusses the forestry sector of the economy at Haines and indicates the extent to which the community is dependent on forestry and forest products.

THE FOREST ECONOMY OF HAINES, ALASKA

CHAPTER I.

SUMMARY

This report describes the timber resource base of the Haines area of Alaska. It discusses current utilization of the resource and the resultant economic activity generaged in the community. Several harvesting and manufacturing alternatives are suggested to improve the efficiency of overall forest utilization and strengthen the export base of the community.

The Forest Resource

The timberlands accessible to Haines, Alaska, consist of three main components. First, adjacent to the community are some 129,000 acres of commercial forest land under state, private, federal (Bureau of Land Management), and Indian (Bureau of Indian Affairs) ownership. Two, to the east and south, lie the Skagway Block and the Lynn Canal Block of the North Tongass National Forest. This contains 123,000 acres of commercial forest. Last, to the north, in British Columbia, some 13,000 acres of commercial timber are located in connecting river valleys. The first component is readily available for utilization in Haines. The latter two components come within the Haines sphere of influence, but utilization would involve high extraction costs and some public policy changes.

Major species include Sitka spruce (some 50 per cent of the stands) and western hemlock. Minor hardwood species account for approximately 10 per cent of the stands. This is comprised mainly of cottonwood. More than 70 per cent of the timber on lands adjacent to Haines is old growth sawtimber. The Forest Service blocks and the British Columbia acreage are estimated to be 80 per cent old growth timber. Considerable cull is evident in these old growth stands, particularly in large diameter hemlock. Annual mortality appears to be very high in old growth Sitka spruce.

Total accessible timber and potentially accessible timber in the next few years in the Haines area is estimated at 3,260 million gross board feet. An additional 3,740 million gross board feet is located on adjacent National Forest lands to the south and in British Columbia to the north. Limited information indicates old growth stands in the Haines area average some 28,000 board feet to the acre. An annual cut of softwood in the immediate Haines area (depending on individual ownership objectives and policy) might reasonably range from 32 million board feet to 48 million board feet. Some 51 million board feet to 64 million board feet of potential annual cut are on adjacent Forest Service land, and 20 million board feet or more, depending on specific policy and management conditions, might be available from British Columbia. Improved accessibility would increase both the Forest Service and the British Columbia estimates.

Current Utilization

Timber utilization in Haines in 1966 consisted of exports to Japan of logs and the product of two mills which cut cants or large flitches.[1] In 1967 one mill completed installation of a chipping unit to convert mill residues to chips. These mills are reasonably simple in layout and operation in comparison to the traditional concept of a sawmill.

Both mills to date have concentrated on cutting reasonably high quality Sitka spruce cants. Thickness and particularly length of cant

[1] Figure 3, p. 43, illustrates the product.

are cut to Japanese specifications. Cants, commonly referred to as 6", 7", and 8" cants, actually have a minimum thickness of 6-1/2", 7-1/2", and 8-1/2". Thus, a 6" cant has a thickness of at least 6-1/2", but less than 7-1/2". A cant measuring over 7" but less than 7-1/2", is counted as 6". Marketable lengths are 13 feet, 20 feet, and 26 feet. The 26 foot length predominates and a 3" to 12" trim allowance is allowed.

One mill began operations in 1965, the other in 1967. Previous to its permanent establishment in 1967 one firm operated two portable cant sawmills in the woods.

The first significant cant shipments to Japan occurred in 1963 when 5-1/2 million board feet were exported. An increase in exports occurred from 1965 to 1966 (from 10 million to 31 million board feet) with the advent of the first permanent mill. With the second permanent mill in 1967, exports increased from 31 million to 76 million board feet on the basis of mill tally.

Both mills depend on regular and large volume production for profits. From 1963 to 1967, no significant change occurred in the average price received for cants, and increased revenues were due to greater output and improved efficiency.

Under conditions of low stumpage value and small sales, round log export could be more profitable to individual logging firms than cutting logs for sale to the cant mills. While the value added in manufacture reported was higher for cants prior to 1967, and resulted in a greater income to the state, profits to the individual logger or firm appear to be slightly higher in log export.[2] A logger with sufficient capital

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[2]Based on limited evidence as discussed in Chapter IV, on an equal volume basis, the price received for logs in 1967 exceeded the price received for cants. Thus, log export appeared to be a more attractive alternative than manufacture.

to purchase stumpage and run a log export operation could probably make more profit than if he were contract logging for a mill. However, most loggers in the Haines area of Alaska operate on a small scale with limited capital. Hence, a third party agreement involving financing of contract logging is necessary. This reduces the profitability of the operation to the logger to essentially the same as contract logging for a mill. The differential income effect between log export scales and the primary manufacture of cants warrants further investigation, because the matter is vital to economic development in many Alaskan communities.

The manufacture of cants produces a waste factor of approximately 21 per cent of the cubic volume of log inputs. Of this loss factor, 5 per cent is sawdust and 16 per cent is sound residual wood comprised of slabs. (See Table 6.) This debarked slab material is suitable for the manufacture of pulpchips, and chipping appears feasible under current conditions. Based on current average mill production at Haines, about 75 bone dry tons of chips could be produced per day from this material. Additional tonnage would also be available if the cants or flitches were slabbed again to produce a squared product. This is the procedure at other export mills in Alaska. Chipping would provide additional revenues from this by-product, resulting in approximately 9 per cent more chippable wood from which currently no income is received. Also, the resultant volume of squared product then could be more accurately measured in board feet.

Current utilization at Haines converts 1,000 board feet of logs (measured Scribner Decimal C rule) into 1,450 board feet of cants on the basis of mill tally. The 1,450 board feet mill tally estimate (on the basis of total cant volume in cubic feet converted to board feet, i.e., 1 cubic foot equals 12 board feet) actually amounts to 1,700 board feet. (See Table 10.) The practice whereby mill tally is taken as the equivalent of a "Brereton" scale, based on the sampling and research shown in this report, results in a 17 per cent underestimation of wood volume.[3]

In addition to production studies at the mill, tests were conducted to determine the difference between stumpage sales and mill inputs. The mill studies indicated over 95 per cent of mill inputs were Sitka spruce. Similarily, total exports from Haines since 1963 have been not less than 94 per cent Sitka spruce (1965) in any one year. Past records of the Bureau of Land Management and the Alaska Division of Lands, the major stumpage sellers, indicate that on a total volume basis, 67 per cent of sales was Sitka spruce, 31 per cent hemlock, and some 2 per cent cottonwood. This leads to the following conclusions: (1) hemlock sale volumes are not being cut as quickly as expected, and/or (2) in sales that have been cut, hemlock volumes are residual to logging in a high degree. Sale and cut records of the Alaska Division of Lands tend to support the first point, as did visual inspection of known areas of recent logging activity in the Haines area. Results of sampling logged areas in regard to logging residue support the second point. Since the forest inventory for the Haines area of Alaska indicates that about 50 per cent of the stands are

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[3]The Japanese frequently report timber imports on the basis of a "Brereton" scale (i.e., Japan Lumber Journal, April 10, 1967) which gives the actual board foot content of the timber product. Usually the term is applied only to logs. However, the basic concept of the Brereton scale (i.e., accurately estimated cubic foot volume times 12) can be applied to accurately determine the board foot content of logs, flitches, cants, squares, and lumber. If, as in the Haines case, the estimated board foot content of the cants divided by 12 does not give the cubic foot volume, the measure is inaccurate.

Sitka spruce, continued heavy utilization of Sitka spruce implies a heavy accumulation of hemlock and an eventual drastic shift in species utilization.

Plot samples in logged areas indicated 1,090 cubic feet (or 5,300 board feet of sound wood measured to an eight inch top) are residual to current logging. (See Table 5.) On the average, about twice as much sound residual wood was hemlock compared to spruce. Average stump height exceeded 18" and average diameter of tops exceeded 8". Significant quantities of sound wood were found in log, log segment, or stem form. An estimated 20 per cent of the average residual volume per acre could be milled to present market specification. However, due to size and/or quality, the possibility exists that adverse economies of handling, hauling, and milling could make manufacture of this material a marginal operation.

Utilization Alternatives

Up to and including 1966, cant manufacturing appeared more attractive than log export as an alternative in terms of export sales value. Regular and significant gains in Haines employment were evident in forest-based industries, and the value added in manufacture was relatively high compared to other basic industries of the area. However, by the end of 1967, the average selling value of logs on an equal volume basis exceeded that of cants. In late 1967, log export appeared more attractive than cant manufacture. Traditional lumber manufacture and veneer manufacture do not appear to be feasible alternatives to cant manufacture at this time. Cant production is estimated to be a profitable enterprise if the delivered cost of sawlogs is less than $45 per thousand board feet, Scribner Decimal C scale. (See "Cant Manufacture," p. 61.) Veneer manufacture appears feasible on a small to moderate capacity basis using highly efficient labor saving equipment.

Integrated utilization, where slab waste from cant manufacturing and waste incurred from logging are used to produce pulpchips, appears feasible. Chipping slab wastes ranks as first choice based on rate of return estimates, but logging residues could also be profitably chipped. Chipping of low quality timber marginal for the manufacture of cants does not appear feasible if the integrated operation sacrifices cant production for chip capacity. Heavy duty, portable equipment to chip pulpwood in the woods seems to be a better alternative, if chip manufacture would reduce cant production. Taken altogether, the "best" alternative for Haines evaluated in this report would be "full" cant production, using a debarker and the chipping of both mill and logging residues. It is assumed that the price received for chips would be greater than $10.44, but less than $15 per bone dry ton.

Economic Impact upon the Haines Area

The successful introduction of logging and cant manufacturing enterprises in the Haines area has led to major changes in the economic base of the region. Marked employment gains were registered in the past three years, and the forest products industry has stimulated an economy which was dormant in practically every sector in 1962-63.

Economic Indicators: Employment and Income

The expansion of forest products output, sold almost exclusively to Japanese buyers, has been associated with a direct increase in manufacturing employment. The initial annual increases were large, partially representing the construction of mills and loading facilities. More recently, manufacturing employment has grown to approximately 2.6 fully employed persons per million board feet exported (measured Scribner Decimal C). As export sales of forest products continue to expand, employment in forest-based industries should grow to the limit imposed by sustained yield forest management.

Additional employment and income would result from greater utilization of the existing timber sales. This might occur through debarking and chipping operations based on present logging practices or through utilizing additional wood fiber (e.g., short lengths, less desirable export species). By and large, the major benefits from these activities have been limited to a direct employment impact, which in turn has stabilized the Haines economy.

For the decade prior to 1963, the local economy has undergone recurring short periods of prosperity and recession, based principally upon vacillating annual salmon catches and erratic construction activity. With the introduction of wood products manufacturing, more predictable employment patterns have appeared, and year to year business conditions have become more stable with longer term growth readily apparent.

By the close of 1967, forestry had become the major private industry in the entire Icy Straits - Lynn Canal labor market area, having surpassed fisheries in importance for generating personal income to residents. In contrast to many Alaska communities, the Haines economic base is comprised of relatively small complements of employment and income from the federal agencies and contract construction. These same industries differed markedly in terms of their respective contributions to local spending, or secondary benefits.

Secondary Benefits

The introduction of cant manufacturing in Haines occurred at a time when fisheries harvesting declined and a very modest growth from tourism appeared. As a consequence, these changes were offsetting, and the overall economic impact of forest products manufacturing growth was extremely dampened. In particular, retail/wholesale trade and service sectors have not improved directly and markedly in terms of employment with expanding export sales of lumber. Even without these offsetting conditions, the secondary employment benefits from lumber and cant manufacture would have been small in terms of indirect employment growth.

The major secondary benefits of this new industry have been substantiated. In order of magnitude, these are:

(1) Local income generated through wholesale/retail sales and taxes.

(2) Addition of full-time residents and improved property tax base.

(3) Net additional revenues to land owners, particularly the State of Alaska.

Increased utilization of the forest resource has led to the previously mentioned primary benefits and the above secondary benefits. However, based on this study, there are no readily identifiable differences in secondary benefits derived from cant manufacture rather than log export.

Conclusions and Recommendations

This study is a detailed examination of forest utilization in a confined region and its effects on a specific Alaskan community. Due to the diversity and broad scope of the study, as well as sampling limitations, some specific economic benefits of the industry could not be isolated. However, recognition of the following conclusions and implementation of the following recommendations could lead to improved forest utilization and increased economic benefits in the Haines area.

From the examination of changes in the structure of the Haines economy, it was concluded that several of the findings would apply to other Alaskan communities in which new forest products manufacturing might be introduced.

Conclusions

(1) The isolated location of the Haines community and the existence of unattractive domestic shipping costs have to date limited profitable sales of forest products from Haines to a one buyer market -- Japan.

(2) Present Japanese product specifications are not conducive to utilizing a large portion of the timber resource; although improvements have been noted, only selected components of the resource have been harvested and utilized.

(3) The current trend in cutting practice in the area favors the harvest of one species (Sitka spruce) and large volumes of uncut western hemlock are being left. Also, current utilization favors higher quality timber, resulting in lower quality old growth timber becoming an increasing proportion of the remaining stands.

(4) During 1966-67 about 5,300 board feet per acre of sound wood was left as residue in harvesting. Some 20 per cent of this volume was of a size and quality acceptable for use in manufacture under current market specifications. Approximately 16 per cent of the mill log inputs used in cant manufacturing end up as slab waste. These wastes could be utilized in chipping to increase the overall economic contribution of the resource.

(5) Since the Haines cant mills do not own supplies of standing timber, and since private ownership of timber in the area is only a minor source of supply, the mills are now caught between public timber (State of Alaska) ownership policies and product buyer desires. In order to conform to market specifications, the mills are often forced to directly or indirectly oppose some public timber management policies which support sustained yield and increased resource productivity.

(6) Additional markets and new manufacturing opportunities are needed in the area to better utilize the timber resource. The manufacture of pulpchips appears to be a feasible complementary operation to the cutting of cants. Its successful introduction would reduce the amount of timber now being wasted, and would enable utilization of lower quality timber not now being harvested.

(7) On nearly every basis of comparison, the "better" utilization alternative economically for the Haines area is cant manufacturing, rather than lumber manufacture. This would be even more beneficial with the introduction of pulpchipping, which would utilize slab waste from cant cutting and/or logging residue.

(8) Limited and temporary evidence indicated that round log export, where permitted in the Haines area, provided greater gross revenues per unit volume than cant manufacture in 1967.

(9) Volume conversion factors between mill inputs and outputs are not standardized (i.e., are not commonly recognized by other than the specific trade). Outputs on a mill tally basis, when compared with standardized units of measure (i.e., actual board feet as is the case with squares or lumber), are consistently underestimated. If mill tally is assumed to be equivalent to a "Brereton" scale (i.e., actual board foot content of the cant without allowances), the underestimation of volume amounts to approximately 17 per cent. In other words, if cants are considered as "lumber" type products, production has been much larger than commonly reported and selling prices effectively lower than popularly perceived.

(10) Any additional annual increase in timber harvesting and forest product manufacturing in Haines might endanger a sustained yield management program of the Haines area timber unless the timbershed is expanded. Additional timber could come from the Tongass National Forest or from the Province of British Columbia.

(11) More than one-third of the employment in the Haines area is dependent on the export of forest products. On an annual basis, approximately 2.6 jobs result from every million board feet of logs manufactured into cants and exported. Government is the next most important employer, generating slightly less than one-quarter of all jobs in the area.

(12) The Haines growth experience in employment and income are typical of that which could be forecast for other similarly remotely situated Alaskan communities, that have sufficient commercial forests and marketable species. Japanese buyers represent a firm export market, and local benefits from this type of foreign trade are substantial.

(13) Income benefits could not be fully substantiated for the community. Based on direct gross income (wages and salaries), a provisional estimate of approximately $13,500 per person employed in harvesting, handling or manufacturing a forest product (including management) was formulated.

(14) Community adjustment to a new manufacturing industry rarely represents a "cure" for local unemployment problems by itself. Manufacturers hire laborers with specific and current skills, and frequently these are imported from outside the community. Local hiring normally is a more gradual process. Well trained and skilled Alaskans must be willing to migrate to those areas where natural resource-based manufacturing is developing, or face the prospect of lost job opportunities.

(15) Logging and milling operations represent a kind of manufacturing that is relatively stable seasonally, and in which the longer run employment opportunities are favorable. This new manufacturing represents a more broad and diversified industrial base in the community and is appropriate if employment conditions are to be improved year after year. In particular, it represents a way in which young adults now entering the labor force might be employed locally, or at least within the state.

(16) Wood products manufacturing of the type observed in Haines represents an example of a single community within the framework of longer term forestry development of national forests and state forest lands. Taken in this historical perspective, additional mills should appear in fairly rapid order at other similar locations.

Recommendations

(1) Cant manufacturing for Japanese markets should presently be maintained as the most feasible product. However, increased benefits might be derived if the scope of primary manufacture were broadened (i.e., resaw facilities) to further reduce cants produced at Haines into squares more similar to the product now sold to the Japanese from Wrangell, Alaska, and areas of British Columbia.

(2) Cant outputs from higher quality Sitka spruce from the Haines area should not be increased. More hemlock and lower quality spruce should be utilized.

(3) Primary products of irregular shape such as cants are difficult to measure accurately. A cubic foot measure of volume would be more accurate than the currently used mill tally system but extremely difficult to calculate. Scaling by weight could be both expedient and accurate and warrants investigation. No allowance should be made for resawing or unslabbed segments. Cants should be recognized as products containing wood for resawing as well as pulpchips. If reduced to squares they would be subject to a more accurate measurement by an actual board foot lumber tally, and the additional slabbing would result in increased wood for pulpchip manufacture in Haines.

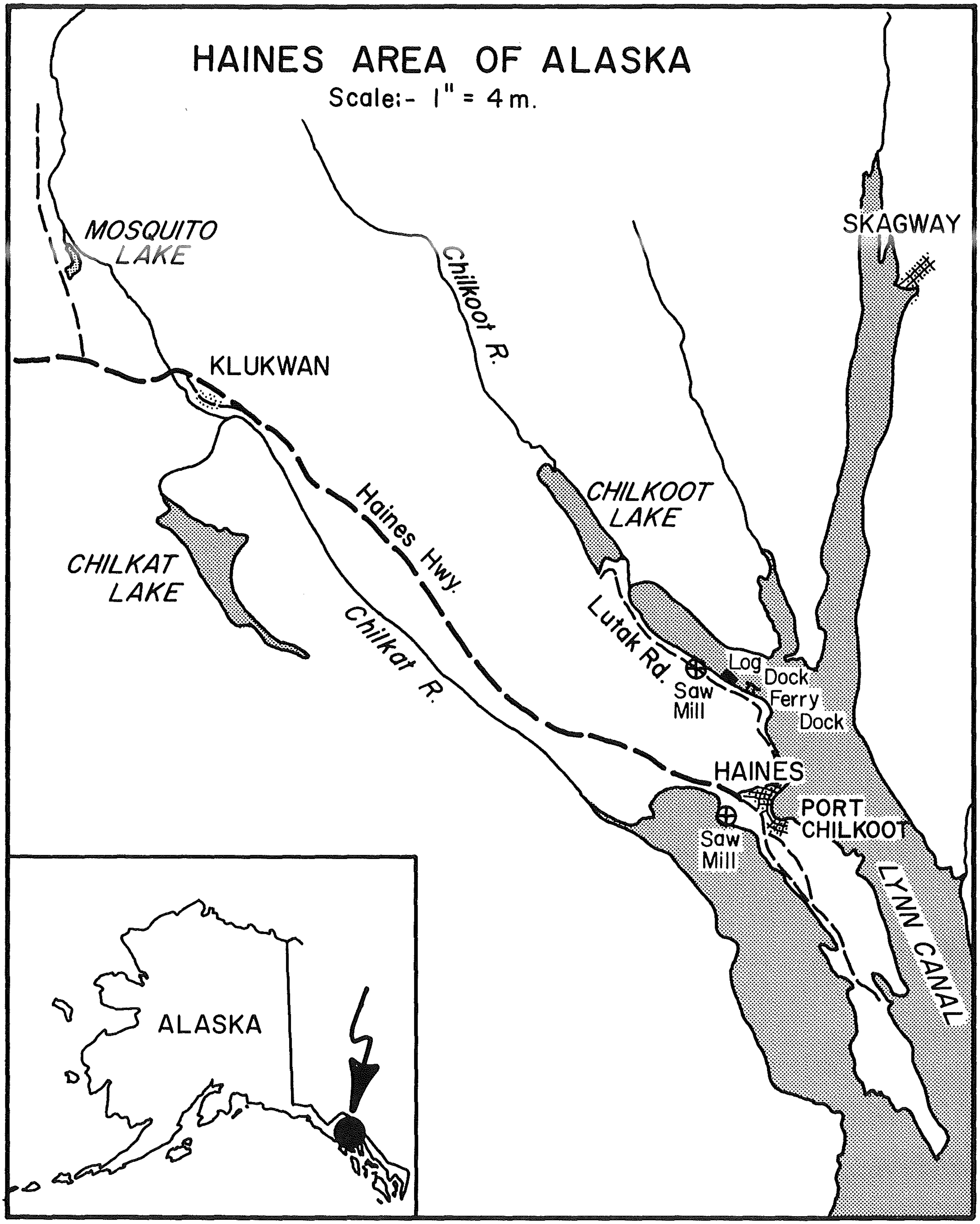
(4) The State of Alaska should inquire into any price-cost situations such as that which developed in 1967. At that time the limited but fairly conclusive evidence discussed in this report indicated that the average price of exported logs exceeded the average price of exported cants on an equal volume basis. This price-cost situation negated most of the economic advantages gained by public regulation of round log export. In such circumstances the following courses of action should be

considered: (a) a re-evaluation of log export policy in terms of stated goals and economic social costs, (b) re-evaluation of stumpage appraisal policies, or (c) investigation of ways and means of hastening development of alternative markets, improving buyer competition and thus effecting a relative increase in the price of cants.

(5) Government and private enterprise should make every effort to further the establishment of integrated timber utilization facilities in the Haines area, to make better use of raw timber products now being wasted, and to increase the timber industry's contribution to the economy of the area. One feasible facility appears to be the manufacture of cants or squares for the Japanese market with the manufacture of pulpchips for domestic or foreign markets. In addition, after a length of time in which to validate the feasibility of this integrated utilization approach all state timber sale contracts should contain enforceable regulations such that the sustained yield capacity and the productivity of the total resource is maintained or improved.

(6) Public agencies and private firms elsewhere that are linked to the Haines forest products industry should aid the industry in expediting changes in policy and/or methods of operation that will make the industry more efficient and less economically wasteful of a valuable natural resource.

FIGURE 1


HAINES AREA OF ALASKA
Scale:- 1" = 4 m.
MOSQUITO LAKE
KLUKWAN
Chilkoot R.
SKAGWAY
CHILKOOT LAKE
Haines Hwy.
CHILKAT LAKE
Lutak Rd.
Chilkat R.
Log Dock
Saw Mill
Ferry Dock
HAINES
PORT CHILKOOT
Saw Mill
LYNN CANAL
ALASKA

CHAPTER II

THE FOREST RESOURCE

The Haines area of Alaska (Figure 1) has an extensive forest resource base. Not only are diverse ownerships present, but also diverse topography, causing the raw material source in support of economic activity to endure a large measure of friction in allocation. This chapter is concerned with recognizing one sphere of economic activity (i.e., primary manufacturing of wood products in Haines, Alaska) and attempts to suggest alternatives in supplying the raw materials necessary to support that activity regardless of topography, ownership and political boundaries. Considering that the forest resource is constant in biological characteristics in the short run (i.e., supply) and that current industry is established on the basis of servicing markets (i.e., demand), which is unlikely to change in the short run; any major change will be the result of either political or social action, largely divorced from present economic rationale, or from policy changes on the part of various ownership classes within the total timbershed.

The total geographical area concerned is that which is influenced or which might be influenced in the short run by forest utilization at Haines. This includes land traversable by road or water in the peninsulas and river valleys in and around Haines. It also includes lands to the south accessible by water, via the Lynn Canal, and lands across the international boundary in British Columbia which are accessible by road now, or may be accessible in the near future. The tables and commentary in this chapter are presented by sub-divisions in order to adequately represent any or all ownerships which might, depending on the degree of "trade," "market," or "allocation" barriers, play a role in the timber based economy of Haines, Alaska.

Areas and Ownerships

The forest areas involved in this chapter on the whole support three major West Coast timber species; namely, Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*), and black cottonwood (*Populus trichocarpa*). Other species are a very small part of the total forest resource and are mainly considered as non-commercial under present and near future conditions. Stands are largely old growth and vary in quality and accessibility. The diversity of ownership or administration is a further complicating factor added to the rugged topographic divisions of the region.

Commercial forest land[1] is defined on a basis of being accessible or inaccessible to establish some rationale for economic activity. Accessible is broadly considered to be that land which can be logged, with little or no change in present economic and technological conditions. Commercial forest land ownership is given in Table 1 and its approximate location is shown in Figure 2. Closest to Haines are the state lands and the "private and other" classifications. Also, intermingled here are the Bureau of Indian Affairs (BIA) lands. Further away, but still within political or economic reach are the Bureau of Land Management (BLM) lands, lands administered by the U.S. Forest Service and land in the Canadian Province of British Columbia. Some 265,600 acres of commercial forest

[1]Lands capable of producing useable crops of industrial wood, provided, however, such land under current conditions would product 8,000 board feet of useable timber per acre.

TABLE 1.

Commercial Forest Acreage and Ownership Pattern for

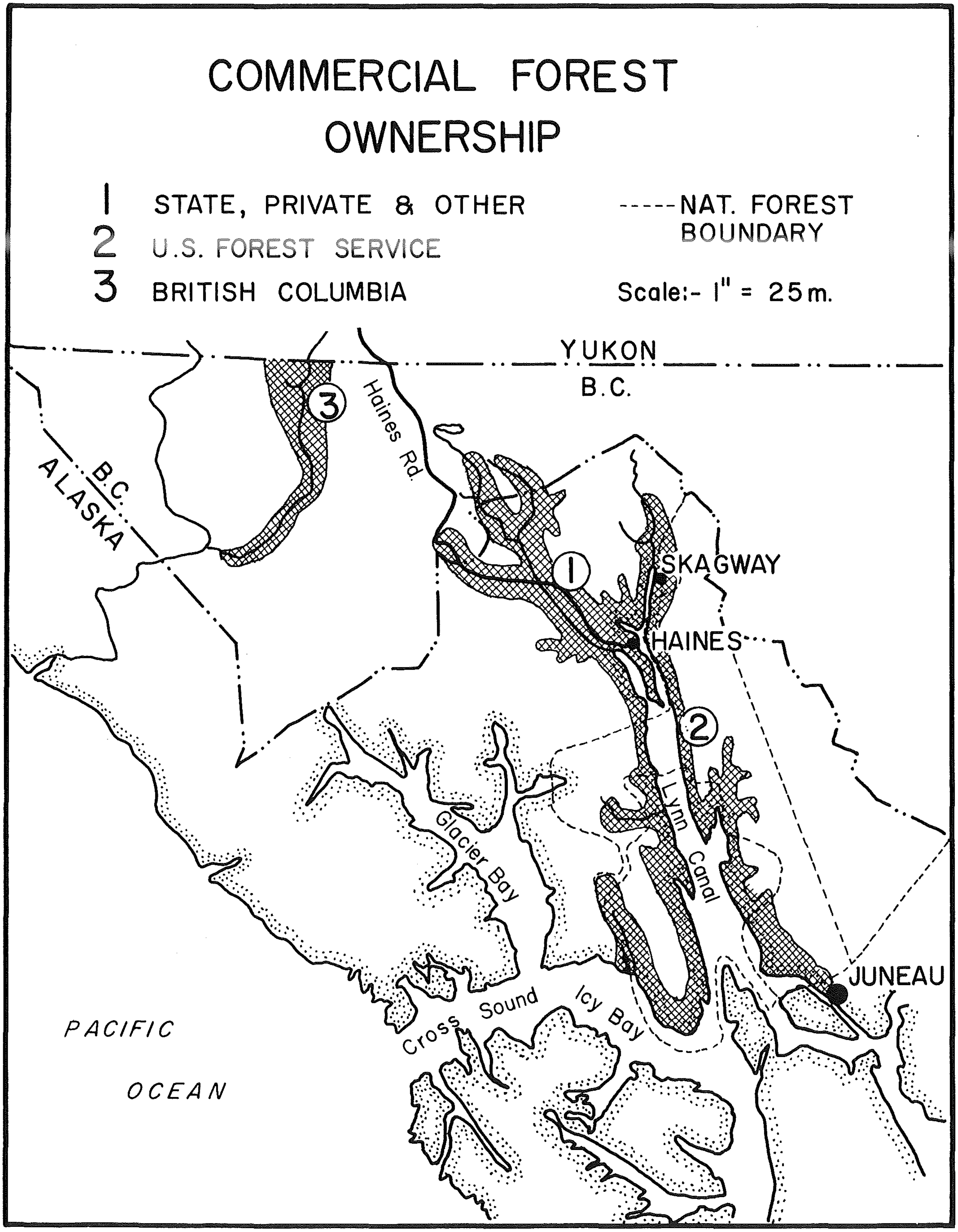
the Upper Lynn Canal and Adjacent Areas, 1967

Ownership or Administration		Commercial Forest Acreage: Accessible Acres	Accessible Percent		Inaccessible Acres	Inaccessible Percent
Federal Land			%			%
Bureau of Indian Affairs[1]		3,512	1			
U.S. Forest Service						
Skagway Block	61,250			31,150		
Lynn Canal Block	61,300	122,550	46	26,100	57,250	33
Bureau of Land Management		6,545	3		7,455	4
Provincial Land						
British Columbia		13,584	5		108,291	63
State Land						
Community Grant	64					
General Grant	5,351					
Mental Health	61,440					
School	1,191					
University	9,730	77,776	29			
Private and Other[2]		41,600	16			
TOTAL FOREST ACREAGE		265,567	100		172,996	100

[1] Includes 295 acres in the vicinity of Gustovus and Icy Strait, and 1039 acres in Indian Reservations near Haines.

[2] Includes acreages of private land and land in or being processed for State selection, and minor miscellaneous ownerships acreages.

SOURCE: Bureau of Indian Affairs (11), Caporaso (12), U.S. Forest Service (28), (32), Alaska Division of Lands (38), Faulkner (44), (45), and British Columbia Forest Service (49), (50).


COMMERCIAL FOREST
OWNERSHIP
1 STATE, PRIVATE & OTHER
2 U.S. FOREST SERVICE
3 BRITISH COLUMBIA
-----NAT. FOREST BOUNDARY
Scale:- 1" = 25 m.
YUKON
B.C.
B.C.
ALASKA
Haines Rd.
SKAGWAY
HAINES
JUNEAU
Lynn Canal
Glacier Bay
Icy Bay
Cross Sound
PACIFIC
OCEAN

are currently accessible. Of this total, and closest to Haines, about 129,400 acres are mingled ownerships, involving state, BIA, private, BLM, and miscellaneous ownerships. Some additional 122,600 acres are in the National Forest directly south of Haines, and some 13,600 acres are north and east of Haines in the Province of British Columbia.

Timber Volumes

Gross timber volumes on commercial forest land are shown in Table 2. These are presented by predominant species and ownership patterns. The figures reported represent a volume measure of the timber resource under current conditions in poletimber, small sawtimber and large sawtimber. More than 70 per cent of the volume of the BIA, BLM, state, and private ownership group is in old growth sawtimber, while more than 80 per cent of the volume is old growth in the U.S. Forest Service and British Columbia ownerships. Total accessible timber volume for all ownerships is currently estimated to exceed 7,000 million board feet. If timber from the National Forest and British Columbia is omitted, the volume would be some 3,260 million board feet.

Annual Cut

Annual cut figures for the upper Lynn Canal and adjacent areas are difficult to estimate because of wide variation in land ownership, accessibility, management policy, resource characteristics (particularly considering a high proportion of old growth timber with a possible high

TABLE 2.

Gross Volumes of Timber on Commercial Forest Land for the

Upper Lynn Canal and Adjacent Areas, 1967[1]

Ownership or Administration	Sitka Spruce		Western Hemlock		Cottonwood & Miscellaneous	
	Accessible[2]	Inaccessible	Accessible[2]	Inaccessible	Accessible[2]	Inaccessible
	(------------------------	----	-----millions of board feet	----	----	---------------------)
Bureau of Indian Affairs	22.5	----	6.5	----	13.8	----
U.S. Forest Service						
Skagway Block	954.0	485.0	744.0	378.0	7.3	3.7
Lynn Canal Block	700.0	298.0	1,066.0	455.0	2.1	0.9
	1,654.0	783.0	1,810.0	833.0	9.4	4.6
British Columbia	163.6	806.1	28.3	791.0	81.2	631.6
State of Alaska						
Community Grant	0.7	----	0.7	----	----	----
General Grant	56.5	----	35.2	----	13.9	----
Mental Health	859.0	----	714.0	----	97.5	----
School	13.8	----	11.2	----	4.0	----
University	133.2	-----	89.7	-----	37.0	-----
	1,063.2		850.8		152.4	
Bureau of Land Management	79.4	90.4	65.2	64.3	12.0	13.7
Private and other[3]	504.1	----	414.2	----	76.1	----
TOTAL ALL OWNERSHIPS	3,486.8	1,679.5	3,175.0	1,698.3	344.9	649.9

[1]Bureau of Indian Affairs and British Columbia figures for small sawtimber and larger, all other figures poletimber and larger. British Columbia figures converted from cubic feet on the basis of 1 cu. ft. = 5 bd. ft. log scale; B.I.A. and U.S. Forest Service on the basis of Scribner Decimal C log rule; State, B.L.M. and private on the basis of International 1/4 in. log rule. No allowance for deductions for cull.

[2]Accessible is broadly defined as that land which can be logged with little or no change in present economic or technological conditions. Possible decreases in the "accessible" and increases in the "inaccessible" component of the U.S. Forest Service estimates might be forthcoming with revised inventory estimates. Regional Office, U.S. Forest Service, Nov. 18, 1968.

[3]Includes acreages of private land and land in or being processed for State selection, and minor miscellaneous ownerships acreages.

SOURCE: Bureau of Indian Affairs (11), Caporaso (12), U.S. Forest Service (28), (32), Alaska Division of Lands (38), Faulkner (44), (45), and British Columbia Forest Service, (49), (50).

incidence of quality deterioration) and biological information on site, growth, and mortality, etc. The figures shown in Table 3 are based on the acreages and volumes used in Tables 1 and 2. They are presented in three logical ownership groups combining major management policy similarities as well as ease of accessibility. Three estimates were derived under three different sets of assumptions which cover basic approaches to sustained-yield forest management.[2] The three estimates range from a conservative approach (i.e., area control) to an approach designed specifically for the Haines area situation (i.e., old growth liquidation). However, the slightly more liberal old growth liquidation approach is still an estimate based on the principal of sustained yield.

Estimate A simply implies cutting 1/100 of the total harvestable commercial forest acreage every year. Unless mortality exceeds growth, which cannot be discounted in an area with a high percentage of old growth timber, or proper silvicultural and management policies are not carried out on harvested land, annual volumes should be low in comparison to the actual commercial forest productivity. Emphasizing area rather than volume could result in a high probability of underestimating what might be cut each year when allowances are not being made for cumulative growth and original estimates are based on old growth timber approaching zero in growth potential. A very real danger in this method applied in this situation is that the old growth would not be cut fast enough (i.e., mortality in many stands might drastically exceed growth) and net losses

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[2] Davis, (73) Chapter 7; particularly "Application of Area Control Summarized," p. 129, and "The main features of Hanzlik's method---," p. 138.

TABLE 3.

Annual Cut Estimates for the Commercial Forest Acreage in the Upper Lynn Canal and Adjacent Areas, 1967

Ownership or Administration[1]	Sitka Spruce	Western Hemlock	Cottonwood & Miscellaneous
		(Thousands of Board Feet)	
Estimate A - Area Control[2]			
U.S. Forest Service	24,370	26,430	140
British Columbia	9,697	8,193	7,128
All Other Ownerships	17,596	14,733	2,680
Total All Ownerships	51,663	48,733	9,948
Estimate B - Growing Stock and Increment[3] (Hanzlik's Formula)			
U.S. Forest Service	30,726	33,332	180
British Columbia	10,087	9,490	7,614
All Other Ownerships	20,456	25,420	7,950
Total All Ownerships	61,269	68,242	15,744
Estimate C - Old Growth Liquidation[4]			
U.S. Forest Service	30,506	33,122	192
British Columbia[5]	3,271	566	1,625
All Other Ownerships	25,146	22,810	4,952
Total All Ownerships	58,923	56,498	6,769

[1]Grouped from previous tables on the basis of intermingled or widely separate areas and/or similar timber management policies.

[2]Estimate A - Assumptions: 100 year rotation--cut 1/100 of total acreage per year starting with mature timber. Inaccessible timber will be accessible before the end of the rotation. Proportional harvesting of species on basis of current volumes. Davis (73).

[3]Estimate B - Assumptions: 100 year rotation; old growth cut first; inaccessible will become accessible before the end of the rotation; annual growth calculated on basis of U.S.F.S. data (32) and (28).

[4]Estimate C - Assumptions: Cut only accessible, mature, old growth for the next 50 years until liquidated. Then, cut old growth inaccessible that has become accessible. No cutting of any young growth or poletimber until after 50 to 75 years, whether classified accessible or inaccessible. No re-cutting any area until after approximately 100 years. If maturing timber volume accumulation is taken at three per cent per year on young growth sawtimber and poletimber and inaccessible becomes accessible in 50 to 75 years, no decrease in annual cut is expected after old growth liquidation.

[5]Based on two accessible river valleys only; total volume available times 50. If a sale were made, it is entirely likely a larger area would be considered as the management unit and hence, a larger cut would be allowed in a shorter time period in any one river valley that was accessible.

SOURCE: Derived by the author from data sources listed in Table 1.

in timber harvesting on an annual basis would be incurred because young stands with a high growth potential were not established for future years.

Estimate B, based on Hanzliks' Formula, takes into account growing stock, and particularly old growth as well as the average annual growth of younger timber which is to be harvested in future years. An inherent weakness in this method is that the accuracy of estimation is severely impaired if an excessive acreage and volume is in old growth -- which is precisely the case in the Haines area. This estimate is really an adjusted area control method on the basis of minor increment adjustments.[3] If increment information or management policies enforcing good silvicultural practices are lacking, then less than sustained yield cutting might result.

Estimate C does not differ widely in method from Estimate B. However, the approach is different and thought to be far more practical for the Haines area. Primarily, it separates the consideration of growing stock into mature and immature timber (i.e., old growth and young growth plus increment. This is done on the basis of the rotation time period involved. It also allows an easy check (i.e., first time period--old growth cutting) on volume versus acreage in cutting. Essentially the cut would be very similar whether based on a volume estimate or area control. It has the additional advantage of focusing attention on cutting old growth accessible timber first and young or second growth timber or inaccessible timber at a later date. Inherently, one weakness would be alienation of cut productive forest lands to uses other than timber growing. This would result in cut reductions during the second time period to maintain

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[3]Davis (73), p. 138.

sustained yield. However, this could be planned for, and margins allowed to cover this eventuality.

On the basis of U.S. Forest Service data for the Lynn Canal blocks (listed as U.S. Forest Service in the three estimates) total annual growth was calculated as an approximation, using compound interest, to be cut only after a time lapse of 50 years. Furthermore, an allowance was made for one per cent of compounded or cumulative growth (i.e., estimated four per cent, used in calculations three per cent) which would amount to a larger cut in the future of 25 per cent (or 25 per cent margin for alternative uses or failure to implement appropriate management on cut stands). Essentially, this method implies not making any cuts in other than old growth -- in short, not considering cutting any increment on the average, as in the Hanzlik formula, but allowing it to accumulate for 50 years.

One noticeable difference between Estimate B and Estimate C is for the "all other ownerships" classification. In the first case, the cut on old growth spruce is low in relation to the cut on hemlock which is weighted more heavily with non-old growth accessible timber. In the second case old growth accessible spruce would be cut more heavily and hemlock stands more conservatively (i.e., proportionately cutting in hemlock would be less in the first 50 years and more in the second 50 years). This should be balanced against management and market objectives, but the alternatives are clear -- the first involves possible cuts in other than old growth timber and reliance on the accuracy of average annual increment -- an estimation which is difficult to make for the Haines area considering that immature timber comprises a very minor portion of the total timber volume. The second alternative involves cutting in only old growth mature timber with a high incidence of mortality while leaving younger timber to grow and accumulate at either a "natural" rate or an increased rate, if improved methods and technology are feasible.

One additional note of caution might be added. During the first 50 years (considering Estimate C) if the incidence of decay or mortality proves higher in old growth hemlock than in spruce, then adjustments might be made in order to proportionately increase the hemlock cut and hold down the spruce cut. Additional calculations would then be evident. Estimate C is based on a simple break-even point of 50 years or one-half the estimated rotation. In actuality, this need not necessarily be the case. A basic method for calculating the time periods applicable could be developed with the use of a computer if sufficient data were available.

Considering all three estimates advanced in Table 3, Estimate A might be considered conservative and Estimates B and C somewhat more realistic. Without considering British Columbia, the latter two are really comparable.[4] Only the focus of attention and method of performance differ. Essentially, Estimate C brings the problem of liquidating old growth accessible timber into a position of precedence over other than old growth and inaccessible timber. In either case, the annual cut of timber in the upper Lynn Canal and adjacent areas should be in excess of 105 million board feet, not including British Columbia. National Forest

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[4]Available British Columbia estimates include only old growth timber. Also, under Estimate C, inaccessibility is not considered in the first period and other than old growth is needed to complete estimates for the second period. Hence, only old growth currently accessible was used for B.C. (Provided harvesting can be accomplished under current policy), and drastic underestimation of annual cut in the future is highly probable.

timber should involve about 60 million board feet annually, while the intermingled ownernship closer to Haines would involve about 45 million board feet.

Additional annual volumes might be available from British Columbia under specific conditions. While timber from British Columbia might logically be milled in Haines (other centers of utilization do not appear economically feasible at this time) major policy considerations must be considered.[5] Private industry in Haines would have the alternative of: (1) manufacturing British Columbia timber into a primary product by establishing milling facilities within British Columbia (i.e., a portable sawmill) or (2) applying for an export permit for timber in the round. In the second case, application must be made to the "Export Advisory Board" composed of both British Columbia Forest Service and private industry personnel. Accompanying the above application should be three refusals from independent forest products manufacturers in British Columbia stating a testimony of non-interest in the timber contemplated for purchase. The Board then makes recommendations to the government which, if acceptable, result in an "Order in Council" for the necessary permit to export round timber. Also, a permit can be issued by the government for the export of round logs where topographic or political boundary considerations preclude manufacture within the Province. Both these procedures have been instituted before. The timber sale of this nature is liable to be fairly short in duration and have minimum restrictions.

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[5] Additional policy clarification can be noted in the British Columbia Forest Act (57), obtained from the District Forester, Prince Rupert, British Columbia, or from Ranger Headquarters, Lower Post, British Columbia.

Resource Characteristics

The timber resource in the upper Lynn Canal area differs from that farther south along the canal in that a higher proportion of the resource is Sitka spruce rather than western hemlock. The Juneau Working Circle in the North Tongass National Forest is estimated on a volume basis to be 66 per cent hemlock, 32 per cent spruce, one per cent Alaska cedar and one per cent miscellaneous species.[6] Species composition by volume at the head of the canal (i.e., Haines-Skagway vicinity) has been estimated at 28 per cent hemlock, 62 per cent spruce, and 10 per cent other species which is comprised mainly of cottonwood.[7] More recently, the Institute of Northern Forestry has reported, on the basis of a statistical sampling of net volume of sawtimber, that species composition is approximately 47 per cent spruce, 43 per cent hemlock, and 10 per cent hardwoods.[8] Some nine per cent of the latter was cottonwood. Depending on measurement criteria, and the statistical accuracy of sampling, various estimates can be obtained. However, the important point is that Sitka spruce is the predominate species in the area, while farther south western hemlock predominates. Future utilization plans and both current and future management plans should consider this as well as other pertinent changes occuring in species composition via regeneration, cutting practices, etc.

Commercial forest land occurs from sea level to approximately 1,500 feet in elevation. Cottonwood stands occur mainly in lower river bottoms.

[6]U.S. Forest Service (28), p. 8.

[7]Faulkner (45), p. 9.

[8]U.S. Forest Service (32), Table 18.

Spruce and hemlock, in both pure and mixed stands, occur in benches and lower mountain slopes throughout the area.[9]

On both a volume and stand acreage basis old growth timber predominates. The National Forest timber in the Lynn Canal area is estimated on a volume basis as 94 per cent old growth sawtimber. On an acreage basis 89 per cent of the timber stands are old growth sawtimber, six per cent young growth sawtimber, two per cent poletimber and three per cent seedlings and saplings or non-stocked.[10] In the Haines-Skagway area on a net volume of growing stock basis, about 73 per cent is old growth sawtimber, 25 per cent young growth sawtimber, and 2 per cent poletimber.[11]

Considerable cull is evident in old growth stands. U.S. Forest Service estimates indicate that some two per cent of gross volumes are cull trees in spruce and 11 per cent in hemlock in the Juneau Working Circle. Also, average defect in live merchantable sawtimber trees is estimated to be 13 per cent for spruce and 23 per cent for hemlock.[12] Accurate estimates for cull in the Haines-Skagway area are not currently available. Foresters in the State Division of Lands and this author believe the above estimate might be applicable with the possible exception that old growth hemlock stands appear to have an even higher cull factor.

Table 4 indicates net volume of sawtimber in the Haines-Skagway area for the three major species by log grade. On this basis only two per cent of the mature resource can be considered high quality timber.

[9] Faulkner (44), (45).

[10] U.S. Forest Service (28).

[11] U.S. Forest Service (32), Table 10.

[12] Caporaso (12).

TABLE 4

Estimated Net Volume of Standing Sawtimber By Log Grade,

Haines-Skagway Area, 1965[1]

	Log Grade (thousands of board feet)[2]					Percent	
Species	Select and Peelers	1	2	3	4	Select & Peelers Grade 1	Select & Peelers Grades 1 & 2
Spruce	10,430	8,428	259,930	1,133,662	-----	1.3	19.7
Hemlock	6,667	30,615	249,802	952,611	-----	3.0	23.2
Cottonwood	-----	3,280	26,807	176,195	14,758	1.5	13.6
ALL SPECIES	17,097	42,323	536,539	2,262,468	14,758	2.1	20.7

[1]Major species only

[2]International 1/4-inch rule.

SOURCE: Derived by the author from U.S. Forest Service (32), Table 19. Revised by the U.S. Forest Service, October 21, 1968.

Considering minor defects (i.e., log grade 2) 21 per cent of the timber in the Haines area can be classed quality timber. Traditionally, if market specifications and product price are taken into account, quality timber is usually directed into peeled and sawn products. Lower quality timber, considering fiber yield and per unit price in relation to higher quality timber, is usually directed into pulpwood markets. If old growth timber in the Haines area of Alaska, the National Forest lands of the upper Lynn Canal and adjacent British Columbia is to be utilized and the quality implications shown in Table 4 are valid, then an expansion of fiber markets rather than peeled or sawn products markets will be necessary.

Annual growth and mortality are difficult to estimate. Previous estimates[13] depending on species and timber size have indicated an average annual increment of slightly less than two per cent. The forest survey[14] reports annual growth in thousands of cubic feet. A comparison with net volumes of growing stock indicates an average annual increment of about one per cent. However, old growth sawtimber is considered in growing stock. If the assumption is made that this contributed little if anything to annual growth, then the average annual increment based on young sawtimber and smaller trees appears to be about three to four per cent.

Annual mortality of sawtimber was reported by species.[15] Spruce accounts for some 79 per cent and hemlock 20 per cent. This amounts to about 1,700,000 cubic feet annually for spruce and 420,000 cubic feet annually for hemlock. Growth was some 2,270,000 cubic feet for spruce and 2,680,000 cubic feet for hemlock. Under these conditions net volumes for hemlock for future harvesting will increase relative to net volumes of spruce. More volume is in younger growing stock in the case of hemlock, and proportionately less in old growth large diameter trees.

Information presented in this chapter indicates in a general way: (1) that large volumes of old growth timber exist in the upper Lynn Canal and adjacent areas, in proportion to local timber volumes, (2) that this old growth timber is relatively poor in quality, and (3) slightly larger volumes and larger diameters are in spruce, while hemlock has a slight advantage in younger growing stock volumes.

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[13] Faulkner (45), p. 9, U.S. Forest Service (28).

[14] U.S. Forest Service (32), Tables 10, 16, 20.

[15] U.S. Forest Service (32), Table 23.

CHAPTER III

CURRENT UTILIZATION

There are several problems affecting the efficiency of current utilization of the timber resource in the Haines area. Normally, an efficient operation starting at the timber sale level involves several basic steps: (1) an accurate cruise of the stand to determine timber type, volume, quality, etc., (2) a well organized logging plan to recover maximum volume in the best possible form for intended use but which will leave the area in a condition in line with pre-planned management objectives, and (3) the use of a contract as a means of accomplishing the sale and the objectives of buyer and seller. Under this procedure the assumptions are made that the seller has met his management objectives and that the buyer has acquired useable raw material.

Frequently, in practice and in the Haines area this is not necessarily the case. Here, the seller is trying to meet management objectives and the buyer is trying to meet market objectives, and the two do not always match. Currently, the main problem that exists in Haines is that a portion of the resource which should be cut to meet management objectives does not meet the market objectives of potential buyers. As a result, conflicts of interest have developed. In general, where a contract is involved, the seller desires terms supporting management objectives, while the buyer desires terms which involve maximizing the amount of useable material at the lowest cost. In Haines, depending on the type of ownership, contract terms have favored buyers in some cases and sellers in others. When buyers are favored, detailed forest management objectives are usually not obtained, particularly those involving the improvement of the timber resource for the future. When the seller is favored, additional costs are frequently incurred by the buyer in handling and using some raw material inputs that are marginal in terms of available product markets.

Efficiency in timber utilization can be improved if changes occur in (1) timber owners' policies, (2) harvesting methods and technology, (3) manufacturing technology, and (4) markets. For the Haines area, this could involve the manufacture of pulpchips. The production of pulpchips, together with the manufacture of cants for the Japanese market, could provide a pattern of utilization whereby most, if not all, of the objectives of both timber sellers and timber buyers might be attained. Basically, a pulpchip market and the manufacture of pulpchips open up three possibilities in improved utilization: (1) improved efficiency in current timber harvesting through the chipping of logging residues, (2) improved efficiency in utilizing current timber inputs in milling by chipping waste material (i.e., slabs), and (3) improved efficiency in that low quality stands not previously harvested might be utilized. All these possibilities are subject to economic feasibility and are discussed at length elsewhere in this report.

Timber Harvesting

This section of the report is primarily concerned with the supply of chippable material available under current harvesting practices. It is important not only for physical supply estimates, but because the stumpage cost and several fixed costs of harvesting, including insurance, depreciation on current operations, and road building costs have already been incurred. In most cases, variable costs such as the cost of felling and part of the cost of bucking and limbing have been incurred. Even partial skidding costs have been incurred if any bucking takes place at the landing. The chippable material, if available in satisfactory volumes, would require only minor additional logging costs in addition to costs of loading, hauling, and unloading.

Sample Size

In order to ascertain how much sound residual wood from current logging operations might be used for chipping, professional forestry research personnel sampled two large state sales of recent logging activity in the Chilkat-Kelsall River Valley and a private sale and another small state sale in the Taiya River Valley west of Skagway. Forty-one 1/5-acre plots were taken in the first area at six different locations and ten 1/5-acre plots were taken in the second area at two different locations during July and August of 1967. Procedures were not highly standardized due to access conditions, weather, time limitations, and other project research considerations. Total logged area sampled was estimated to be 500 acres. Hence, the lower limit on the number of 1/5-acre plots was set at 50 in order to give a 2 per cent sample.[1] Areas cut to supply both of the mills manufacturing forest products in Haines either directly or via contract, were fairly equally represented. Difficulties in sale and boundary identification and in meeting objectives as to timber types sampled precluded more precise representation.

[1] One more plot than the desired minimum was taken; as it was included in the sample, sample size would be slightly larger than 2 per cent.

Method

Initial plots were established by pacing into logged areas at right angles to logging roads beyond the influence of the road and before the influence of uncut timber. After the initial plot was determined, other plots were established in the direction of greatest length of logged area.

Three men worked each plot, one acting as recorder at the center point. The plot circumference was established with the use of a cloth tape. Down material was counted in a plot if more than one-half of the length lay in the plot.

All commercial species (i.e., Sitka spruce, western hemlock, and cottonwood) were recorded. Any individual piece of timber had to be 50 per cent sound and at least six feet in length to be recorded.[2] Minimum top diameter was set at six inches. Minor crook or sweep were allowed; major crook or sweep were rejected. All figures reported include deductions for cull. Any tree measured had to have a conservatively estimated six feet of useable stem between diameter at breast height (D.B.H. - 4 1/2 feet) and a six-inch top. All sound wood was measured, including trees, residual logs, tops, down trees, broken trees standing, broken trees down, broken logs, and partially buried timber, whether under earth or slash.

Measurements for logs were taken at both the small and large ends to the nearest inch. Tops were measured at the cutting point and length taken to an eight-inch and six-inch upper diameter.[3] Lengths were recorded to the nearest foot. Trees were measured at D.B.H. and top diameter if

[2] Excepted were butt or top cuts of less than six feet that were less than 50 per cent cull and were the obvious residual to a trimmed log that had been removed.

[3] A Lufkin diameter tape was used in recording the upper diameter of tops and tree diameters.

down, while top diameter was estimated if the tree was standing. A stump count by species was taken for each plot, and both height of stump and cut-off diameter were recorded.

Results[4]

Stump computations revealed that some 23 plots were taken in almost pure spruce type, seven in almost pure hemlock type, and three in almost pure cottonwood type. Ten plots were taken in which spruce and hemlock stumps were almost equally represented, and there were eight plots in which spruce and cottonwood stumps were almost equally represented.

The spruce plots had the lowest average residual volumes. Similarly, on mixed plots, residual volumes of spruce were less than the components. Spruce plots averaged a residual volume of some 3,400 board feet per acre. Mixed spruce-hemlock plots averaged 9,600 board feet per acre with the majority in hemlock. However, the seven hemlock plots averaged 7,060 board feet per acre.

Actual volumes for each plot are reported in Table 5. Cubic volumes to both a six-inch and eight-inch top are given as well as Scribner Decimal C volumes to both a six-inch and eight-inch top. The difference in utilizing to six inches or eight inches was not considered to be significant. Most tops measured were larger than eight inches.

On the average, based on the plots sampled, 1,090 cubic feet of solid wood or 5,300 board feet Scribner Decimal C log rule are not removed in harvesting. Under current assumptions as to milling and markets, most

[4]While results in this section were based primarily on volumes residual to logging, some of the data collected are useable for other purposes. For this reason, taper information appears in Appendix I.

TABLE 5.

Timber Volumes Residual to Logging

in the Haines Area of Alaska

		Volume (1/5 Acre)			
		Cubic Feet		Board Feet (Scrib. D. C.)	
Plot No.	Timber Type[1]	6" top	8" top	6" top	8" top
121	Sp.	321.6	249.3	1510	1170
122	H	700.5	670.9	3730	3590
123	H	382.6	357.9	1720	1610
124	H	201.7	201.7	1000	1000
125	Sp.	195.8	150.4	1080	790
141	Sp.	29.0	22.5	130	120
142	Sp.	9.9	00.0	50	0
143	Sp.	43.9	38.0	180	150
144	Sp.	60.6	53.7	210	180
145	Sp.	51.8	40.7	190	150
146	Sp.	86.4	68.0	330	245
147	Sp.	24.0	19.1	90	70
148	Sp.	60.6	52.1	170	150
149	Sp.	79.0	71.8	130	110
150	Sp.	143.4	137.0	540	520
151	Sp.	448.6	446.3	2380	2380
152	Sp. Ctwd.[2]	462.2	456.7	2500	2480
153	Sp. Ctwd.	589.8	568.5	2900	2830
154	Sp.	236.7	218.6	1050	985
155	Sp.	94.1	80.9	390	380
171	Sp.	255.2	238.7	1250	1180
172	Sp.	143.6	122.5	640	560
173	Sp. H	906.0	902.3	5910	5910
174	Sp. H	574.6	574.6	2890	2890
175	H	316.7	313.2	2160	2140
176	H	173.8	150.0	710	630
177	H	177.9	138.8	810	585
178	H	118.9	83.5	500	310
181	Sp. H	331.0	307.8	1270	1140
182	Sp. H	320.5	288.4	1290	1140

Table 5 (Cont'd)

Plot No.	Timber Type	Volume (1/5 Acre) Cubic Feet 6" top	Cubic Feet 8" top	Board Feet 6" top	Board Feet 8" top
183	Sp. H	332.7	311.4	1750	1660
184	Sp. H	295.9	253.2	1470	1290
185	Sp. H	59.4	51.0	420	380
186	Sp. H	488.7	459.8	1790	1670
187	Sp. H	291.9	266.8	1440	1340
188	Sp.	286.9	272.3	1270	1210
189	Sp.	111.7	102.0	470	430
190	Sp.	284.6	268.0	1280	1210
191	Sp.	185.7	170.7	930	860
192	Sp.	370.9	335.1	1900	1730
193	Sp. H	335.6	315.4	1750	1690
201	Ctwd.	107.4	96.7	340	340
202	Ctwd.	383.2	345.6	1530	1370
203	Ctwd.	183.7	168.9	630	550
204	Sp.	276.5	251.3	1360	1230
205	Sp. Ctwd.	85.0	74.0	300	350
206	Sp. Ctwd.	112.9	90.6	540	410
207	Sp. Ctwd.	176.0	148.8	660	550
208	Sp. Ctwd.	68.2	54.0	280	240
209	Sp. Ctwd.	13.5	2.8	60	10
210	Sp. Ctwd.	61.2	56.1	260	250
Average volume per acre		1181	1090	5700	5300

Sp. = Spruce H. = Hemlock Ctwd. = Cottonwood

[1] Timber type based on stump count by species; single designation indicates 60 per cent or more of the stumps were of the same species.

[2] Sp. Ctwd.) Either component less than 60 per cent of the total
Sp. H) number, but greater than 40 per cent of the total
) number.

but not all of this volume could not be utilized. However, at least 20 per cent was of a size and quality that could be milled and meet market specifications. It is possible that adverse economies of handling and hauling caused this material to be left in the woods.

Because stump height was recorded, the residual volume left in stumps both above 12 inches and above 18 inches could be ascertained in cubic feet. Average stump height was found to be approximately 21.6 inches. Cutting to a 12-inch stump under Haines climatic and geographic conditions using current technology appears to be unfeasible, but would result in an additional 318 cubic feet harvested per acre. However, cutting to 18 inches should be feasible with minor difficulty. This would result in approximately an additional 120 cubic feet harvested, or some 600 board feet per acre.

Primary Manufacturing

In order to ascertain the efficiency of current utilization in the production of cants, an input-output analysis was effected at the two sawmills in Haines during the months of July and August, 1967. Tests were conducted on a one-half or full day basis at whichever mill could be expediently handled on any particular day. Standardized statistical procedures were not preplanned as patterns of mill operation, log supply characteristics and weather had to be taken into account independently on each day and for each test. However, tests followed uniform procedures once they were started. No limits were set on the size of any particular test, but minimum acceptable limits were established for total volume tested at each mill.

Method

Logs were measured in the mill yard by a team of research assistants, one of whom acted as recorder. All logs destined for a particular test were measured in a manner that would give precise cubic volume and Scribner Decimal C board feet volume. As they were measured, all logs were numbered with flourescent paint on both ends. Species were predominantely Sitka spruce and relatively free of defect.

Once a test of logs commenced to enter the mill, research personnel restationed themselves in the mill and on the green chain. In the mill two research personnel recorded each numbered log that was placed on the carriage, the number of cants recovered from each log, the number of sawcuts per log, and the mill tally for each cant from a numbered log. Each cant was marked with reference to the originating log number as it left the mill. Two personnel on the green chain measured each marked cant carefully at both ends, recording measurements adequate to calculate accurate cubic volumes.[5]

A computer program was designed at the University of Alaska to calculate cubic log volumes and cubic cant volumes recovered from the logs. Sufficient data were available to accurately adjust for such inconsistencies as butt flare and taper. Cubic volumes were calculated by means of Newton's Formula (frequently called the engineering formula), which is noted for its accuracy.[6] This formula can be used for both logs and cants (i.e.,

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[5] It was not necessary to record cant length as log inputs were measured after bucking and/or any butting or trimming.

[6] $$V = \frac{(B + 4B\ 1/2 + b)}{6} L$$

where V = Cubic foot volume,
B = area in square feet large end,
B 1/2 = area in square feet at mid-point,
b = area in square feet at small end, and
L = length in feet.

volume of a prismatoid). Area calculations necessary for use in the formula were made by the computer from basal area tables for logs and from area formulas based on cant types as shown in Figure 3. The major cant types as shown in this figure accounted for approximately 95 per cent of the total sample. The computer was also used to calculate the Scribner Decimal C board feet content of logs tested by programming measurements, Scribner Decimal C volume tables, and instructions.

Sample Size

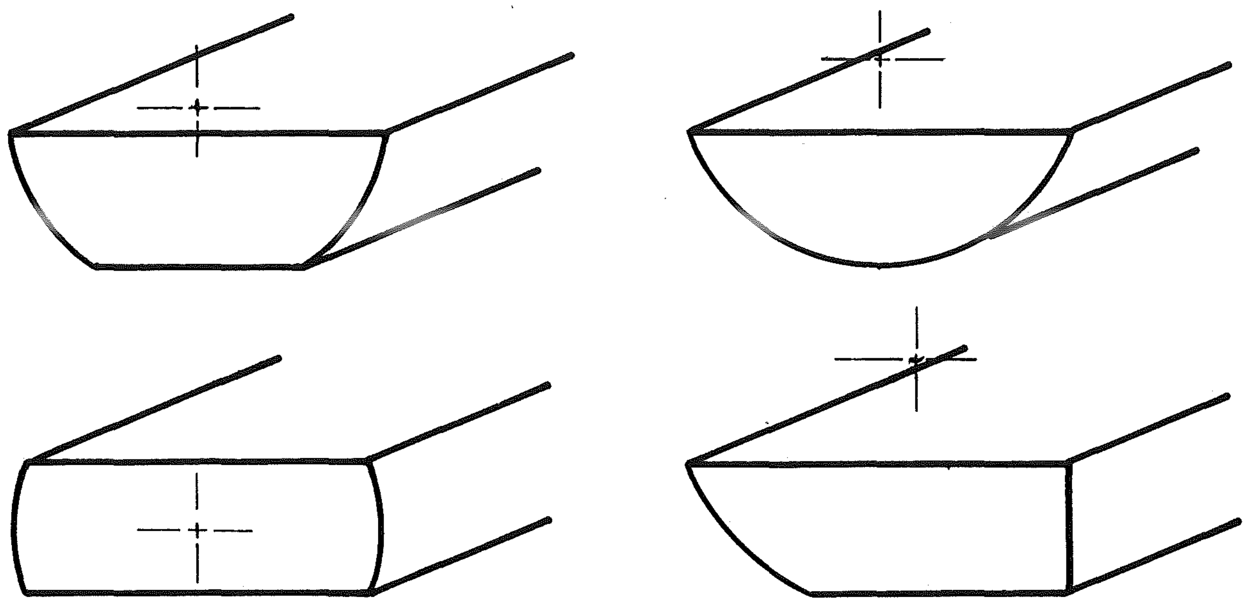
Total sample size of the input for both mills was approximately 38,000 cubic feet of logs, or approximately 235,000 board feet, Scribner Decimal C log scale. Due to production methods at one mill which greatly increased time spent sampling, sample size was not equally divided between mills. Sample size was approximately 23,000 cubic feet at one mill and approximately 15,000 cubic feet at the other. A total of 757 logs (mainly 26 feet long Sitka spruce) comprised the input, and a total of 1,329 cants the output. These figures are cumulative for a series of 21 tests.

Results

Cubic volume recovery estimates for the manufacture of spruce cants are shown by individual test in Table 6. The 696 spruce logs sawn in the 20 tests had an average top diamter of 16.2" and an average butt diameter of 20.5". Average volume was 51 cubic feet per log, or 316 board feet, Scribner Decimal C. On the average, 1.8 cants were recovered for each log sawn. Average volume per cant was 22.5 cubic feet.

FIGURE 3. HAINES CANT TYPES, JULY - AUGUST, 1967

MAJOR CANT TYPES



MINOR CANT TYPES

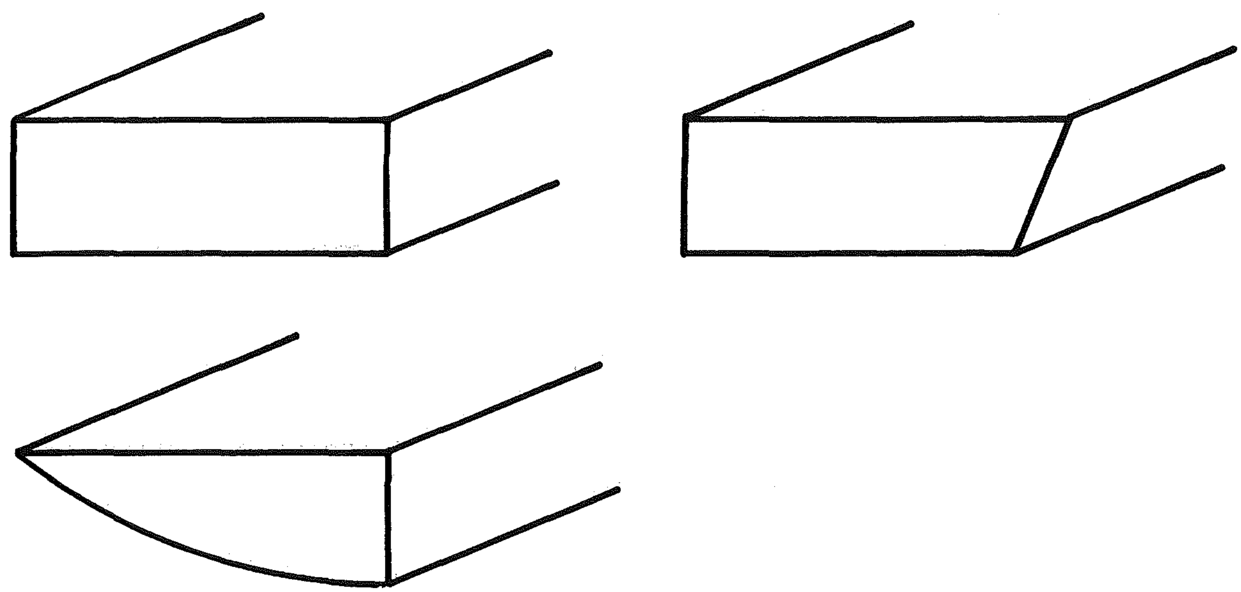


TABLE 6.

Volume and Recovery Estimates

For the Manufacture of Spruce Cants

In the Haines Area of Alaska, July-August, 1967

Test Number:	1	2	3	4	5	6	7	8
Inputs:								
No. of logs sawn	17	20	15	20	26	17	32	16
Log volume cu. ft.	630	1104	619	824	1186	801	2066	1146
Outputs:								
No. of cants recovered	22	38	24	32	41	29	69	39
Actual cant volume cu. ft.	452	915	500	669	887	650	1704	980
Cu. ft. volume of waste	178	189	119	155	299	151	362	166
Cu. ft. vol. of sawdust	29	53	32	42	56	40	98	56
Cu. ft. vol. of slabs	149	136	87	113	243	111	264	110
Input-Output Relationships:								
Cant recovery (percent)	71	83	82	81	75	81	82	85
Waste (percent)	29	17	18	19	25	19	18	15
Sawdust (percent)	5	5	5	5	5	5	5	5
Slabs (percent)	24	12	13	14	20	14	13	10

TABLE 6. (Cont'd)

Test Number:	9	10	11	12	13	14	15	16
<u>Inputs</u>:								
No. of logs sawn	58	15	32	80	23	30	83	20
Log volume cu. ft.	3949	626	773	3128	1086	1165	3816	972
<u>Outputs</u>:								
No. of cants recovered	131	23	41	116	36	41	136	31
Actual cant volume cu. ft.	3266	481	622	2407	858	841	3092	752
Cu. ft. volume of waste	683	145	151	721	228	324	724	220
Cu. ft. volume of sawdust	196	31	52	153	51	53	185	42
Cu. ft. volume of slabs	487	114	99	568	177	271	539	178
<u>Input-Output Relationships</u>:								
Cant recovery (percent)	83	77	80	77	79	72	81	78
Waste (percent)	17	23	20	23	21	28	19	22
Sawdust (percent)	5	5	7	5	5	5	5	4
Slabs (percent)	12	18	13	18	16	23	14	18

TABLE 6. (Cont'd)

Test Number:	17	18	19	20	21[1]	Tests 1-20	All Tests[2]
Inputs							
No. of logs sawn	44	22	46	80	61	696	757
Log volume cu. ft.	3038	1118	1762	5669	2318	35,478	37,796
Outputs:							
No. of cants recovered	99	42	65	180	94	1,235	1,329
Actual cant volume cu. ft.	2382	880	1284	4467	1869	28,089	29,958
Cu. Ft. volume of waste	656	238	478	1202	449	7,389	7,838
Cu. ft. vol. of sawdust	151	57	81	277	115	1,735	1,850
Cu. ft. volume of slabs	505	181	397	925	334	5,654	5,988
Input-Output Relations:							
Cant recovery (percent)	78	79	73	79	81	79	79
Waste (percent)	22	21	27	21	19	21	21
Sawdust (percent)	5	5	5	5	5	5	5
Slabs (percent)	17	16	22	16	14	16	16

[1] Test No. 21 was hemlock.

[2] For purposes of comparison, three weight recovery tests involving 53 logs (21,550 bd. ft. gross Scribner Decimal C scale) were conducted in late July. Cant recovery as a percentage of log weight was estimated to be 79.5 per cent. This compares very favorably with the cubic "all test" cant recovery of 79 per cent shown above. The weight recovery tests are summarized in Appendix D.

Test 21 was the only one on hemlock. The 61 hemlock logs sawn had an average top diameter of 13.7" and an average butt diameter of 17.9". Average volume was 38 cubic feet per log, or 189 board feet Scribner Decimal C.

Input-output relationships shown at the bottom of Table 6. indicate that on the average the mills recover 79 per cent of their input volume in the form of cants. Of the 21 per cent residual, 5 per cent is in the form of sawdust and 16 per cent is waste wood, primarily slabs. A two per cent waste wood differential was noticed between mills. No difference was noticed for sawdust. About 16 cubic feet of wood is available for chipping for every 100 cubic feet of log inputs. Thus, for every 26 foot log sawn, about 8 cubic feet of wood, on the average, would be available for the manufacture of pulpchips.

Table 7 indicates the relationship between top diameter of the log sawn and cant recovery. Cant recovery is less for small top diameter logs and there is a slightly higher percentage of waste. Large top diameter logs produce more cant volume and less waste. Logs from 8" to 13" top diameter average 28 per cent waste, while logs from 14" to 21" averaged 19 per cent waste.

Sawdust production (averaging 5 per cent of the waste) increases slightly with log diameter but remains fairly constant as a percentage of total waste. Sawdust production does increase, however, when top diameter is such that an extra cant can be sawn from a log which required one more sawcut (i.e., a 13" top diameter log producing two cants rather than one cant will have a higher percentage of sawdust and a lower percentage of slab). Since the same thing occurs when three cants can be taken from a log rather than two and so on, sawdust production with reference to Table 7 will have a range as follows:

TABLE 7.

Relation of Top Diameter of Log

To Cubic Volume Cant Recovery

Top Diam.	No. of Logs	No. of Cants	No. of Cants per log	Total Log Volume	Total Cant Volume	Total Waste	Waste as percent of Log Volume
(Inches)				(cu. ft.)	(cu. ft.)	(cu. ft.)	(percent)
8	6	6	1.0	88	66	22	25
9	25	25	1.0	471	360	111	24
10	28	28	1.0	599	443	156	26
11	43	45	1.05	1,145	808	337	29
12	60	66	1.10	1,797	1,260	537	30
13	39	49	1.26	1,288	950	338	26
8-13	201	219	1.09	5,388	3,887	1,501	28
14	44	72	1.64	1,700	1,290	410	24
15	33	60	1.82	1,445	1,127	318	22
16	38	75	1.97	1,848	1,480	368	20
17	25	50	2.0	1,356	1,130	226	17
18	34	68	2.0	2,063	1,695	368	18
19	26	53	2.04	1,725	1,467	258	15
20	22	45	2.05	1,656	1,293	363	22
21	21	50	2.38	1,682	1,405	277	16
14-21	243	473	1.95	13,475	10,887	2,588	19
22	14	37	2.64	1,255	1,022	233	19
23	13	37	2.85	1,284	1,002	282	22
24	10	29	2.90	1,029	852	177	17
25	5	15	3.00	619	503	116	19
26	3	10	3.33	393	334	59	15
27	3	10	3.33	396	351	45	11
22-27	48	138	2.9	4,976	4,064	912	18

Top Diameter	8" to 13"	One cant"	4% to 6%
		Two cants:	7%
	14" to 21"	One cant:	3% to 4%
		Two cants:	4% to 5%
		Three cants:	6% to 7%
	22" to 34"	Two cants:	3% to 4%
		Three cants:	4% to 5%
		Four cants:	6%.

In general, logs having top diameters from 8" to 13" produce slightly more than 5 per cent sawdust, logs 14" to 21" about 5 per cent, and logs from 22" to 34" slightly less than 5 per cent. Average cubic feet volumes lost to sawdust are shown in Table 8.

During the tests, it was noted that the manner in which measurements for mill tally were taken would result in a lower mill tally than actual cubic cant volume when measured in board feet on the basis of one cubic foot of cant equaling 12 board feet. A comparison between mill tally volumes and actual volumes is shown in Table 9. Considering that a cant is a primary product which is to be resawn, it is entirely logical that an allowance for resawing be made. However, since both mills sell to the same buyer and there is a significant difference between mills, both the size of the allowance and the accuracy of the product measurement might be questioned.[7] Average actual cant volume exceeded mill tally volume by 17 per cent.

[7]A 3 per cent difference in mill tally was noticed between mills and a 9 per cent difference on the basis of actual cant volume. The differences between mills are the result of slight variations in production techniques, but primarily the accuracy with which volume of output is measured.

TABLE 8.

Cubic Foot Volume Lost to Sawdust Per Log Sawn[1]

Log Top Diam.	1 Cant / 2 Cuts (cu. ft.)	Percent Average Log Volume	2 Cants / 3 Cuts (cu. ft.)	Percent Average Log Volume	3 Cants / 4 Cuts (cu. ft.)	Percent Average Log Volume	4 Cants / 6 Cuts (cu. ft.)	Percent Average Log Volume
	Number of Cants Recovered and Saw Cuts							
8"	.95	6.4						
9"	1.12	6.0						
10"	1.01	4.7						
11"	1.18	4.4	1.78	6.7				
12"	1.35	4.5	2.03	6.8				
13"	1.42	4.5	2.14	6.8				
14"	1.42	3.7	2.14	5.5				
15"	1.49	3.4	2.23	5.1				
16"	1.63	3.4	2.44	5.0	3.25	6.7		
17"	1.78	3.3	2.66	4.9	3.55	6.5		
18"	1.85	3.0	2.78	4.6	3.70	6.1		
19"			2.95	4.4	3.93	5.9		
20"			3.15	4.2	4.20	5.6		
21"			3.42	4.3	4.56	5.7		
22"			3.24	3.6	4.32	4.8		
23"			3.54	3.6	4.72	4.8		
24"			3.54	3.4	4.72	4.6		
25"			3.60	2.9	4.80	3.9		
26"			3.93	3.0	5.24	4.0	7.86	6.0
27"					4.92	3.7	7.38	5.6

[1] Average log - 26 feet long, Saw kerf - 3/8 inch.

TABLE 9.

Difference Between Mill Tally and

Actual Cant Volume Produced

Test Number	No. of Logs	No. of Cants	Mill Tally Volume		Actual Cant Volume[1]		Difference in Volume		Difference as Percent of Mill Tally
			(cu.ft.)	(bd.ft.[2])	(cu.ft.)	(bd.ft.)	(cu.ft.)	(bd.ft.)	
1	17	22	368	4,416	452	5,424	84	1,008	23
2	19	37	693	8,316	837	10,044	144	1,728	21
3	16	26	404	4,848	500	6,000	96	1,152	24
4	19	31	512	6,144	650	7,800	138	1,656	27
5	26	41	729	8,748	887	10,644	158	1,896	22
6	17	29	535	6,420	650	7,800	115	1,380	21
7	13	28	607	7,284	707	8,484	100	1,200	16
8	10	23	469	5,428	538	6,456	69	828	15
9	38	82	1,723	20,676	2,007	24,084	284	3,408	16
10	7	11	217	2,604	248	2,976	31	372	14
11	27	35	400	4,800	534	6,408	134	1,608	33
12	49	73	1,301	15,612	1,584	19,008	283	3,396	22
13	18	29	558	6,696	698	8,376	140	1,680	25
14	25	36	599	7,188	730	8,760	131	1,572	22
15	43	72	1,378	16,536	1,655	19,860	277	3,324	20
16	18	27	576	6,912	676	8,112	100	1,200	17
17	34	78	1,673	20,076	1,864	22,368	191	2,292	11
18	19	37	680	8,160	791	9,492	111	1,332	16
19	45	62	1,164	13,968	1,257	15,084	93	1,116	8
20	80	180	3,962	47,544	4,467	53,604	505	6,060	13
21[3]	59	89	1,610	19,320	1,815	21,780	205	2,460	13
1-20	540	959	18,548	222,576	21,732	260,784	3,184	38,208	17

[1]Actual cubic cant volumes shown will not necessarily agree with Table 6 as mill tally figures could not be obtained for all cants sawn during a particular test without interferring with mill operation.

[2]Data were taken in cubic feet; conversion basis 1 cu. ft. = 12 bd. ft.

[3]Hemlock test.

Over-run estimates are shown in Table 10. These are the quantities of product measurement in board feet that are in excess of inputs measured in board feet log scale. Log scales inherently provide excess board feet (i.e., underscale) actual volume in order to provide a margin for sawing and manufacture. A specific rule estimates the volume of product lumber that can be recovered from a log under specific assumptions as to slabbing, board size, saw kerf, etc. The Scribner Decimal C rule underscales or provides over-run in the manufacture of lumber with modern equipment. Also, in the manufacture of cants where sawing is minimal, a larger over-run can be expected. In Table 10, over-run on the basis of mill tally, which has been explained previously as being inaccurately low, amounts to about 45 per cent. On the basis of actual cant volume measured accurately in cubic feet and converted to board feet (on the basis of one cubic foot equals 12 board feet) over-run amounts to 70 per cent. In short, 100 board feet of log Scribner Decimal C scale can be expected to yield 145 board feet of cants on the basis of mill tally or 170 board feet in terms of actual board feet content.[8]

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[8] Cants are a unique product in terms of measurement. Volumes cannot be easily measured in terms of board feet as is the case with squares or lumber which have rectangular dimensions. Cants of the type produced in Haines usually have irregular, non-rectangular dimensions with one or more curved surfaces. The current method of measurement gives a conservative estimate on the basis of length and thickness which are more or less standardized but most importantly on the basis of width. The width measurement is an arbitrary figure based on average width both across the thickness of the cant and throughout the length. Based on the information shown in Table 9, the mill tally measure was 17 per cent less than the true or actual volume of the cants.

TABLE 10.

Over-Run Estimates for Cants

Sawn from Haines Area Logs, 1967

Test	Vol. of Logs Sawn (Scrib. DC)	Mill Tally[1] Recovery	Actual[2] Recovery	Over-Run	
				Mill Tally	Actual
	(bd. ft.)	(bd. ft.)	(bd. ft.)	(Percent)	
1	3,080	4,416	5,424	43	76
2	5,730	8,316	10,044	45	75
3	3,250	4,848	6,000	49	85
4	4,250	6,144	7,800	45	84
5	6,310	8,748	10,644	39	69
6	4,530	6,420	7,800	42	72
7	4,980	7,284	8,484	46	70
8	3,940	5,628	6,456	43	64
9	14,650	20,676	24,084	41	64
10	1,730	2,604	2,976	51	72
11	3,460	4,800	6,408	39	85
12	10,700	15,612	19,008	46	78
13	4,790	6,696	8,376	40	75
14	5,120	7,188	8,760	40	71
15	11,120	16,536	19,860	49	79
16	4,490	6,912	8,112	54	81
17	13,270	20,076	22,368	51	69
18	5,780	8,160	9,492	41	64
19	8,290	13,968	15,084	68	82
20	33,860	47,544	53,604	40	58
21[3]	10,780	19,320	21,780	79	102
1-20	153,330	222,576	260,784	45	70

[1]Underscales actual volume; based on cant width as determined by mill scale, set thickness and length. Mill tally figures could not be obtained for all cant sawn during a particular test without interferring with mill operation. Hence, the volumes shown above (sample size) are somewhat less than those in Table 6.

[2]Cubic volume of the same cants recorded in Mill Tally translated to bd. ft. on the basis of one cu. ft. = 12 bd. ft.

[3]Hemlock test.

CHAPTER IV.

UTILIZATION ALTERNATIVES

The purpose of this chapter is to compare a variety of utilization alternatives (on a cost of manufacture basis) that are compatible with the forest resource, location, and needs of the Haines community. The characteristics of the forest resource and current utilization trends as discussed in the previous two chapters were considered in selecting the alternatives compared in this chapter. The cost of manufacture of the alternatives were all computed in the same manner. The basic underlying assumptions that would be common to all the alternatives (i.e., annual operating days, wage rates by area of specialization, etc.) were standardized. Thus, meaningful comparisons can be made between alternatives on a least cost of manufacture basis and, where product prices are known, on a profitability basis.

Log Export Policies

The most likely alternative with which to compare log export is the primary manufacture of cants. Log quality in regard to Japanese round log imports from North America tends to be highly oriented toward sawlogs. Lower quality timber is generally not imported in the round, but is taken in the form of pulpchips. Veneer quality timber possibly for availability reasons appears to be a small portion of total shipments.[1]

The limited log exports from private and BIA administered land which were shipped from Haines during the summer of 1967 fit this marketing

[1] Adams (1), p. 2.

pattern. The spruce and hemlock logs shipped appeared to be of moderate quality. Cottonwood logs showed a greater diversity in quality, but they cannot be used for comparative purposes as they do not come under the same export restrictions as the softwoods. Also, they are not manufactured into cants and are for different markets.

In comparing the alternative of softwood log export to the primary manufacture of cants, the benefits used in selecting the alternative were value obtained in export and employment generated. A static annual, historical comparison is made in regard to the Haines situation in which both products were purchased by the same market at relatively stable prices.

The comparison made in the Pacific Northwest differs from the Haines situation in that domestic processing without ship loading costs was compared to exporting with ship loading costs.[2] In Haines, both products involve ship loading costs. Thus, value can be compared aboard ships.[3]

On the basis of U.S. Customs Export Declarations for the calendar year 1966,[4] the average value of 1,000 board feet of cants was $51.78 on board ship. Similarly, the on-board value of logs was reported to average $64.53.[5] Both of these figures are for Sitka spruce, which

[2] Adams (1).

[3] A slight difference in cost is involved between loading cants and loading logs. On a per unit basis, due to log bulk in comparison to square bundled cants, slight cost advantages accrue in cant loading. If this difference were not significant, a comparison could be made f.o.b. dock.

[4] As reported to the Alaska Division of Land, Haines, Alaska, February 1967.

[5] Some values and prices for logs in Japan are reported in Table 14.

comprised 92 and 94 per cent respectively of these types of exports in 1966. In order to compare logs and cants on a per unit basis, cant scale must be converted to log scale. Using an over-run factor of 45 per cent as discussed in Chapter III of this report, 1,000 board feet of logs, Scribner Decimal C scale, have a value of $75.08 in cant form. Thus, on an equal volume basis, the average value of cants exported in 1966 exceeded the average value of logs exported by $10.55. In 1967 the average price of cants declined slightly to $50.96, but the

TABLE 11.

Average Value of Logs and Cants Exported from Haines, Alaska, 1963 - 1967[1]

Item and Species	1963	1964	1965	1966	1967
	(Dollars per thousand board feet)				
Cants (mill tally)					
Spruce	48.61	53.63	55.02	51.78	50.96
Hemlock	-----	55.00	54.06	51.79	46.53
Logs (Scrib. DC.)					
Spruce	65.11	52.77	62.73	64.53	88.35
Hemlock	-----	-----	-----	-----	73.04
Cottonwood	-----	-----	31,78	34.99	64.00

[1]Based on total shipments as shown in Table 13; no entry indicates no export in that category.

SOURCE: Based on U.S. Customs Export Declarations as reported to the Alaska Division of Land, 1963 - 1966; 1967 based on U.S. Customs figures as reported to the authors by the U.S. Treasury Department, Bureau of the Customs.

average price of logs increased from $64.53 to $88.35 -- an increase of 37 per cent. Table 11 shows the average annual price based on declared value.

Prices have been relatively stable until the large increase in log price in 1967. This price of $88.35 when compared to the price of cants on an equal volume basis ($73.89) results in a negative margin of $14.46 (i.e., the price of the raw material exceeds the price of the processed product by $14.46). Reasons for this imbalance are not entirely clear, but a situation of this nature suggests imperfections in the price system and the competitive model (i.e., lack of price competition and/or use of intensive market power which results in relatively low, stable offered prices).

One implication is plain. Primary processors would find it more profitable to export their log inputs in the round rather than mill them, where regulations permit this course of action.

Employment differences on the basis of man-hours per thousand board feet of logs for the two alternatives cannot be estimated with precise accuracy. However, based on limited study, and interview data establishing hours of employment and production, sufficient information is available to indicate that a range of 0.38 to 1.23 more man-hours of employment per thousand board feet are provided by cant manufacturing. (See Table 12.)

On a historical basis, in terms of value and employment (1963-1966 for value and mid-1967 for employment), it appears that cant manufacturing rather than log export provided greater economic benefits to the state and local community. This does not mean, however, that cant manufacture rather than log export was more attractive in terms of profitability to any individual enterpreneur or firm. On the contrary, under conditions of relatively low stumpage prices, log export could provide greater profits to the individual firm. Also, if the price trend established in 1967 continues and the price of logs on an equivalent volume basis remains higher than the price of cants, then the following courses of action should be considered: (a) a re-evaluation of log export policy in terms of stated goals and economic and social costs, (b) re-evaluation of stumpage appraisal policies, or (c) investigation of ways and means of hastening development of alternative markets, improving buyer completion, and thus effecting a relative increase in the price of cants.

TABLE 12.

Employment Differences per Thousand Board Feet,

Cant Manufacture Versus Log Export, 1967

Item	Cant Manufacture	Log Export
	(hrs. of employment per M. bd. ft. Scrib. DC.)	
Logging and Hauling[1]	---	----
Cant milling and delivery	Range 1.16-1.45	----
	Estimated 1.25	----
Log export handling and scaling	Range ---	0.12-0.23
	Estimated ---	0.15
Loading logs	Range ---	0.5-1.0
	Estimated ---	0.65
Loading cants	Range 0.45-0.5	----
	Estimated 0.45	----
TOTAL	Range 1.61-1.95	0.72-1.23
	Estimated 1.70	0.80

[1]Unknown: Estimated no difference.

SOURCE: Study estimation.

Lumber Manufacture

Traditional lumber manufacture is not considered an attractive utilization alternative in Haines for several reasons. Lumber manufacturing was attempted there prior to World War II and again at a later date. In both instances, it met with very limited, if any, success. Primary obstacles were lack of markets and logistical difficulties in reaching and competing in markets distant from Haines.

The manufacture of lumber in Southeast Alaska has decreased in the past few years. New and modern equipment is necessary to attain specifications desired by purchasers in the United States market; price competition is keen; and shipping costs from Alaska are not attractive. Similarly, price competition is keen in foreign markets, and special modern equipment would be necessary. A major problem would be the high costs involved in establishing and operating a complex modern facility in Alaska. The product specifications and quality necessary to compete in current markets require specialized machines which in turn require skilled labor and special maintenance and repair.

Relative to other Pacific Northwest regions, both the skilled labor and the maintenance and repair in terms of importing parts and service from distant service centers are costly. Similar arguments apply to installation costs and operating costs (i.e., cost of electric power).

Rather than establish an enterprise which has relatively high labor requirements, relatively large and complex machine capital requirements and a relatively low output of diverse products which require special sorting, handling and packaging, a preferred utilization alternative should have advantages wherever possible in the above areas. The ideal alternative would have moderate labor requirements, with fairly simple, dependable and sturdy machine capital substituting for labor where possible. Large amounts of machine capital are desirable, but production equipment should be reasonably simple to operate and maintain. Complex systems and sub-routines or additive production routines should be avoided wherever possible. Not only is a high volume of output desirable, but a high volume of a relatively standard product. Diverse specifications should be avoided if possible. Marketing efforts would be best directed toward one major market with relatively simple specifications and shipping procedures. The manufacture of cants for the Japanese market comes closer to meeting the above conditions than does the manufacture of softwood lumber.

Cant Manufacture

The manufacturing of cants in Haines represents a relatively new industry. The first significant exports occurred in 1963 and amounted to slightly more than five million board feet cant scale. As can be seen from Table 13, increased export occurred during 1964 and 1965. But, following the installation of new milling facilities in late 1965, 1966 exports increased to over 30 million board feet. This figure was expected to at least double as new milling facilities were again established in 1967, and exports in 1967 exceeded 75 million board feet. They are expected to exceed 80 million board feet in 1968.

The Haines forest products industry is based primarily on two large modern milling facilities. A diagram depicting a cant mill layout is shown in Figure 4. High volume production of a relatively simple product is aimed directly at Japanese markets. Transportation presents few difficulties as purchase is made f.o.b. dock and shipping is handled by the Japanese. This type of utilization appears to be sound considering the forest resource and current economic conditions in the Haines area.

TABLE 13.

Timber Exported from Haines, Alaska, by Type of Product and Species

1963 - 1967

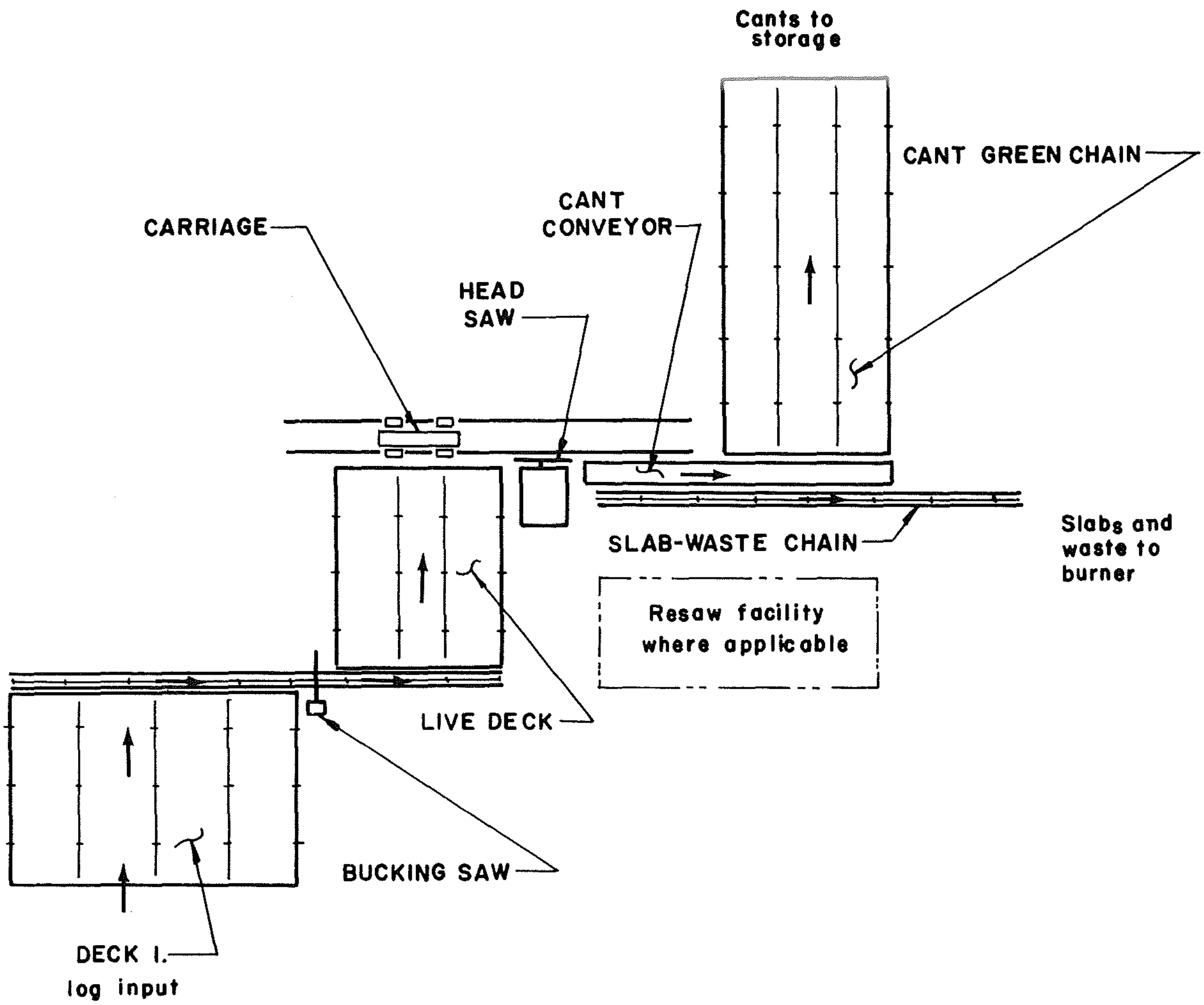
Item	1963	1964	1965	1966	1967
			(1000's of board feet)[1]		
Cants (mill tally)					
Spruce	5,471	7,397	9,026	29,689	71,370
Hemlock	0	82	1,191	1,105	4,380
Total Cants	5,471	7,479	10,217	30,794	75,750
Logs (Scrib. DC.)					
Spruce	1,746	3,406	5,159	6,366	5,275
Hemlock	0	0	0	0	283
Cottonwood	0	0	126	126	173
Total Logs	1,746	3,406	5,285	6,492	5,731
Total Logs and Cants					
Actual Board Feet	9,382	14,558	20,963	47,139	98,522
Scribner Decimal C Scale	5,519	8,564	12,331	27,729	57,972

[1] 1000 board feet log scale Scrib. DC. = 1450 board feet mill tally.
1000 board feet log scale Scrib. DC. = 1700 actual board feet.
1000 board feet Mill Tally = 1172 actual board feet.

SOURCE: Based on U.S. Customs Export Declarations as reported to the Alaska Division of Land, 1963-1966; 1967 based on U.S. Customs figures as reported to the authors by the U.S. Treasury Department, Bureau of the Customs.

FIGURE 4

ALASKAN CANT MILL
(hypothetical diagram)



The f.o.b. dock price of cants per thousand board feet mill tally was reported to range from $45.00 to $47.00 in 1966-1967.[6] This range appears appropriate when the average f.o.b. ship value of $51.78 per unit in 1966-1967 is reduced by loading and handling charges[7] of $5.00 to $6.00 per unit. The f.o.b. dock price for cants cannot be evaluated against alternative sources because both the price and the product are unique to Southeast Alaska. Table 14 indicates prices for spruce and hemlock logs and sawn products in Japanese markets. Caution is urged in interpretation because of diversity of conditions and specifications.

Substantial profit margins are evident over the f.o.b. Alaskan mill price. While hemlock cants are priced at the same rate as spruce, it should be kept in mind that over 97 per cent of all exports of logs and cants were spruce in 1966. Table 15 indicates the percentage of total logs and cants exported that are Sitka spruce for the years 1963-1967. The C.I.F. price of spruce lumber imported from the United States, based on Japanese customs clearance, was $95.27 per 1000 FBM. Since Alaska was the only United States supplier in 1966 and the only region which exported Sitka spruce cants or squares to Japan, the above selling price is an indicator of the value of Alaskan spruce cants delivered at Japanese ports. The C.I.F. Japan price then would have been approximately $43.50 per thousand board feet higher than the f.o.b. Haines price if the board measure used for custom clearance in Japan was the same as the

[6] 18 months; January 1, 1966 to July 1, 1967.

[7] Loading and handling charges based on information acquired by interview: Wrangell Stevedoring, August 11, 1967, and Haines Stevedoring, August 2, 1967.

TABLE 14.

Value and Price of Sitka Spruce and Western Hemlock Logs and Sawn Products in Japan, 1965 - 67

Item	Pricing Reporting Conditions	Specifications or Grade	Date	Price (U.S. Dollars)	Unit[1]
Section A (U.S. or Can.)					
Spruce logs	wholesale, Tokyo	Large Dia.	Mar. 1966	$131.10	MFBM
Hemlock logs	wholesale, Tokyo	No. 1 Med. Dia & Gd.	Mar. 1966	76.69	MFBM
Hemlock squares	wholesale, Tokyo	12 in. #2-3	Mar. 1966	105.53	MFBM
Hemlock baby squares	wholesale, Tokyo	4 in. #2	Mar. 1966	119.30	MFBM
Spruce logs	wholesale, Tokyo	No. 1	Jan. 1967	129.79	MFBM
Hemlock logs	wholesale, Tokyo	mixed grades	Jan. 1967	79.31	MFBM
Hemlock squares	wholesale, Tokyo	No. 2-3, mixed size	Jan. 1967	111.43	MFBM
Hemlock baby squares	wholesale, Tokyo	No. 2-3 4x4"	Jan. 1967	127.82	MFBM
Spruce log	wholesale, Tokyo	No. 1	Mar. 1967	$134.37	MFBM
Hemlock log	wholesale, Tokyo	mixed grade	Mar. 1967	80.62	MFBM
Hemlock square	wholesale, Tokyo	12"x12", mixed grade	Mar. 1967	112.74	MFBM
Hemlock square	wholesale, Tokyo	4"x4", mixed grade	Mar. 1967	129.13	MFBM
Spruce logs	wholesale	No. 1	July-Aug. 1967	137.65	MFBM
Hemlock logs	wholesale	mixed	July-Aug. 1967	81.28	MFBM
Hemlock mixed squares	wholesale	mixed	July-Aug. 1967	115.37	MFBM
Hemlock baby squares	wholesale	No. 1	Aug. 1967	132.41	MFBM
Section B					
U.S. Spruce logs	customs clearance	ALL	Av. 1965	$111.25	1000 FBM
U.S. Spruce lumber	customs clearance	ALL	Av. 1965	92.80	1000 FBM
U.S. Hemlock logs	customs clearance	ALL	Av. 1965	80.43	1000 FBM
U.S. Hemlock lumber	customs clearance	ALL	Av. 1965	89.51	1000 FBM
Can. Spruce Logs	customs clearance	ALL	Av. 1965	103.34	1000 FBM
Can. Spruce lumber	customs clearance	ALL	Av. 1965	115.18	1000 FBM
Can. Hemlock logs	customs clearance	ALL	Av. 1965	81.02	1000 FBM
Can. Hemlock lumber	customs clearance	ALL	Av. 1965	93.21	1000 FBM

Table 14. (Continued)

Item	Pricing Reporting Conditions	Specifications or Grade	Date	Price (U.S. Dollars)	Unit
Section C					
U.S. Spruce logs	CIF Customs Clearance	ALL	Av. 1966	$117.78	1000 FBM
U.S. Spruce lumber	CIF Customs Clearance	ALL	Av. 1966	95.27	1000 FBM
U.S. Hemlock logs	CIF Customs Clearance	ALL	Av. 1966	84.42	1000 FBM
U.S. Hemlock lumber	CIF Customs Clearance	ALL	Av. 1966	91.11	1000 FBM
Can. Spruce logs	CIF Customs Clearance	ALL	Av. 1966	110.06	1000 FBM
Can. Spruce lumber	CIF Customs Clearance	ALL	Av. 1966	128.44	1000 FBM
Can. Hemlock logs	CIF Customs Clearance	ALL	Av. 1966	88,28	1000 FBM
Can. Hemlock lumber	CIF Customs Clearance	ALL	Av. 1966	93.93	1000 FBM

[1]Believed to be based on the Japanese conversion rate of 1 cubic meter = 390 board feet.

SOURCE: Section A: monthly issues Japan Lumber Journal as shown.
Section B: Japan Lumber Journal, June 25, 1966.
Section C: Japan Lumber Journal, March 25, 1967.

Haines mill tally.[8] This appears to be an adequate margin per unit for transportation (including profit and risk) when the efficiency of the modern specialized Japanese carriers is considered.

TABLE 15.
Sitka Spruce as a Percent of Total
Log and Cant Exports, Haines
1963-1967

Year	Logs	Cants
1963	100%	100%
1964	100	99
1965	98	88
1966	98	97
1967	92	94

SOURCE: Derived from Table 13, p. 62.

The estimated costs of cant manufacture in Haines are itemized in Table 16. Such a milling enterprise would employ approximately 20 people. The procedures whereby the costs were computed follow the format shown in Appendixes A, B, and C.

The cost of manufacturing cants in Haines is estimated to be $36.44 per thousand board feet mill tally, providing logs are delivered to the mill for $36.00 per thousand board feet Scribner Decimal C scale.[9] The

[8] As the product was not lumber and FBM was used, some means of estimation was necessary. Only two known methods are common to Japan-Alaska trade: (1) mill tally, or (2) Brereton scale. Since the Japan Lumber Journal of April 10, 1967 indicates Alaska was the only U.S. supplier of Sitka spruce lumber in 1966 and gives the quantity as 136,341,000 board feet Brereton scale, and the March 25, 1967 issue lists the U.S. as having supplied 116,014,000 board feet of Sitka spruce in a table reporting an average value of $95.27 per thousand board feet, it can only be assumed that a mill tally measure was used. This conclusion is further confirmed by Table 9 which shows actual cant volume to be 17 per cent more than mill tally on the basis of Haines data.

[9] Costs must be considered on an output basis. Taking into account a 45 per cent overrun, sufficient logs to manufacture one thousand board feet of cants would cost $24.84.

TABLE 16.

Estimated Cost of Milling Cants, Haines Area of Alaska, 1966-67

Production: 200,000 board feet cant tally per day
Inputs: 138,000 board feet logs Scribner Decimal C scale
Operating Days: 225
Installation Cost: $450,000.00

Item	Daily Cost	Cost per Thousand Board Feet Cant Tally	Percent
		(dollars)	
Fixed Cost			
Depreciation	248.89	1.24	3
Interest @ 7%	87.27	.44	1
Taxes & Insurance	40.00	.20	1
Maintenance	4.44	.02	-
Total Fixed Cost	380.60	1.90	5
Variable Cost			
Logging Burden[1]	4,968.00	24.84	68
Mill Labor	883.20	4.42	12
Mill Power	191.04	.95	3
Maintenance & Repair	248.00	1.24	3
Access. Equip. Operation	422.36	2.11	6
Supplies	75.00	.38	1
Office Administration	120.00	.60	2
Total Variable Cost	6,907.60	34.54	95
Total Cost of Cant Production	7,288.20	36.44	100
(Logging Burden taken as $50.00)	9,220.20	46.10	

[1] Cost of 138 thousand board feet of sawlogs f.o.b. mill at $36.00 per thousand board feet.

cost of raw material inputs delivered to the mill is by far the most important factor in cant manufacturing. On an output basis, major costs per unit are as follows: fixed milling cost $1.90, or 5 per cent of total cost, delivered logs $24.84 or 68 per cent of total cost, and variable milling cost $9.70 or 27 per cent of total cost. If logs delivered to the mill cost $50.00 per thousand board feet Scribner Decimal C, which can be the case with timber cut south of Haines on National Forest land and then rafted to Haines, then the cost of manufacturing cants increases to $46.10 per thousand board feet mill tally. Continued operations become marginal when a market price of $45.00 to $47.00 per unit is considered. Taking into account a high volume of production, a likely break-even point based on a fair margin for profit and risk would be where logs delivered to the mill cost $45.00 per thousand board feet Scribner Decimal C scale. Based on the assumptions shown in Table 16, very substantial profits are realized if the delivered log cost can be kept below $40.00 per thousand board feet Scribner Decimal C scale. Between $40.00 and $45.00, an adequate profit margin is thought to exist, but over $45.00 per unit results in a very narrow margin with a high probability that profits might not be adequate for the risk and capital expenditures involved.

Veneer Manufacture

A veneer plant could possibly locate in the Haines area of Alaska but several difficulties would be involved. First, based on the location and the availability of quality raw material which could be shipped in from the immediate and surrounding areas, the sustained-yield capacity would be less than that which appears necessary for a successful operation.

Similarly, a veneer-plywood plant involving large capital expenditures might not be justified if a size of the order of current industry capacity-per-mill is necessary. Based on information reported by the Forest Industries "37th Annual Plywood Review" (January, 1968), softwood veneer plants in British Columbia, Oregon, and Washington have an average annual capacity of 144.8 million square feet of 1/8" veneer per lath. For plants producing plywood from their own veneer, annual capacity per lath is 55.6 million square feet of plywood (3/8") per lath. Plants of this size would require a minimum of $1.5 to $2.5 million in capital investment and approximately 107 to 145 million board feet of veneer logs per year.

This type of production is not compatible with the Haines area, but might be possible at some other location in Southeast Alaska. Plant location would require (1) a large labor supply at relatively as low a price as possible, (2) large amounts of larger size, quality timber tributory to the area, and (3) a source of cheap power or fuel to dry and/or form the product.

One possible alternative for the Haines Area would be a small specialty veneer plant. Such a plant should only be installed after a market has been investigated for the product and desired specifications are known. Since a veneer plant requires a high initial capital investment, every effort should be made to substitute proportionately small increases of machine capital if savings in labor can be obtained. A mill without several automatic machine features could be established for some $500,000 and would require from 20 to 30 employees. A modern automatic mill based on new European technology could be established for about $725,000 and would require about 10 employees. Not only would cost savings in veneer manufacture occur over time, but the high speed European equipment could cut cottonwood and hemlock as well as spruce if conditions were favorable.

Estimates of the cost of producing specialty veneer with high speed automatic equipment at a capacity which should be compatible with timber availability are shown in Table 17. Since the equipment produces quality veneer from small to medium sized logs (i.e., veneer production would not be dependent on large sized "peelers"), adequate inputs could be obtained by sorting average size sawlogs for minimum defect. Also, logs might be acquired from other adjacent areas accessible via the Lynn Canal. A premium price for smaller but sound material is considered. For Haines a rate of $41.00 per thousand board feet Scribner Decimal C delivered at the mill should provide enough incentive to induce sorting and establish a veneer log market. For the Lynn Canal area a rate of $55.00 per thousand board feet Scribner Decimal C is considered. If all inputs were purchased at this rate, the cost per thousand square feet of veneer as shown in Table 17 (i.e., $24.69) would increase by $1.56 to $26.25.

Price comparisons cannot be made for the type of specialty product liable to production at Haines. Individual market negotiations would be necessary, and it is not known if a production cost of some $24.00 to $26.00 per thousand square feet would be feasible. A slightly lower production cost could be attained if lower cost hemlock and/or cottonwood logs were used to manufacture core and/or back stock, rather than the entire capacity consisting of slightly more expensive spruce inputs.

TABLE 17.

Estimated Cost of Veneer Manufacture, Haines, Alaska

Production: 114,000 square feet (1/8") per day[1]
Inputs: 25,000 board feet logs Scribner Decimal C scale[2]
Operating Days: 225
Installation Cost: $725,000
Annual Production: 25,650,000 square feet
Annual Inputs: 5,625,000 board feet logs

Item	Daily Cost	Cost per Thousand Square Feet	Percent
	(dollars)		
Fixed Cost			
Depreciation	295.56	2.59	11
Interest @ 7%	132.46	1.16	5
Taxes & Insurance	66.67	.58	2
Maintanance	8.88	.08	-
Total Fixed Cost	503.57	4.41	18
Variable Cost			
Logging Burden[3]	1,025.00	8.99	36
Mill Labor	451.20	3.96	16
Mill Power	104.00	.91	4
Mill Fuel	250.80	2.20	9
Maintenance & Repair	182.00	1.60	6
Access. Equip.[4]	140.00	1.23	5
Supplies	100.00	.88	4
Office Administration	58.40	.51	2
Total Variable Cost	2,311.40	20.28	82
Total Cost of Veneer Production	2,814.97	24.69	100

[1]114,000 sq. ft. 1/8" sanded or 3/16" rough, equal 57,000 sq. ft. 3/8" rough. See Conversion factors (46), p. 24.

[2]57,000 sq. ft. 3/8" rough requires 25,000 bd. ft. of logs Scribner Decimal C scale. See Conversion factors (46), p. 23.

[3]Veneer logs f.o.b. mill in Haines estimated at $5.00 per M. bd. ft. more than sawlogs (i.e., $41.00). Slightly higher log quality is assumed which requires additional handling and sorting.

[4]Operation of out of plant equipment. Estimated on the basis of 1 medium sized truck to move output to shipping location and 1 medium sized fork loader.

Pulpchip Manufacturing

Chipping Alternatives

The chipping alternatives suggested in this section are based on the assumption that chipper location will be at the mill site. The premise is that initial chipping will occur in order to utilize wood wasted in current sawmilling activities. The slab-wood concentration yard approach appears not applicable in the Haines area because of the number, size, and location of current milling activities and other local conditions. A chipping facility located at a tidewater shipping point rather than the mill site would, however, be fairly similar to the slab-wood concentration yard approach. For a mill not located on tidewater, additional transportation charges would be necessary to transfer the chips to the shipping point. This would increase the estimates made in this section as all examples were based on chipping costs f.o.b. mill site.

The cases shown in Tables 18-23 are examples of possible alternatives based on 1966-67 conditions at Haines. Portable chipping in the woods, which appears to be one of the less feasible alternatives, is discussed briefly in the latter part of the section. Additional research on this type of utilization would be necessary before any positive conclusions could be drawn. However, it is logical to assume that the chipping of current mill waste will occur before any portable chipping. After preliminary research, a large chipping installation not integrated with sawmilling was deleted from possible utilization alternatives. This scale of installation (i.e., production 300-400 bone dry tons per day) was considered not feasible for the following reasons: (1) it would exceed in capacity volumes which are compatible to integrated utilization, (2) without reductions in current

TABLE 18

Cases Estimating Costs of Chipping Alternatives

Case I - Estimated Cost of Chipping Debarked Mill Waste, 1967[1]

Production:	200 M bd. ft. cant tally
Inputs:	138 M bd. ft. Scribner Decimal C log scale
Chip Recovery:	37 bone dry tons[2] per day
Installation Cost:	$200,000
Operating Days:	225 annually

Type of Cost	Daily Cost	Cost per Ton	Percent
	(dollars)		%
Fixed Costs			
Depreciation	84.44	2.28	20
Interest	35.62	.96	8
Taxes and Insurance	17.78	.48	4
Maintenance	1.78	.05	-
Total Fixed Cost	139.62	3.77	32
Variable Costs			
Labor[3]	134.40	3.63	31
Power	107.44	2.90	25
Maintenance and Repair	52.44	1.42	12
Total Variable Cost	294.28	7.95	68
Total Cost of Chip Production	433.90	11.72	100

[1]Mill waste which is typically burned in cant mills not having a chipping facility is considered at zero cost. Hence, stumpage or logging costs are not applicable under variable costs.

[2]Based on recovery as shown in Chapter III; 6.2 bd. ft. Scribner Decimal C scale = 1 cu. ft.;
chippable waste 16 per cent of cubic input;
actual cubic volume chipped less 10 per cent for losses in processing;
specific gravity of Sitka spruce taken as .37.

[3]Three men in addition to sawmill and office employees.

TABLE 19

Cases Estimating Costs of Chipping Alternatives

Case I(a) - Estimated Cost of Chipping Mill Waste Considering an Improvement in Sawmill Efficiency due to Debarking[1]

Production:	220 M bd. ft. cant tally
Inputs:	152 M bd. ft. Scribner Decimal C log scale
Chip Recovery:	41 bone dry tons per day
Installation Cost:	$200,000
Operating Days:	225 annually

Type of Cost	Daily Cost	Cost per Ton	Percent
	(dollars)		%
Fixed Costs	139.62	3.40	34
Variable Costs	294.28	7.18	72
Total Cost	433.90	10.58	106
Less saving in Sawmilling[2]	26.22	.64	6
Total Adjusted Cost	407.68	9.94	100

[1]If barker installation increased sawmilling production and lowers saw-maintenance costs the costs from Case I must be adjusted. A combination of two factors is relevant; (1) a sharper sawblade on the average, and (2) less down time for sawblade changes. Both factors would tend to increase production and the latter would also lower the variable cost of sawing. A 10 per cent increase in production is assumed. Estimated cost savings were taken as 50 per cent of the labor charge for one mill-wright and a modest annual saving of $500.00 in saw parts and replacement.

[2]Since the debarker is being charged entirely to chipping; when savings accrue to the sawmilling function from the use of the debarker, they can be deducted from chipping costs. See Appendix B, p. 123.

TABLE 20

Cases Estimating Costs of Chipping Alternatives

Case II - Estimated Cost of Chipping Mill Waste and Logging Residues[1]

Production:	220 M bd. ft. cant tally
Inputs:	152 M bd. ft. sawlogs
	6540 cu. ft. of logging residues
Chip Recovery:	109 bone dry tons per day
Installation Costs:	$200,000
Operating Days:	225

Type of Cost	Daily Cost	Cost per Ton	Percent
	(dollars)		%
Total Fixed Cost	139.62	1.28	12
Variable Costs[2]			
Logging	60.00	.55	5
Skidding	300.00	2.75	26
Hauling	330.00	3.03	29
Labor	40.00	.37	4
Other Variable Costs[3]	268.06	2.46	24
Total Variable Costs	998.06	9.16	88
Total Cost of Chip Production	1137.68	10.44	100

[1]Additional timber available for chipping from the acreage logged to supply the 152 M bd. ft. of sawlogs. Volume of chippable wood 6540 cu. ft. resulting in an additional 68 tons of bone dry chips. If the material is assumed not sawable it would be incorrect to apply the Scribner Decimal C log rule. As logging residue tests (Chapter III, Table 5) were taken in both Scribner and Cubic one can be substituted directly for the other. Note for conversion purposes that mill waste as used in Case I was tributary to sawlogs where 1 cu. ft. = 6.2 bd. ft. Scribner Decimal C. For logging residue in Case II, 1 cu. ft. of smaller size material = 4.86 bd. ft. Scribner Decimal C log rule.

[2]Increased costs in utilizing logging residue. Additional bucking and limbing at $2 per M bd. ft., skidding at $10 per M bd. ft., hauling at $11 per M bd. ft. One additional unit of labor to handle increased wood inputs at the mill at $4 per hour.

[3]Total variable cost of chipping as listed in Case I (a). Assumption made previous labor, power, maintenance and repairs were incurred at less than capacity; additional chipping within capacity at the same rate.

TABLE 21

Cases Estimating Costs of Chipping Alternatives

Case III - Estimated Cost of Chipping Mill Waste, Logging Residue and Limited Amounts of Pulpwood[1]

Production:	217.5 M bd. ft. cant tally
Inputs:	140 M bd. ft. sawlogs
	10 M bd. ft. sawlogs recovered from pulpwood stand
	20 M bd. ft. of pulpwood
	6540 cu. ft. of logging residue
Chip Recovery:	145 bone dry tons[2]
Installation Costs:	$200,000
Operating Days:	225

Mill Operating at Maximum Capacity

Type of Cost	Daily Cost	Cost per Ton	Percent
	(dollars)		%
Total Fixed Cost	139.62	0.96	8
Variable Costs[3]			
Stumpage	20.00	.14	1
Logging	80.00	.55	5
Skidding	200.00	1.38	12
Hauling	220.00	1.52	13
Other Variable Costs[4]	998.06	6.88	61
Total Variable Costs	1518.06	10.47	92
Total Cost of Chip Production	1657.68	11.43	100

[1] This example presupposes that excess capacity exists in the use of the debarker and chipper and that enough slack time exists in saw use to reduce the limited number of large pulp logs into sections suitable for chipping. Also, this example would be applicable if sawlogs inputs were decreased due to adverse supplying conditions (weather, stumpage acquisition, etc.) at various times throughout the year. Rather than have idle capacity pulpwood could be chipped if available.

[2] Chip recovery is based on 41 bone dry tons from mill waste, 68 bone dry tons from logging residue and 36 bone dry tons from pulpwood.

[3] Increased costs in utilizing 20 M bd. ft. of pulpwood. Stumpage estimated at $1 per M bd. ft., logging at $4 per hour, skidding at $10 per hour and hauling at $11 per hour.

[4] Total variable cost of chipping was listed in Case II; previous labor, power, maintenance and repair were incurred at less than capacity.

TABLE 22

Cases Estimating Costs of Chipping Alternatives

Case III(a) - Estimated Cost of Chipping Mill Waste, Logging Residue and Large Amounts of Pulpwood[1]

Production: 145 M bd. ft. cant tally
Inputs: 100 M bd. ft. of sawlogs
4355 cu. ft. of logging residue
90 M bd. ft. of pulpwood
Chip Recovery: 210 bone dry tons per day
Installation Costs: $650,000
Operating Days: 225
Mill Operating at Maximum Capacity[2]

Type of Cost	Daily Cost	Cost per Unit	Percent
(Sawmill)	(dollars)		
Fixed Cost			%
Depreciation	248.89	1.72	4
Interest	87.27	.60	1
Taxes and Insurance	40.00	.28	1
Maintenance	4.44	.03	-
Total Fixed Cost	380.60	2.63	6
Variable Cost			
Logging Burden[3]	3600.00	24.83	62
Labor[4]	883.20	6.09	15
Power	191.04	1.32	3
Maintenance and Repair	248.00	1.71	4
Accessory Equip. Operation	422.36	2.91	7
Supplies	75.00	.52	1
Office & Admin.[5]	120.00	.83	2
Total Variable Cost	5539.60	38.21	94
Total Cost of Cant Production	5920.20	40.84	100
(Chipping)			
Fixed Cost			
Depreciation	84.44	.40	2
Interest	35.62	.17	1
Taxes and Insurance	17.78	.08	1
Maintenance	1.78	.01	-
Total Fixed Cost	139.62	.66	4

TABLE 22 (Cont'd)

Cases Estimating Costs of Chipping Alternatives

Case III(a) - (Continued)

Type of Cost	Daily Cost	Cost per Unit	Percent
	(dollars)		%
(Chipping) - (continued)			
Variable Cost			
Logging burden	3220.00	15.33	87
Labor[6]	174.00	.83	5
Power	107.44	.51	3
Maintenance and Repair	52.44	.25	1
Total Variable Cost	3553.88	16.92	96
Total Cost of Chip Production	3693.50	17.58	100

[1]Since in this Case sawmilling capacity is sacrificed to increase chip capacity, sawmilling costs must also be estimated to correctly allocate costs of the total integrated operation. This Case might be applicable if the mill were drawing on low quality stands where only about one-half of the timber is fit for sawlogs. In addition to chipping facility (installed cost $200,000) a cant mill installation cost of $450,000 is assumed.

[2]Volume of inputs would probably be at or near capacity for a large ring debarker. Similarly, a large wastewood chipper would have to operate at or near capacity considering chip tonnages involved. Saw capacity not used in cant production is assumed used in reducing large pulp logs to material of a size suitable for the wastewood chipper.

[3]Costs of logs, f.o.b. mill, Scribner Decimal C; sawlogs at $36 per M bd. ft. and pulplogs at $30 per M bd. ft. Stumpage charges included in the former estimated at $7 per M bd. ft. and in the latter $1 per M bd. ft.

[4]Labor is for 18 men allocated to mill.

[5]Includes 2 office staff.

[6]Labor is for 4 men allocated to mill chipping operation including debarking.

TABLE 23

Cases Estimating Costs of Chipping Alternatives

Case IV - Estimated Cost of Heavy Duty Portable Chipping in the Woods[1]

Inputs:	Approximately 45 M bd. ft. of logging residues and pulpwood (i.e., 7580 cu. ft.)
Chip Recovery:	81 bone dry tons per day
Installation Cost:	$250,000[2]

Type of Cost	Daily Cost	Cost per Ton	Percent
	(dollars)		%
Fixed Cost			
Depreciation	114.44	1.41	10
Interest	46.28	.57	4
Taxes and Insurance	22.22	.27	2
Maintenance	2.22	.03	-
Total Fixed Cost	185.16	2.28	16
Variable Cost			
Stu8page	37.50	.46	3
Logging	157.50	1.94	14
Skidding	450.00	5.56	39
Labor[3]	86.40	1.07	8
Fuel (Chipping)	50.00	.62	4
Maintenance and Repair	73.00	.90	6
Truck Operation[4]	112.00	1.38	10
Total Variable Cost	966.40	11.93	84
Total Cost of Chip Production	1151.56	14.21	100

[1]The estimates above are for a heavy duty portable chipping unit rather than a smaller unit as large volumes of timber in the Haines Area suitable for pulpwood are of large diameter. Thus, a large unit can utilize small as well as large diameter material. A smaller unit might have application in "cleaning-up" logging residues of small diameter.

[2]Includes truck tractor and two trailer units as well as barker-chipping facility.

[3]Includes operator and one assistant.

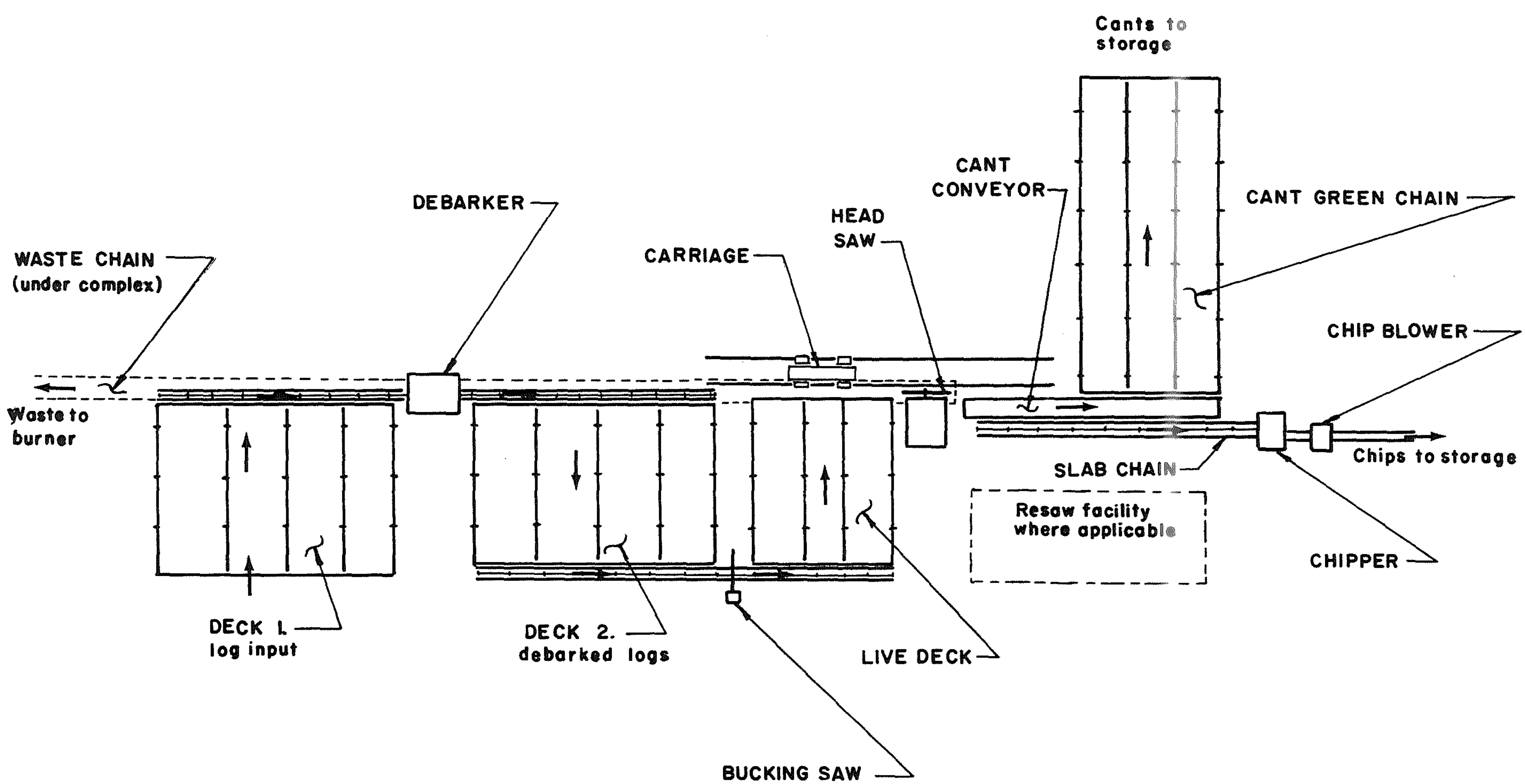
[4]Includes driver and operating expenses such as fuel, maintenance, repairs, etc.

sawmilling it would endanger sustained-yield in the immediate Haines area by requiring greatly increased annual cuts, (3) it would require special market agreements or additional market investigation, (4) if additional pulping capacity locates in the Northern Panhandle and the chipping facility were not integrated with this capacity, it would endanger the sustained-yield program of Northern portions of the National Forest if both facilities utilized National Forest timber, (5) it would require an exceptionally large capital investment in comparison to smaller chipping units integrated with sawmilling, and (6) it would require large amounts of cheap electrical power which currently are unavailable.

Feasible integrated chipping is considered on the basis of a large waste-wood chipping installation. A diagram of an integrated operation is shown in Figure 5. This type of operation presupposes a maximum capacity of about 145 to 210 bone dry tons a day. Larger capacities are not common and increased tonnages are usually the result of establishing pure chipping operations integrated with a pulpmill. As current sawmilling is focused on cant production in fairly large volumes (i.e., about 200 thousand board feet of cants per day), a wastewood chipping installation would tend to be of fairly large capacity. The type of waste produced is frequently large in size. As chipper capacity bears a relationship with "throat size," reasonably large capacity would be logical. The three situations foreseeable in the next several years under the previous assumptions are considered to be (1) chipping mill waste only, (2) chipping mill waste and marginal logs and logging residue from sawtimber stumpage purchases, and (3) the previous, but also including low quality stumpage purchased specifically for chipping if the integrated facility has excess capacity.

FIGURE 5

ALASKAN CANT MILL with CHIPPING FACILITY
(hypothetical diagram)



A basic format indicating procedures for calculating the cost of producing pulpwood chips is shown in Appendixes B and C. While chips have been used as an example, the same format could be used for other products. Great care must be taken in correctly allocating costs. This is particularly true if integrated utilization is being considered. For example, cost allocations would be different if a waste chipping facility is to be added to an established sawmill where overhead and complementary firm production and administrative factors are available. If the integrated unit is established, total cost allocations would reflect complementary factors from either component.

A case in point would be a debarker. A sawmill may operate with or without one. If chipping is considered the debarker can be (1) charged against sawmilling, (2) charged against chipping, or (3) charged against both operations, i.e., charged proportionately on the basis of benefits against revenues derived from sawing and from chipping. In Case I and Case I(a) debarking is charged against chipping; hence, savings in sawmilling are deducted from chipping costs.

Several examples are presented on the preceeding pages. These were all derived using the basic format shown in the Appendix. The examples were derived on the basis of what was thought to be logical assumptions in light of information collected during the course of this study in Haines, Southeast Alaska, and British Columbia. Prices used, such as costs of the factors of production, are applicable to fiscal 1966-67. It is particularly important to note that the following cases are only examples. While every effort was made to use logical assumptions and costs applicable in the Haines Area, the resultant estimates of the costs of manufacturing are only approximations. Any person, firm, or agency desiring estimates under different or specific assumptions should calculate their own. The example format in Appendixes B and C may prove useful for this purpose. Factors common to all the examples presented were standardized (i.e., hourly wages by type of employee, operating days, etc.). Thus comparisons between these examples for the purpose of selecting alternatives are reasonably valid even if a question is raised on the validity of an assumption (i.e., the effect of paying a truck driver $5.00 per hour is common to all alternatives using truck drivers, hence a $4.50 per hour rate would only affect a choice between alternatives where one alternative must have a $4.50 rate and another a $5.00 rate). Assumptions pertinent to each example are shown with the example. Other assumptions based on information provided from other sections of this report or from public and private sources in Haines during the course of the study are shown in Appendix A.

Returns to Integrated Manufacture

The previous cases suggest a choice between alternatives for the integrated manufacture of cants and pulpchips. Based on the daily production costs shown in each case and a range of prices centered around the current offered price for the products involved, the attractiveness of the alternatives can be evaluated. The two Tables 24 and 25 show the figures involved. Cant manufacture appears more profitable in Cases I(a), II, and III. This would be for a full capacity of 220 thousand board feet mill tally or output using a debarker. The alternatives of less than capacity manufacture (i.e., sacrificing cant capacity to increase chip capacity) or manufacture without a debarker do not appear as attractive.

TABLE 24.

Expected Daily Profit for the Integrated Production of Cants Under Various Cost, Price and Production Assumptions, 1967

Price (f.o.b. dock per M[1] bd. ft. cant tally)	Daily Profit According to Cost per 1000 bd. ft. and Production					
	Case I		Case I(a), II, III[2]		Case III(a)	
	$36.44	$46.10[3]	$35.42	$45.09[3]	$40.84	$50.48[3]
	200,000 bd. ft.		220,000 bd. ft.		145,000 bd. ft.	
(dollars)						
40	711.80	-	1007.80	-	-	-
41	911.80	-	1227.80	-	24.80	-
42	1111.80	-	1447.80	-	169.80	-
43	1311.80	-	1667.80	-	314.80	-
44	1511.80	-	1887.80	-	459.80	-
45	1711.80	-	2107.80	-	604.80	-
46	1911.80	-	2327.80	199.80	749.80	-
47	2111.80	179.80	2547.80	419.80	894.80	-
48	2311.80	379.80	2767.80	639.80	1039.80	-
49	2511.80	579.80	2987.80	859.80	1184.80	-
50	2711.80	779.80	3207.80	1079.80	1329.80	-
51	2911.80	979.80	3427.80	1299.80	1474.80	74.80
52	3111.80	1179.80	3647.80	1519.80	1619.80	219.80
53	3311.80	1379.80	3867.80	1739.80	1764.80	364.80
54	3511.80	1579.80	4087.80	1959.80	1909.80	509.80
55	3711.80	1779.80	4307.80	2179.80	2054.80	654.80

[1]Possible range of cant prices which might have existed in 1966-67 for purpose of comparing alternatives. Actual price offered estimated to be $45 to $47.

[2]Approximate for Case III as cant tally actually 217,500 bd. ft.; resulted from rounding 152 M bd. ft. of sawlog inputs to 150 M bd. ft.

[3]Changes in per unit costs if f.o.b. mill price of sawlogs is assumed to be $50 per M bd. ft. Scribner Decimal C log scale rather than $36 per M bd. ft.

TABLE 25.

Expected Daily Profit for the Integrated Production of Pulp Chips Under Various Price Assumptions and the Costs per Unit Estimated in Chapter IV

Price[1] (f.o.b. mill) (bone dry ton)	Daily Profit According to Cost per Ton and Production					
	Case I $11.72/ton 37 tons	Case Ia $9.94/ton 41 tons	Case II $10.44/ton 109 tons	Case III $11.43/ton 145 tons	Case IIIa $17.58/ton 210 tons	Case IV $14.21/ton 81 tons
$10.00	---	$ 2.32	$ ---	$ ---	$ ---	$ ---
11.00	---	43.32	61.32	---	---	---
12.00	10.10	84.32	170.32	82.32	---	---
13.00	47.10	125.32	279.32	227.32	---	---
14.00	84.10	166.32	388.32	372.32	---	---
15.00	121.10	207.32	497.32	517.32	---	63.44
16.00	158.10	248.32	606.32	662.32	---	144.44
17.00	195.10	289.32	715.32	807.32	---	225.44
18.00	232.10	330.32	824.32	952.32	86.50	306.44
19.00	269.10	371.32	933.32	1,097.32	296.50	387.44
20.00	306.10	412.32	1,042.32	1,242.32	506.50	468.44
21.00	343.10	453.32	1,151.32	1,387.32	716.50	549.44
22.00	380.10	494.32	1,260.32	1,532.32	926.50	630.44
23.00	417.10	535.32	1,369.32	1,677.32	1,136.50	711.44
24.00	454.10	576.32	1,478.32	1,822.32	1,346.50	792.44
25.00	491.10	617.32	1,587.32	1,967.32	1,556.50	873.44

[1]A range of prices is shown in order to allow for alternative markets and means of transportation.

While chipping low quality material in the woods represents a form of integrated utilization, this alternative would have no effect on integrated plant production. The merit of this alternative (assuming a tidewater handling and shipping facility is available) would depend principally on the size of the margin between offered price and delivered cost per unit. This utilization alternative would appear to become attractive if the offered price for chips were $15 or more per bone dry ton.

Assuming full cant production with a debarker, three chipping alternatives were considered. Chipping only mill waste (Case 1 (a)) would be most attractive if the offered price per unit of chips were $10. If the offered price was $11, it becomes feasible to chip logging residues residual to sawlog production in the woods. At an offered price of $15 per unit it would become feasible to operate the chipper at capacity by chipping an additional amount of pulpwood as well as mill waste and logging residue. Case III(a) would not be attractive unless the offered price for chips exceeded $31 per ton. This is the point at which chip revenues would cover the greater costs involved in manufacturing less than full cant capacity. The argument that a smaller chipper at a lower fixed and variable cost handling just mill waste would be more profitable alternative is not valid as chipper capacity increases with size of material to be chipped and throat size. The latter would be necessary as large slabs are produced in the manufacture of cants. In short, excess capacity can be expected on a cant mill chipper and this excess capacity is important in alternative considerations. All alternatives were considered on a basis whereby debarker, saw, and chipper were compatible in integrated use. The resulting "best" alternative shown in the previous cases is thought to be valid under Haines conditions. This would be full cant production with a debarker and the utilization of both mill residues and logging residues where the price received for chips was $11.00 per bone dry ton but less than $15.[9] Selected changes in the assumptions could, no doubt, change the attractiveness of an alternative.

[9]Note that alternatives must be considered in terms of profit as shown in Table 25. The break-even point between Case I(a) and Case II occurs at a price between $10.00 and $11.00; similarly, the break-even point between Case II and Case III occurs at a price between $14.00 and $15.00.

CHAPTER V.

ECONOMIC BASE OF THE HAINES AREA

With the introduction of significant logging and cant manufacturing in the Haines area, the economic base of the community was altered and increased employment and income growth appeared. The magnitude and type of growth which resulted from this forest utilization is especially important. Its importance stems from economic benefits which are derived from alternative public policies, and in forecasting the economic benefits which would occur if a similar industry were situated at other communities in Alaska.

The purposes of this section are:

(1) To estimate the amount of employment and income generated by forest products manufacturing in the Haines area.

(2) To examine economic costs and benefits of alternative types of forest utilization and degree of manufacturing.

(3) To develop an initial economic model of the Haines economy with emphasis upon the development role of a newly introduced forest-based industry.

In order to complete an investigation and analysis of the economic base of the Haines area, several methods of gathering evidence were employed. These included extensive interviews of employers and workers throughout the forest products sector. Most of the evidence gathered by unstructured interviews was subsequently re-confirmed through independent sources to avoid personal reporting bias. Almost every employer was interviewed concerning the nature of business purchases (inputs) and sales (product output). In certain few instances, notably tourism, these estimates were considered very preliminary. A census of housing occupancy[1] and a local employment survey were conducted by the Institute of Social, Economic, and Government Research staff members. This canvass included all of the contiguous residential and commercial buildings in the Haines and Port Chilkoot complex. Mills situated beyond the city limits and fishery operations were examined as well. Taken altogether, the sum of evidence from a variety of canvasses and surveys left few questions unanswered about the present economic structure of the Haines economy.

Background

The Haines area, comprised of the communities of Haines, Port Chilkoot and nearby villages, is isolated from other Alaskan cities because of long water and road distances. Up until the early 1950's the area was principally a commercial fishing town, with a public employment complement representing the southern terminus of the military pipeline. Tourist activity was very limited. The conditions of the period are well described and documented in an early study sponsored by the Alaska Development Board.[2]

For practical purposes, these conditions continued without interruption into the early 1960's, although a variety of new industry proposals were examined by local residents and planning groups. By 1963 portable sawmill

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[1] See Appendix H.

[2] R.A. Cooley, An Economic Study -- Haines, Alaska (Juneau, Alaska: Alaska: Alaska Development Board, October, 1953).

operations were producing for export and larger scale logging for export had been endorsed as a part of the districts' Overall Economic Development Plan.[3] Within a relatively short span, basic conditions for attracting new industry changed markedly. The Alaska Ferry System (Marine Highway) introduced daily service, public dock facilities were made available to private industry, and the sale of public timber was actively promoted. The period since 1963 may be generally characterized as one of regular private investment, growth and expansion, except for losses related to the Alaskan Earthquake of 1964 and its subsequent seismic sea wave damage.[4] These growth patterns are readily apparent in Figures 6 through 8.

Forest Products Manufacturing As a Basic Industry for Regional Exports

The introduction of cant manufacturing, with the associated logging operations since 1963, represented new basic manufacturing industry to the Haines locality. Basic industries of this type possess several inherent advantages which stimulate growth in the economy:

(1) They represent new employment to the area and result in local hiring, or in-migration of skilled workers.

(2) An industry which sells to buyers outside the region brings in new money income, which in turn has beneficial secondary effects.

(3) The industry may purchase other factors of production locally, and its employees consume local goods and services.

[3] Overall Economic Development Report: Old Elections District No. 6 (Haines, Port Chilkoot, Yakutat, Hoonah, Skagway) (Haines, Alaska: Report submitted to the Area Redevelopment Administration, April 24, 1963.

[4] See Overall Economic...1966 addition of the 1963 Plan (undated, and pertaining to only the Haines-Port Chilkoot Area).

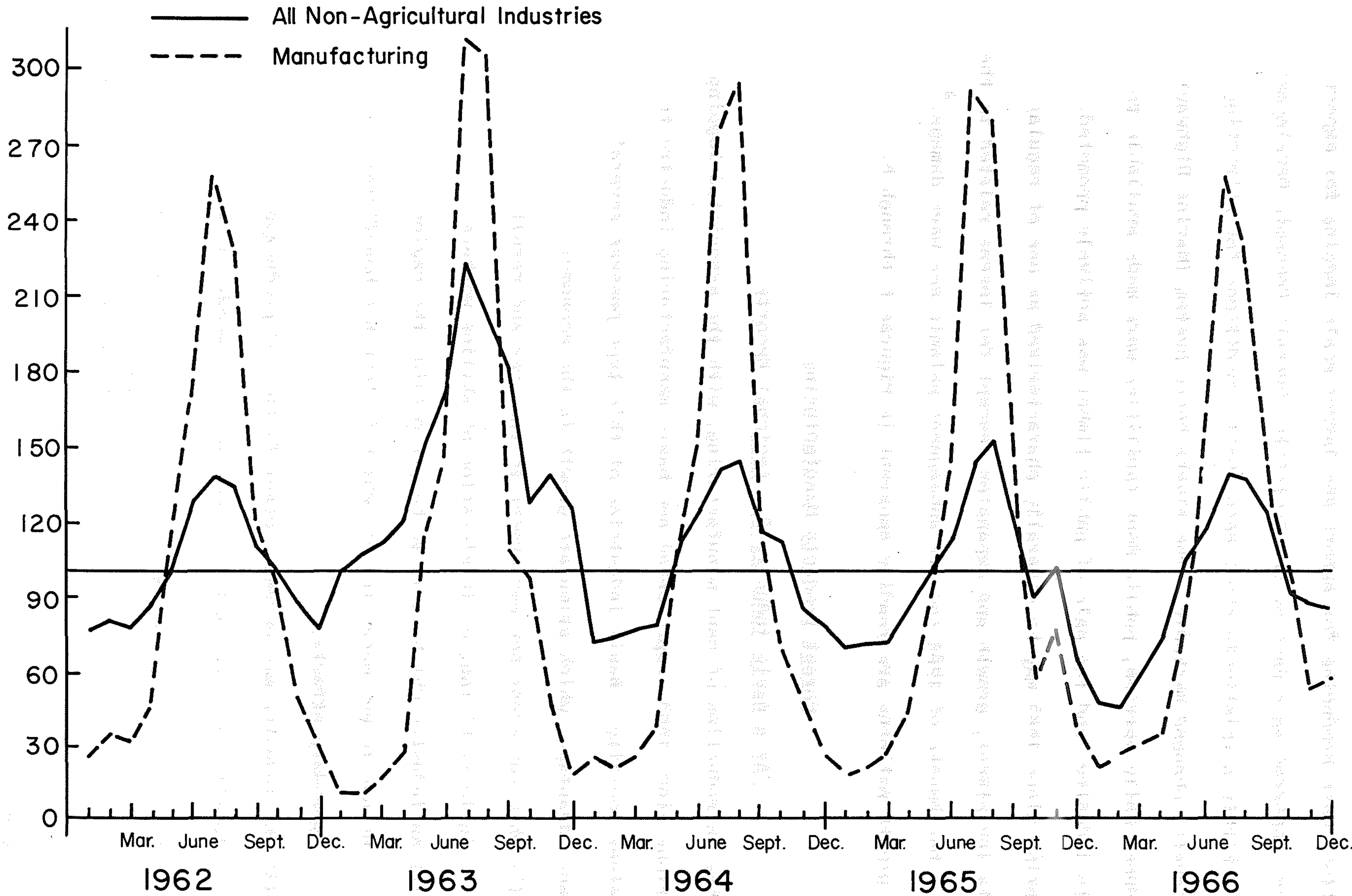


FIGURE 6: SEASONAL INDEXES OF MONTHLY EMPLOYMENT IN MANUFACTURING AND ALL NON-AGRICULTURAL INDUSTRIES FOR THE LYNN CANAL - ICY STRAITS LABOR MARKET AREA, 1962-1966.

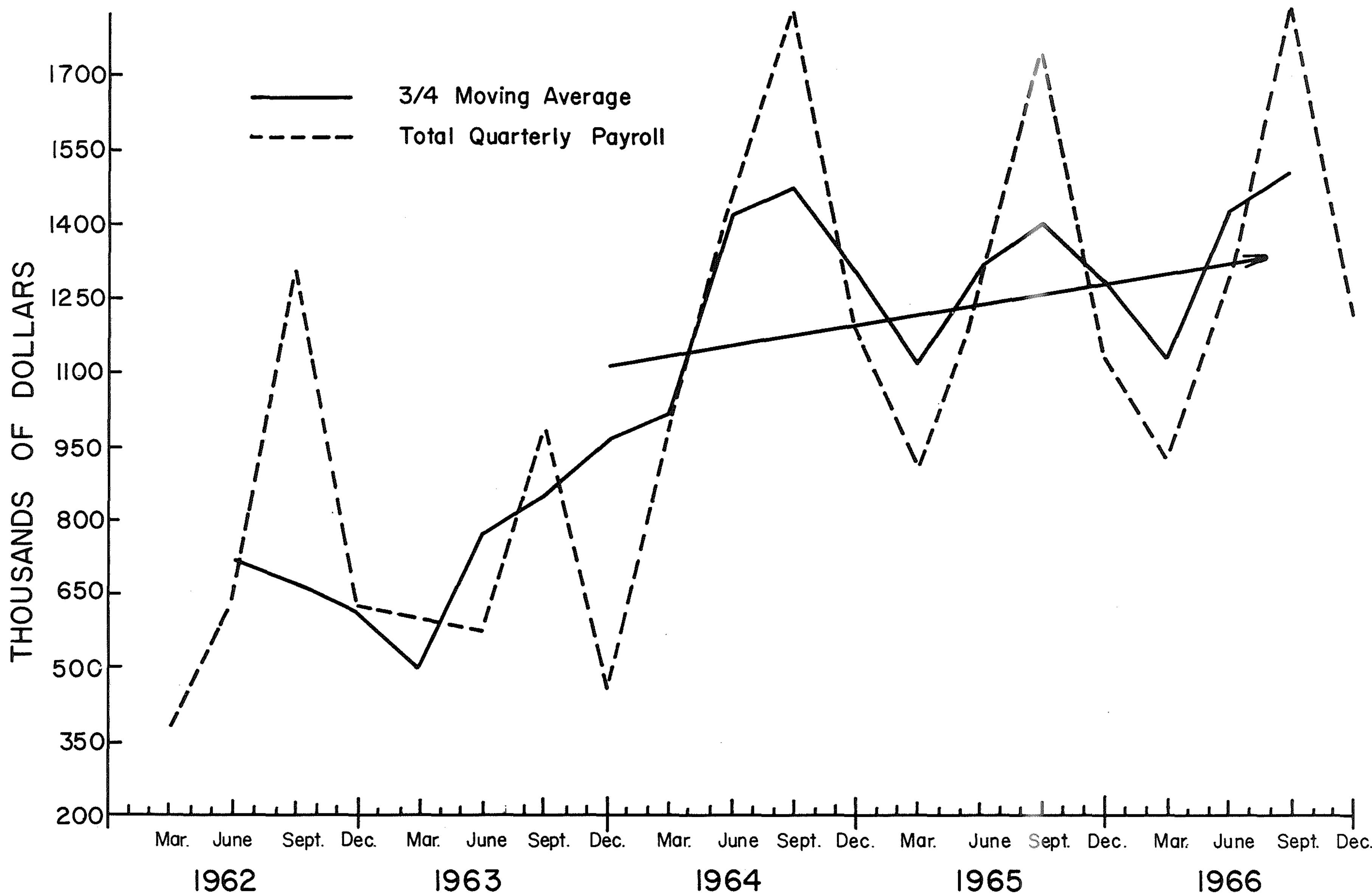


FIGURE 7: ALL NON-AGRICULTURAL INDUSTRIES QUARTERLY PAYROLL IN THE LYNN CANAL - ICY STRAITS LABOR MARKET AREA, 1962-1966. (in thousands of dollars)

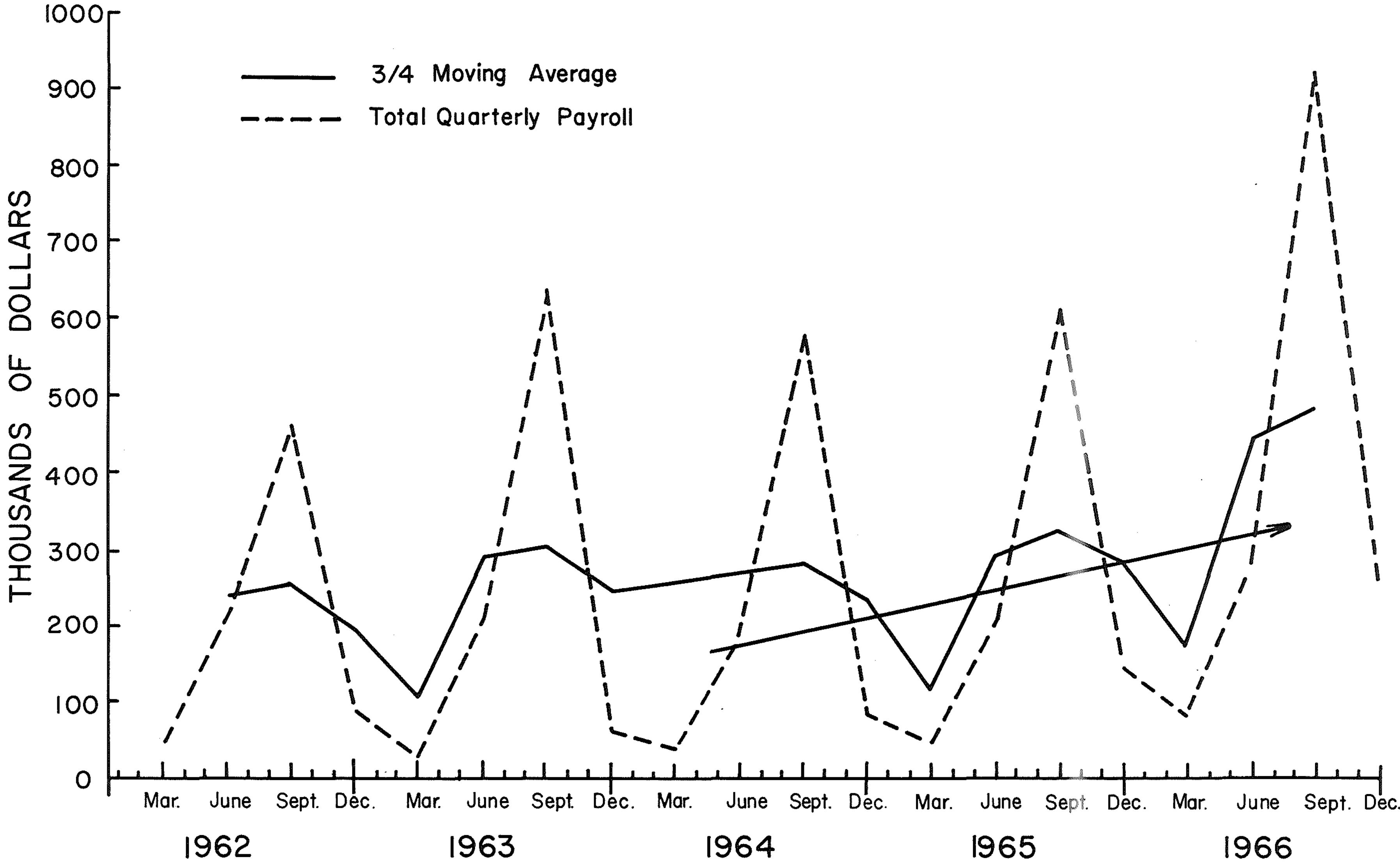


FIGURE 8: MANUFACTURING QUARTERLY PAYROLL IN THE LYNN CANAL - ICY STRAITS LABOR MARKET AREA, 1962-1966.
(in thousands of dollars)

The Haines area has benefited from all these advantages.

For example, this industry generated $380 thousand of revenues in 1963 which increased to $4.3 million by 1967. The expansion in exports generated was $2.3 million between 1966 and 1967. In the last several years roughly 65 per cent of this outside income generated was paid to Haines area residents as wages and salaries. (See Table 26.) In this regard, the rapid growth of this forest products industry had become a million dollar industry by most measures of comparison in a very few years.

TABLE 26.

GROSS INCOME GENERATED BY THE EXPORT OF FOREST PRODUCTS[1]

FROM HAINES, ALASKA, 1963 - 1967

(F.O.B. Ship)

Year	Cants	Logs	Total
		($1,000's dollars)	
1963	266	114	380
1964	401	180	581
1965	561	327	888
1966[2]	1,595	415	2,010
1967[2]	3,783	482	4,265

[1]Total payments for products sold to Japan, including loading and handling, stevedoring, etc. Excluding minor shipment to S.E. Alaska.

[2]Approximately 65 per cent becomes local wages paid by mills, woods contracts, stevedoring, i.e., $1,486 (thousand) in 1966-67.

SOURCE: 1963-1966 based on U.S. Customs Declarations as reported to the Alaska Division of Lands. 1967 based on U.S. Customs Declarations as reported to the authors by the Bureau of Customs.

These industrial enterprises (mills, logging, hauling) purchased business supplies locally. The nature of this increase in demand for local wholesale and retail trade is discussed later in the chapter.

The expansion of this industry required the employment of a labor force particularly skilled in a type of work which had not previously existed on a large commercial scale in Haines. Therefore, it is not surprising that certain problems of migration and unemployment appeared. Reliable persons report, and the Comprehensive Plan confirms, that the following labor conditions developed:

(1) Initially, the largest share of workers were brought into Haines from other areas of Southeast Alaska and the Pacific Northwest. These new residents faced a difficult situation in locating suitable local housing.

(2) Residents were often uninterested in mill and logging employment, or were unskilled considering the available jobs. As in other coastal Alaska areas, a substantial group of adults preferred to fish commercially during the salmon season and to hunt at other times of the year. This voluntary withdrawal from the labor force also has tended to overstate the amount of unemployment in the area.

(3) In due time, a major differential developed between mill manufacturing work and the wages available from alternative employers. This spread in hourly income is shown in Table 27.

The experience recorded in the Haines labor market 1962-1967 suggests that many kinds of new industry entering Alaska, including forest-based operations, must initially hire most of a labor force from other

TABLE 27.

SELECTED WAGE RATES IN THE

HAINES, ALASKA AREA, AS OF 1967

Forest Products[1] (range $3.50 to $6.00 per hour)	
Mill Foreman	$13,000 year
Mechanics and Millrights	$4.50 hr.
Apprentice Operators	$4.50 hr.
"Buckers"	$4.35 hr.
Heavy Machine Operator	$5.00 hr.
Office help (average)	$3.50 hr.
Wood crew	$4.00 to $5.00 hr.
Stevedoring	$4.95 - $5.10 hr. + overtime at $7.43 to $7.65
Service Industries (range $2.00 - $3.75 hr.)	
Butcher	$3.75 hr.
Cooks	$3.00 hr.
Checker	$2.50 to $2.75 hr.
Waitresses and Dishwashers	$2.00 hr.

[1]Approximately $1.50 hr. higher than in Washington and Oregon.

SOURCE: Author's survey.

areas where the industry has matured. In due time, a higher proportion of Alaskans would be employed, or in-migrants would become residents.

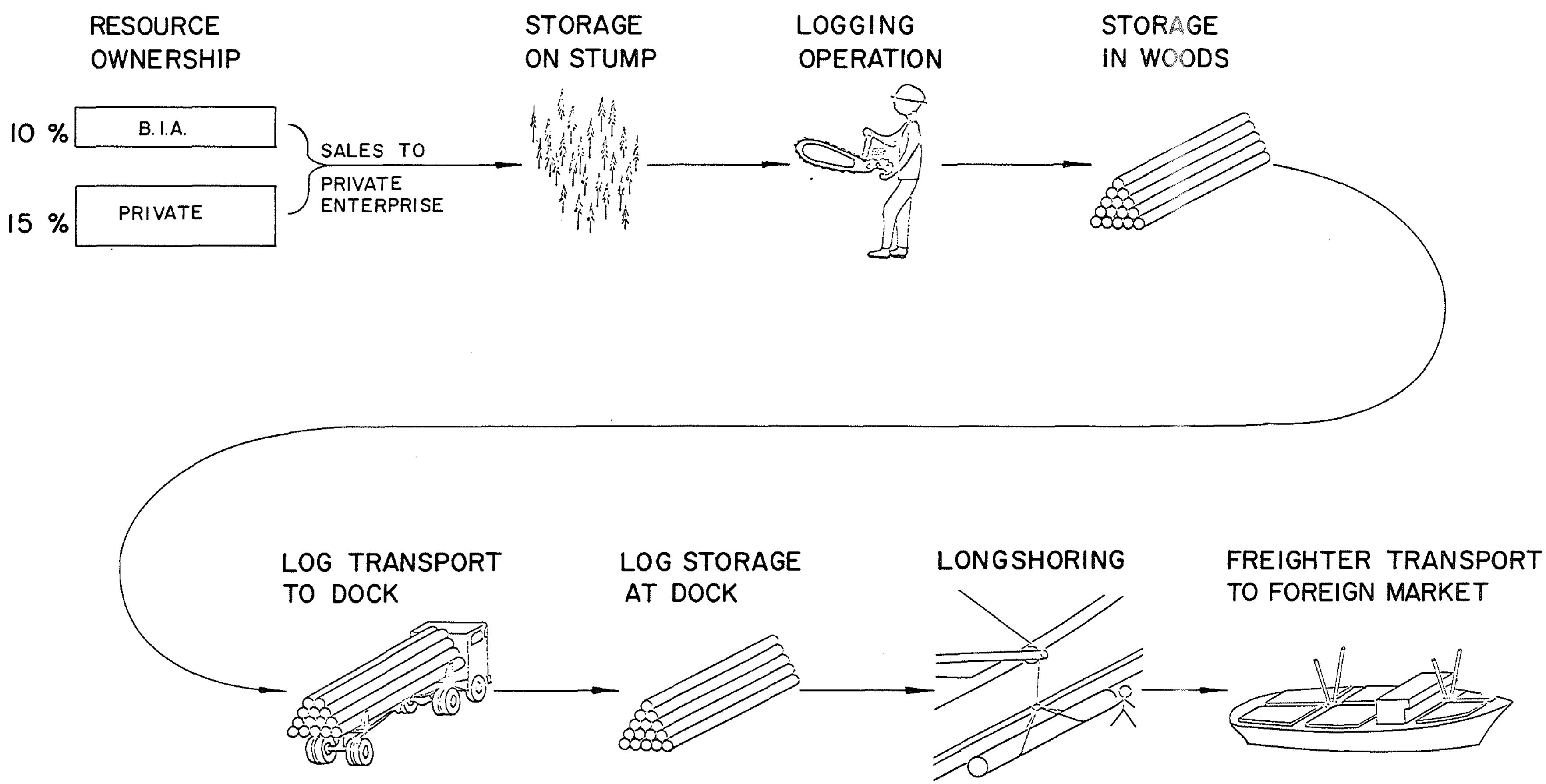
Manufacturing Locations and Plant Construction

The location of the two cant mills which operated during 1967 are identified in Chapter II, in a current map of the Haines area. In comparing Figures 9 and 10, it is readily apparent how the forest resources are

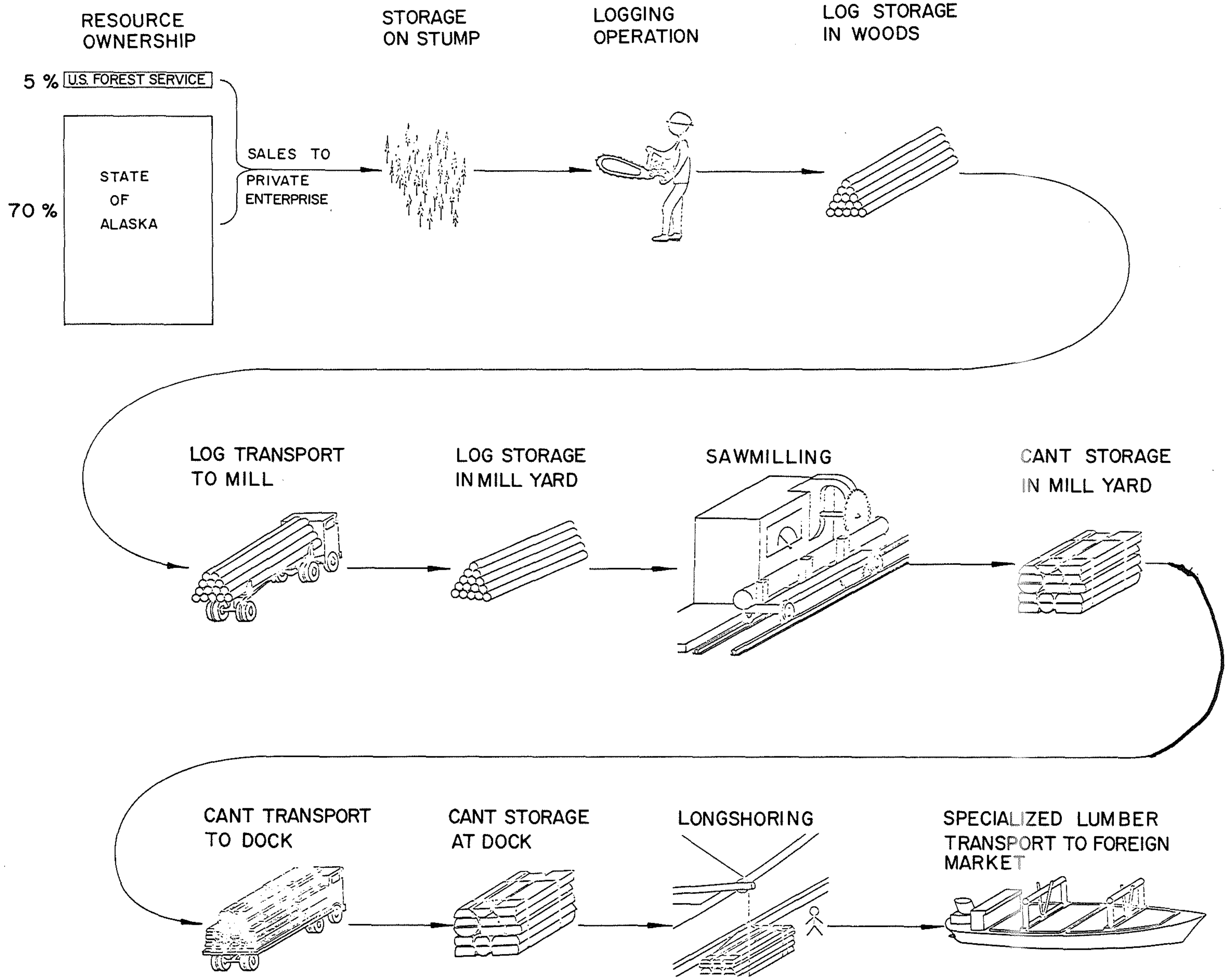
FIGURES 9. AND 10.

HAINES AREA ALASKA TIMBER SALES, HARVESTING, AND FLOW OF FOREST PRODUCTS (Logs and Cants) TO CONSUMERS, 1967

LOGS



CANTS


RESOURCE OWNERSHIP
5 %
U.S. FOREST SERVICE
70 %
STATE OF ALASKA
SALES TO PRIVATE ENTERPRISE
STORAGE ON STUMP
LOGGING OPERATION
LOG STORAGE IN WOODS
LOG TRANSPORT TO MILL
LOG STORAGE IN MILL YARD
SAWMILLING
CANT STORAGE IN MILL YARD
CANT TRANSPORT TO DOCK
CANT STORAGE AT DOCK
LONGSHORING
SPECIALIZED LUMBER TRANSPORT TO FOREIGN MARKET

logged and the basic logistics of transporting logs to cant mills occurs. Increased hauling distances and road grades, involved in future harvesting, will make transport more costly, and therefore rafting in logs from the North Tongass National Forest will become increasingly of greater interest.

During the period 1963-1967 the present mill facilities were constructed. It is especially noteworthy that over the entire period a significant number of the workers (and therefore manhours applied) was assigned in support of expansion of manufacturing facilities. Its importance is found in:

(1) The capital construction cost situation in Haines favors employers building their own mills, with the exception of buying outright certain critical capital equipment and materials.

(2) A significant portion of wage expenses, charged as operating costs of cant production, actually are devoted to plant expansion purposes. Obviously, this practice results in an over-statement of cant manufacturing costs.

The two mills are similar in design and layout. For practical purposes, these sawmills are organized for extremely high volume output with very limited quality control for production management purposes.

Logistics and Marketing

As the industry is organized at present, manufactured cants are moved and rehandled at several additional points, when compared with exported round logs. A visual comparison of these alternative manufacturing and handling systems is shown by examining Figures 9 and 10. Cant manufacturing also requires more substantial inventories in the mill yard, and of finished inventory bound for shipment. For practical purposes, overall inventories are managed in a way not at all typical of the lumber industry in the Northwest United States. These special marketing conditions are:

(1) Inventories are built up for boatload lot size shipment with a fairly firm schedule of shipping times. Therefore, financial risks of obsolete inventory are held at a minimum.

(2) Inventories are moved to the dock in preparation for loading, rather than held at the mill, i.e., the flow of inventory is practically continuous through loading.

(3) Since the buyer's product specifications are known and selling prices are previously established, practically no additional marketing efforts are involved. Alternatively, non-Japanese buyers have not been available and little research is in process to investigate new market possibilities.

All in all, the manufacturing-transportation-marketing system of this particular forest products industry contains a very small amount of marketing risk. The system of production and delivery operates on a practically continuous basis with a very limited number of internal economic changes appearing on a year to year basis. These conditions are, of course, highly conducive to manufacturing efficiency in terms of scale economies reducing the average cost of production.

The shipping and loading equipment which handle cants is designed particularly for this bound product form. It is quite apparent that Japanese industry expects to continue with cant imports on a very long term basis.[5] By comparison to the vessels presently carrying round logs, cant ships enjoy several logisitical advantages:

(1) More efficient and rapid loading,

(2) Better space utilization on larger ships,

(3) Greater wood volume per space unit used.

Even without additional supporting data and investigation, it is readily apparent that the overall logistics of cant manufacturing in Alaska, with rapid ocean transit on large scale vessels, loaded to Port-of-Call and buyer specifications for off-loading, represents a more efficient trade relation than the observed round log export sale. Specifications for a cant ship are shown in Appendix F. In addition, a time study test on loading a ship is shown in Appendix G. (Jobs provided in longshoring are shown in Table 32.)

Inter-Industry Spending Ties

The introduction of the forest-based industry in Haines caused a major change in the economic base of the region. First and foremost, new income and spending ties developed within the community. The flow of forest products, sales of local goods and services supporting the industry, and money income generated are shown in a series of Figures 11 to 13 and Tables, 28 to 30. The major transactions and income linkages are summarized as follows.

Impact on the Haines Area

The basic employers in the area shifted quickly in importance. By the authors' estimates for 1966-1967, the newly developed forest-based

[5] See A. Tussing, et. al. Alaska Japan Economic Relations, (College: University of Alaska, 1969), Part VII.

FIGURE 11.

FLOW OF WAGES AND PROFITS FROM BUSINESS TO CONSUMERS THROUGH THE DOMESTIC HAINES ECONOMY, 1967

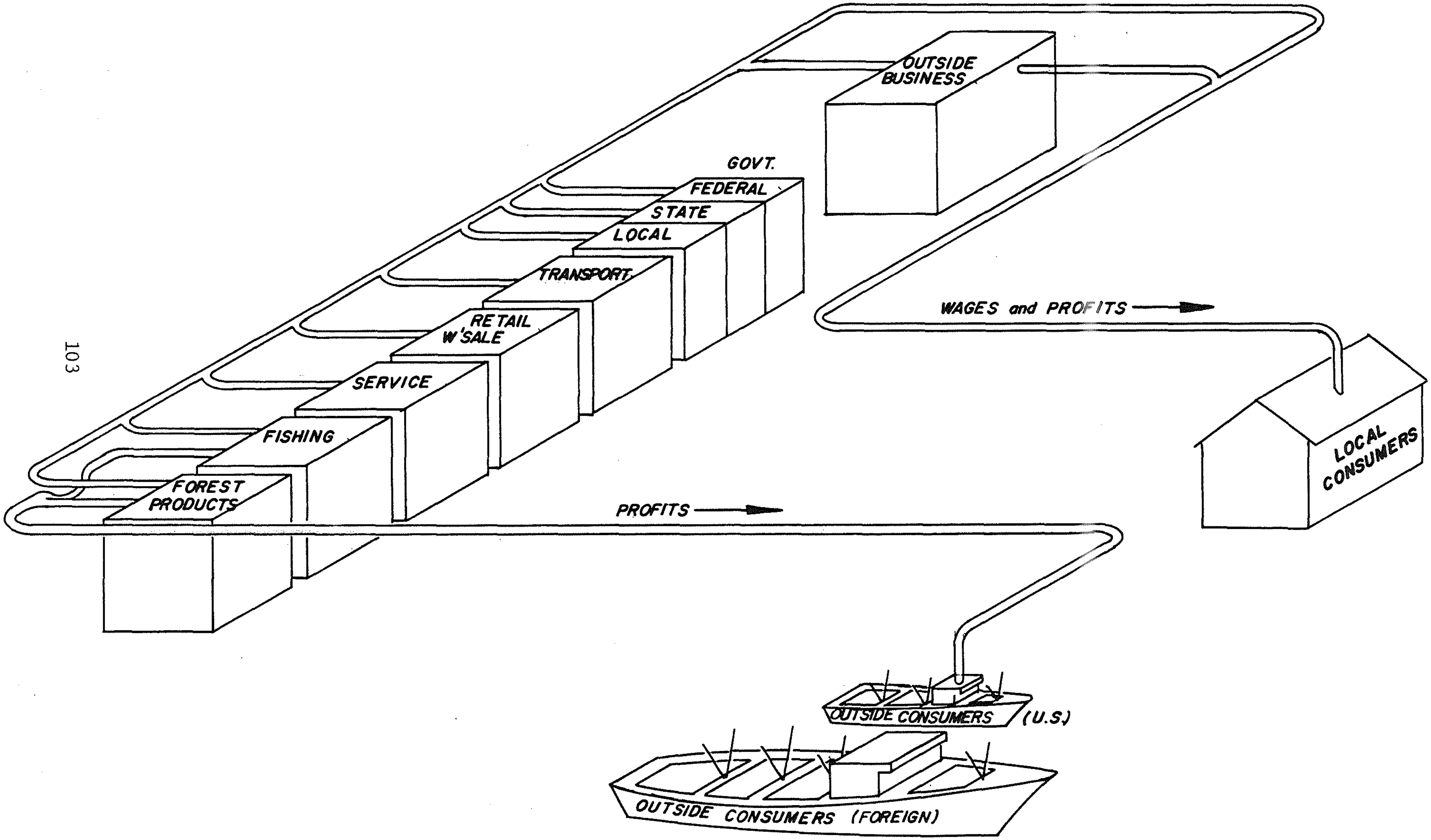


TABLE 28.

VALUE OF FLOWS OF WAGES AND PROFITS FROM THE BUSINESS SECTOR TO CONSUMERS THROUGH THE DOMESTIC HAINES ECONOMY, 1967

<table>
<tr><th>FROM</th><th>TO
LOCAL CONSUMERS</th><th>TO
OUTSIDE CONSUMERS (U.S.)</th><th>TO
OUTSIDE CONSUMERS (FOREIGN)</th></tr>
<tr><td>FOREST PRODUCTS</td><td>$2,772,000
gross wages & salaries, not including profits.</td><td>small</td><td>not substantiated; but indirect and large</td></tr>
<tr><td>FISHING</td><td>cannery workers and local fishermen. unknown</td><td>non-local fishermen unknown</td><td>n/a</td></tr>
<tr><td>SERVICE</td><td rowspan="2">$300,000</td><td>small
absentee ownership</td><td>n/a</td></tr>
<tr><td>RETAIL WHOLESALE</td><td>small
absentee ownership</td><td>n/a</td></tr>
<tr><td>TRANSPORTATION</td><td>$115,000</td><td>small
absentee ownership</td><td>n/a</td></tr>
<tr><td>FEDERAL GOVT.</td><td>$420,000</td><td>n/a</td><td>n/a</td></tr>
<tr><td>STATE GOVT.</td><td>$1,560,000*</td><td>n/a</td><td>n/a</td></tr>
<tr><td>LOCAL GOVT.</td><td>unknown</td><td>n/a</td><td>n/a</td></tr>
<tr><td>OUTSIDE BUSINESS</td><td>local representatives of outside companies unknown</td><td>n/a</td><td>n/a</td></tr>
</table>

*Includes federal government transfer payments.

n/a = not applicable.

FIGURE 12.

FLOW OF EXPENDITURES (payments for goods and services) FROM CONSUMERS TO BUSINESS SECTOR OF THE HAINES ECONOMY, 1967

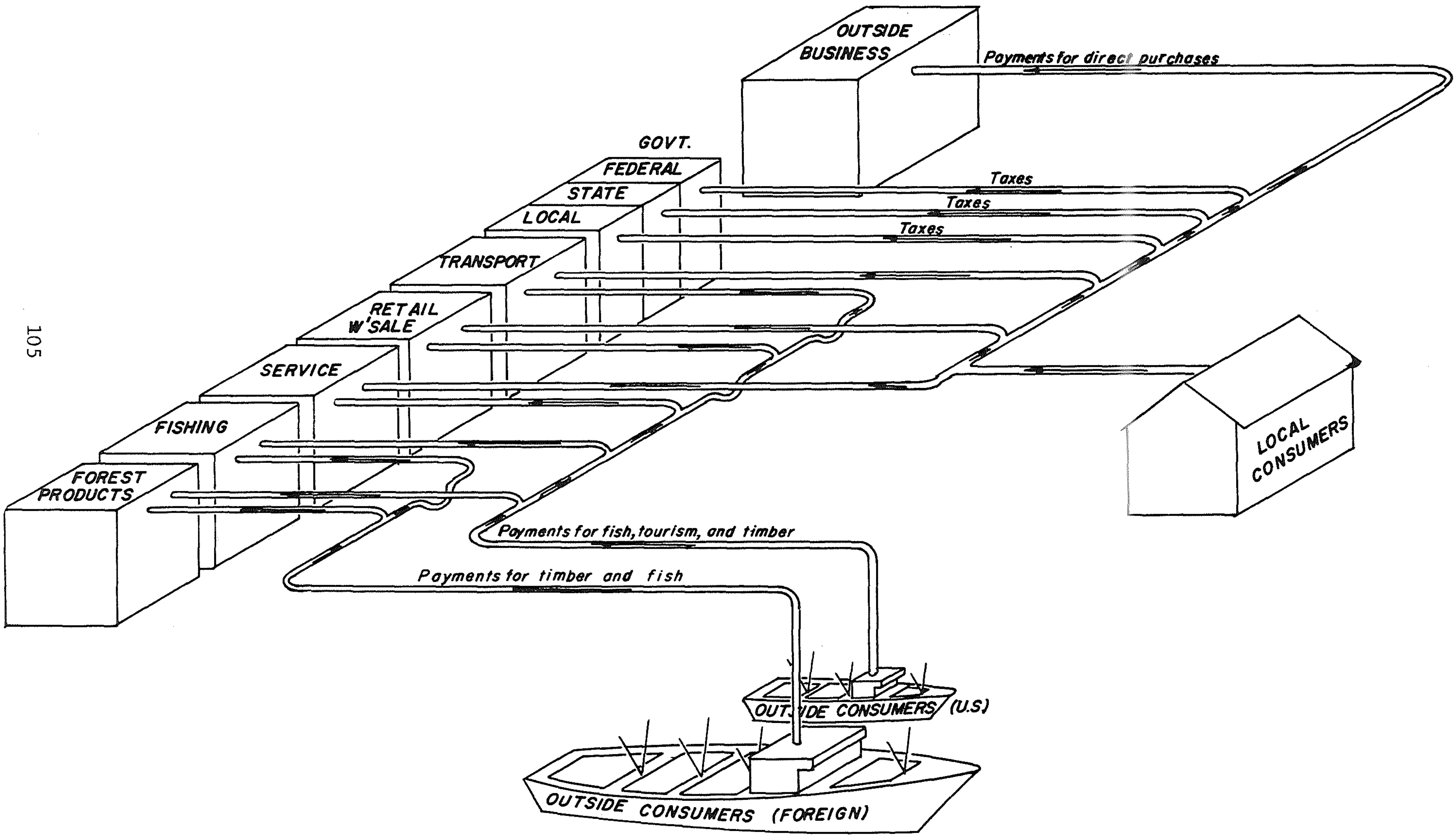


TABLE 29.

VALUE OF FLOWS OF EXPENDITURES (payments for goods and services) FROM CONSUMERS TO THE BUSINESS SECTOR OF THE HAINES ECONOMY, 1967

<table>
<tr><th>FROM
OUTSIDE CONSUMERS
(FOREIGN)</th><th>FROM
OUTSIDE CONSUMERS
(U.S.)</th><th>FROM
LOCAL CONSUMERS</th><th>TO</th></tr>
<tr><td>$2,300,000</td><td>purchasing through Wrangell Lbr. Co. as in 1966</td><td>n/a</td><td>FOREST PRODUCTS</td></tr>
<tr><td>small, principally salmon roe</td><td>major cannery and fresh frozen sales</td><td>small</td><td>FISHING</td></tr>
<tr><td>n/a</td><td rowspan="3">Includes Tourists</td><td rowspan="3">$1,150,000
+ $115,000</td><td>SERVICE</td></tr>
<tr><td>n/a</td><td>RETAIL WHOLESALE</td></tr>
<tr><td>n/a</td><td>TRANSPORTATION</td></tr>
<tr><td>n/a</td><td>n/a</td><td>taxes, stumpage sales</td><td>FEDERAL GOVT.</td></tr>
<tr><td>n/a</td><td>n/a</td><td>taxes, stumpage sales</td><td>STATE GOVT.</td></tr>
<tr><td>n/a</td><td>n/a</td><td>taxes direct and indirect</td><td>LOCAL GOVT.</td></tr>
<tr><td>n/a</td><td>n/a</td><td>wholesale-retail trade purchases of inventory</td><td>OUTSIDE BUSINESS</td></tr>
</table>

FIGURE 13.

FLOW OF REAL GOODS AND SERVICES FROM THE BUSINESS SECTOR OF THE HAINES ECONOMY TO THE CONSUMERS, 1967

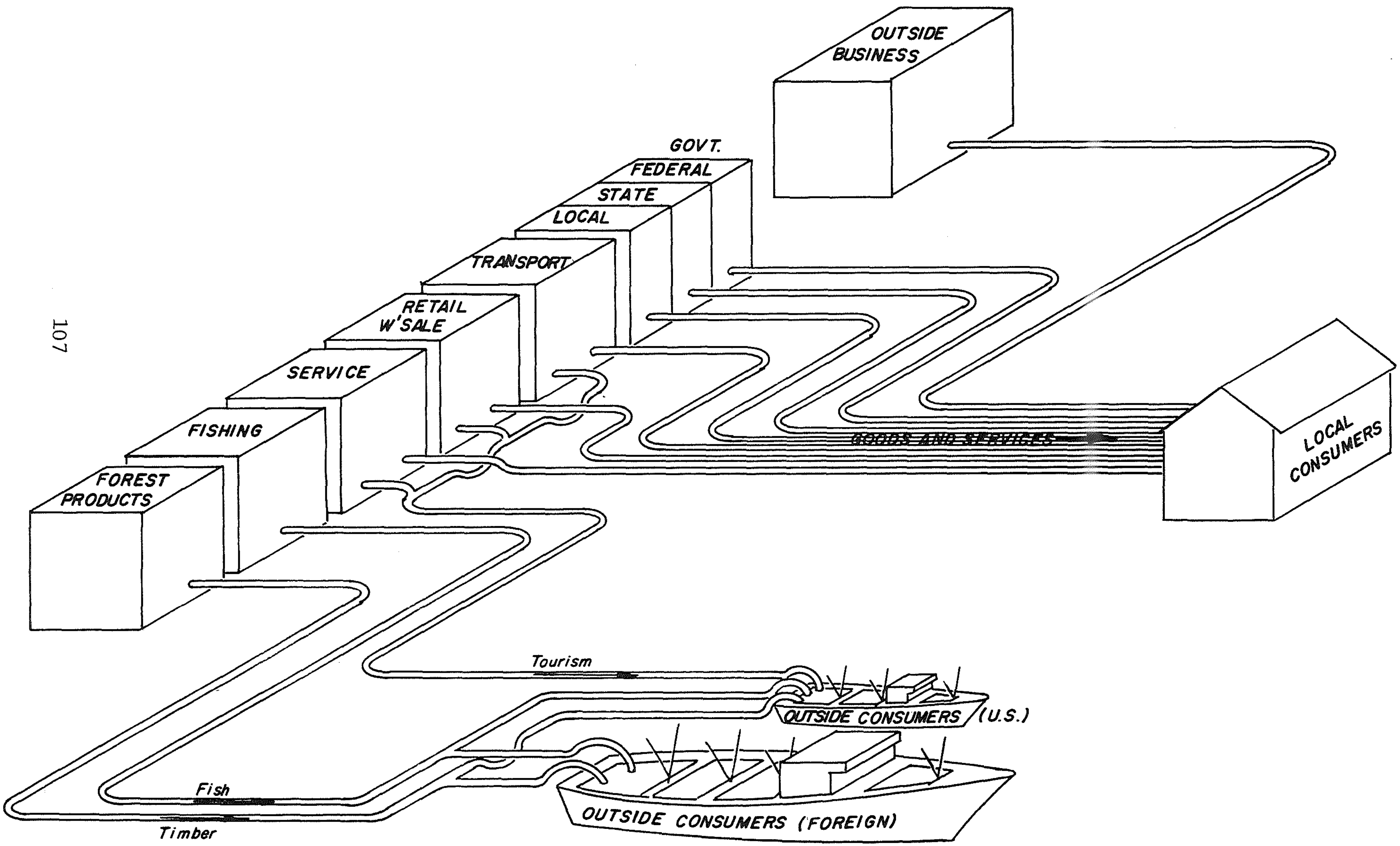


TABLE 30.

VALUE OF FLOWS OF REAL GOODS AND SERVICES FROM THE BUSINESS SECTOR OF THE HAINES ECONOMY TO THE CONSUMERS, 1967

<table>
<tr><th>FROM</th><th>TO
LOCAL CONSUMERS</th><th>TO
OUTSIDE CONSUMERS
(U.S.)</th><th>TO
OUTSIDE CONSUMERS
(FOREIGN)</th></tr>
<tr><td>FOREST PRODUCTS</td><td>negligible</td><td>small</td><td>$2,300,000</td></tr>
<tr><td>FISHING</td><td>negligible</td><td>varies</td><td>small</td></tr>
<tr><td>SERVICE</td><td colspan="2" rowspan="2">$1,150,000</td><td>n/a</td></tr>
<tr><td>RETAIL WHOLESALE</td><td>n/a</td></tr>
<tr><td>TRANSPORTATION</td><td>$115,000</td><td>some</td><td>negligible</td></tr>
<tr><td>FEDERAL GOVT.</td><td>negligible</td><td>n/a</td><td>n/a</td></tr>
<tr><td>STATE GOVT.</td><td>timber sales
(stumpage)</td><td>tourism and
marine highway</td><td>n/a</td></tr>
<tr><td>LOCAL GOVT.</td><td>all</td><td>some through
tourism</td><td>n/a</td></tr>
<tr><td>OUTSIDE BUSINESS</td><td>reflected in sales by local retail and wholesale business</td><td>n/a</td><td>n/a</td></tr>
</table>

workers already comprised 37 per cent of the area's permanent employment, and a correspondingly large contribution to the community's personal income. These conditions are shown, in part, in Table 31. Total wage bill comparisons among sectors are presented in Figure 11 and Table 28. As a consequence of this dramatic income growth, consumer spending in the area increased markedly in purchasing by local residents. This derived consumption benefits of the exporting industry are also shown in Figure 12 and Table 29.

The direct effects of this industry expansion are much larger than the indirect benefits, which initially appeared fairly small. The answers to the small secondary impact are:

(1) The benefits were concentrated in new income generated (e.g., mill wages) rather than derived employment growth (e.g., additional retail clerks).

(2) Non-forest industries declined in operations at the time when the wood products industry prospered, i.e., the structural shifts within the region have been offsetting.

(3) The economy is exposed to purchasing leakages, i.e., the community buys considerable goods and services not produced locally.

Flows Among Sectors of the Economy

The lack of diversified industries in Haines is representative of many coastal Alaskan communities, and the limited amount of trading which occurs within the region adversely affects its development. Secondary industries have not grown up to support the basic manufacturing industries of salmon canning and forest products manufacturing. From examining the historical development of these areas, certain implications for economic growth are clear. Their importance stems from:

TABLE 31

ESTIMATED EMPLOYMENT BY MAJOR SECTORS

OF THE HAINES, ALASKA ECONOMY, 1966-67[1]

Sector	Employment[2] (No. of persons for 12 months)	Percent
Forestry and Forest products	153	37
Fish and Fish Products	51	12
Tourism and Travel	61	15
Government	90	22
TOTAL (Major Basic Employment)[3]	355	86

[1] A comparison of the four major sources of outside income imported into the Haines Area. These sources support primary spending. Other sectors are of lesser importance or are largely concerned with secondary spending.

[2] Based on data and sources shown in Appendix E; adjusted for seasonality on the basis of interview information and trends derived from Statistical Quarterlies Alaska Department of Labor, 1967.

Employment was figured on a monthly basis to allow for multiple occupations allocation. Caution: Do not interpret months of employment to mean any specific number of hours of employment per month. Employment was considered on the basis of main occupation or occupation during each month regardless of the number of hours worked.

[3] For those wishing to compare employment and total population, these population estimates of the Haines area of Alaska, 1967 might be useful.

a. Based on figures reported in Census District Directory; Lynn Canal Icy Strait, Estimated 1966-67 population. 1,115

b. Based on total employment, summer (1967); each job (i.e., employees) averaging 2 dependents. 1,083

c. Based on school enrollment; assuming average 2 adults per enrolled child. 1,155

d. Based on inhabited dwellings (including apartments, shacks and mobile homes), assuming average of 3 persons per habitation. 1,050

(1) Wages and income paid to mill employees are soon spent on housing, fuel, and food products purchased largely from non-Alaskan areas. In short, consumer demand merely stimulates retail sales without a substantial re-circulation of income.

(2) The prosperity of forest products manufacturing has proceeded fairly independently of other enterprises in the local community. The economic independence of this sector is especially apparent in examining income and product flows.

(3) Longer term secondary benefits of an expanding industry are almost always dampened when sharp seasonal changes in employment income occur. Except for logging and milling (and government), the other major sectors of the Haines economy operate on a highly seasonal basis.

Employment and Income Growth

An explicit purpose of this study was to estimate the amount of employment growth which was generated by an expansion of forest products manufacturing. The question, "How much employment and income is generated by cant and log export?" is very important.

Direct and Indirect Employment Generated

A review of manufacturing employment in the Haines area labor market, was complicated by several factors. The labor market area, Lynn Canal-Icy Straits, included much more than the Haines area. Manufacturing employment included workers in the salmon canneries as well as forest products manufacturing. In spite of these complications, the employment impact of cant manufacturing was readily distinguishable.

A summary of these employment characteristics is found in Table 33, which also indicates timber volumes exported and average employment/output ratios. Several years (1963-1965) passed before this time series revealed a "true" magnitude of new employment growth. Its value was

TABLE 32.

SURVEY OF WORKER REQUIREMENTS IN CANT VERSUS LOG EXPORT FOR HAINES, ALASKA, AS OF 1967

Activity		In Milling and Shipping (Jobs per million bd. ft.)[1]	In Log Export
1.	Logging	1.27	1.27
2.	Milling	0.82	----
3.	Longshoring	0.57	0.83
	TOTAL	2.66[2]	2.10

[1] Scribner Decimal C equivalent basis for all figures. CAUTION: figures are applicable to jobs only. Time-production relationships other than those reported in Table 12 could not be accurately formulated.

[2] Approximately 27 per cent greater employment in terms of total jobs in cant manufacturing than log export, using 2.10 as the index base.

SOURCE: Author's estimates based on reported industrial experience.

established at 2.6 persons per million board feet exported by two alternative methods.[7]

The first method was estimation from incremental annual changes reported by the Alaska Department of Labor. For example, row 14 of Table 33 shows in 1966 an employment coefficient of 2.6 persons employed per million board feet.

[7] Actually, 2.66 (Table 32) and 2.6 (Table 33).

TABLE 33.

SUMMARY OF ANNUAL EMPLOYMENT AND FOREST OUTPUT STATISTICS, WITH AVERAGE LABOR COEFFICIENTS AND INCREMENTAL ESTIMATES, FOR HAINES AREA, ALASKA, 1961-1967

EMPLOYMENT CHARACTERISTICS (in person's)	1961	1962	1963	1964	1965	1966	1967
1. Total Employment	836	896	916	911	895	925	
2. Employment Change (+ -)	0	+60	+20	-5	-16	+30	
3. Employment in Mfgr.	175	165	173	152	155	198	
4. Change in Emp. in Mfgr.	0	-10	+ 8	-21	+ 3	+43	
5. Total unemployed	95	106	104	98	118	118	
6. Percent as to Employed	11.4	11.8	11.4	10.8	13.2	12.8	
OUTPUT-TIMBER EXPORTED (Millions bd. ft. Scribner Decimal C)							
7. Logs	0	0	1.7	3.4	5.3	6.4	7.9
8. Change in Export (+ -)	0	0	+1.7	+1.7	+1.9	+1.1	+1.5
9. Lumber	0	0	3.8	5.1	6.0	21.2	51.3
10. Change in Export (+ -)	0	0	+3.8	+1.3	+ .9	+15.2	+30.1
11. Total Timber Exported	0	0	5.5	8.5	11.3	27.6	59.2
12. Change in Total Tim (+ -)	0	0	+5.5	+3.0	+2.8	+16.3	+31.6
EMPLOYMENT/OUTPUT COEFFICIENTS (Persons per million bd. ft.)							
13. Average Employment Output rates	n/a	n/a	31.5	17.9	13.7	12.1	
14 Increment Mfgr. Employ. Output rates	n/a	n/a	1.5	-7.0	1.1	2.6	
15. Incremental Total Employ. Output rates	n/a	n/a	3.6	-.2	-5.7	1.8	

SOURCE: Alaska Department of Labor and Table 13.

That particular employment ratio is considered reasonable and it appeared in the table after conditions in the local economy have stabilized, i.e., in prior years the employment aggregates reflected principally changes in cannery operations. A second method of estimation gauged the amount of employment generated through cant and log export sales. This was accomplished by surveying mill and woods operators concerning the people (and, where possible, manhours) assigned to particular kinds of utilization and shipping. From Table 32 it is readily apparent that:

(1) The employment requirement of 2.66 jobs per million board feet existed in cant manufacturing.

(2) Employment generated by comparable volumes of logs exported was estimated at 2.1, a significant difference under alternative kinds of primary manufacturing.

In comparing the two methods of estimating employment generated through forest products sales, the following conclusions were reached on a provisional basis:

(1) Indirectly generated employment is practically nothing, i.e., forest products utilization did not stimulate employment in wholesale and retail trade.

(2) Although the seasonal pattern of logging and milling operations is less pronounced than other local industries, overall economic development is dampened by the seasonal starting and cessation of enterprises.

<u>Seasonal Considerations</u>

The recurring seasonal employment and payroll patterns for the Haines area are shown in Figures 6 to 8 and Appendix J. These dramatic changes in business activity from winter to summer definitely restrict the character of industrial development for the area. The payroll patterns for all the industry groups are fairly stable, reflecting the fact that many seasonal employees are hired from among transient labor, and most residents (in the "reported" industries) received some income on nearly a year-around basis. Looking at these patterns on a year to year basis, the following observations were made:

(1) Seasonal changes (as reflected in the index number series) have become less marked, compared to the pre-1964 period. The expansion of woods products manufacturing was the major force contributing to the partial evening out of seasonal employment and income patterns.

(2) Using a three-quarter moving average on payroll data of manufacturing and non-manufacturing industries, separate seasonal and annual drifts were revealed. Obviously, logging and milling have been the major cause of these positive growth crends. (See Figures 7 and 8.)

Regional Income Multiplier

From the evidence available[8] growth in local spending is readily attributable to two growth areas -- logging and milling, and tourism. Both have contributed to larger money flow in the area. However, an income multiplier was not readily apparent from the data reported.

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[8] Department of Labor employment and personal income information were available only through 2nd quarter 1967 by June, 1968.

A Provisional Model of Forest Based Development

A simulation of the new forest products manufacturing in Haines was expanded to include the forecasted impact for other Alaskan areas. These relationships, comprising a provisional model, are shown in Table 34. In the small area example shown first, the annual cut is not large enough to establish an efficient mill. Therefore, logging and loading represent the new industry for the area, and its forest products are shipped either by loading for log export or by rafting or hauling to the nearest mill. Indirect benefits are considered negligible because 15 additional persons would tend to generate very little change in the community structure, if one existed.

The second example represents a proposed Afognak Island sale,[9] and is based on information contained in advertising the bid. Although smaller than the Haines forestry complex, new mill(s), employment growth and income generated are substantial to the local area. In addition, the initial construction and starting up of logging and milling would result in immediate benefits far larger than those shown in the table. Within three years, the annual economic activity would settle to the estimated level. With particular reference to Afognak Island, one might also expect the construction of temporary and semi-permanent housing and retail stores where no community had existed before the industry began operations. If such were the case, secondary (or indirect) employment benefits would be substantial. The third example was developed in this report to represent the immediate Haines area in 1967.

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[9] U.S. Forest Service, Chugach National Forest, Sale Packet, "Perenosa Sale" (on Afognak Island), April 3, 1968.

TABLE 34.

Provisional Model Reflecting the Relationships Between Alaska Timber Sales and Associated Annual Cut with the Corresponding Degree and Amount of Manufacturing Industry Required, and the Annual Employment and Income which would be Expected[1]

	Column 1.[2] Management Unit Area or Sale	Column 2. Annual Cut	Column 3. No. of Mills
Case I	Hypothetical Small Area. Private ownership or managed by Bureau of Land Management or Bureau of Indian Affairs. Estimate of total forest resource (gross) approx. 1 billion bd. ft.	Approx. 7 million bd. ft. Scribner Decimal C Scale of white or Sitka spruce	None
Case II	Afognak Island Sale U.S. Forest Service 525 million bd. ft. in 15 years	Estimated annual cut of 35 million bd. ft. of Sitka Spruce	One large mill or 2 small mills
Case III	Immediate Haines area, not including U.S. Forest Service timber. Accessible forest resource (gross) approx. 3.26 billion board feet.	58 million bd. ft. Scribner Decimal C. Mostly Sitka Spruce, some Hemlock.	2

Table 34 (continued)

Column 4. Cant Production Volume[(a)]	Column 5. Chip Production Volume[(b)]	Column 6. Volume of Logs for Export or Rafting to Cant Mill[(c)]
None	None	7 million bd. ft. Scribner Decimal C Scale
50.8 million bd. ft. mill tally	A potential of of approximately 9,459 bone dry tons	not applicable
75.8 million bd. ft. mill tally	A potential of 14,135 bone dry tons	5.7 million bd. ft. Scribner Decimal C

Table 34. (Continued)

Column 7. Employment Generated[d]	Column 8. Direct Income: Wages and Salaries[d]	Column 9. Indirect Income plus Direct Income Flow into Community[e]
15 workers for logging and loading	$202,500	$228,500 (no indirect flow)
93 workers plus managerial personnel	$1,256,000	$1,507,000
151 workers plus managerial personnel	$2,039,000	$2,447,000

[1] Initial mill construction and starting up operations would be expected to result in larger amounts of employment and income than estimated in the model during a period of the first one to three years.

[2] In Table 34, Column 2 is derived from Column 1 which gives information such as gross or net timber volumes, sales and duration of sales or other management information necessary to calculate an annual cut estimate. Column 3 is not relevant for prediction, but is entered as descriptive convenience. Column 4 is predicted directly from Column 2 on the basis of all or a proportion manufactured annually. Scribner Decimal C times 1.45 equals mill tally. Column 5 is a function of Column 4. If chip production is implemented unknown but minor additions to employment and income will occur. Column 6 is a function of any or all of Column 2, not relevant to Column 4. Column 7 is a function of Column 2, but is derived from Column 4 (using the above 1.7 conversion factor) and Column 6. Prediction is on the basis of the coefficients shown in footnote (d). Column 8 is derived from Column 7 by multiplying number of workers times an estimated direct income of $13,500 per employee. This value includes an allowance for managerial personnel not indicated in Column 7. Column 9 is a function of Column 8 and the coefficient shown in footnote (e).

(a) For cants similar to those produced at Haines, Alaska, where cant width usually equals log width and wane occurs on two sides.

(b) Potential chip volume base on utilizing slab waste and excludes logging residues. Approx. 1 bone dry ton per 3.7 M bd. ft. Scribner Decimal C of sawlogs processed.

(c) Log volume for export or rafting to established mill shown where annual cut in an area might not warrant establishment of milling facilities.

(d) Reflects employment, wage and salary income patterns as observed at Haines. Employment based on 2.66 jobs per million bd. ft. Scribner Decimal C, of sawlogs manufactured into cants and exported, and 2.1 jobs per million bd. ft. Scribner Decimal C of sawlogs exported in the round. Includes salaries to management. Payments to landowners for stumpage not included. Direct income estimated at $13,500 per employee.

(e) Total community income, which would appear in due course, was K=1.20 or 1.20 times direct income.

APPENDIX A

ASSUMPTIONS AND CONDITIONS OF ESTIMATION USED FOR CASE COST ESTIMATES SHOWN IN CHAPTER IV

Conversion Factors

Conversion relationships developed from the research conducted in the Haines Area of Alaska which are basic to this report are as follows:

1. Board feet to cubic feet relationships:

   6.20 board feet of mill sawlogs measured Scribner Decimal C scale equal one cubic foot.
   5.95 board feet of woods run logs to one 8-inch top measured Scribner Decimal C scale equal one cubic foot.
   4.90 board feet of logging residue to an 8-inch top measured Scribner Decimal C scale equal one cubic foot.

2. Log rule and milling relationships:

   1,000 board feet Scribner Decimal C log scale equal 1900 board feet Brereton log scale.
   1,000 board feet Scribner Decimal C log scale converts into 1450 board feet of cants measured on a mill tally basis.
   1,000 board feet scribner Decimal C log scale converts into 1700 board feet of cants measured on an actual board foot basis (i.e., one cubic foot of cant equal twelve board feet)
   1,000 board feet mill tally is equivalent to 1170 board feet of cants measured on an actual board foot basis (i.e., one cubic foot of cant equal twelve board feet).

Technical Assumptions

1. Specific Gravity: Hemlock .38
   Spruce .37

2. Approximate yield of bone dry chips per 1000 bd. ft. of logs chipped in tons (2000 lbs.)

	Average Top Diameter of Log	
	10-14 inches	14-18 inches
Spruce	1.9	1.7
Hemlock	2.0	1.8

3. Logging residues per acre, commercial stands, 1965-1966 conditions, 1090 cu. ft. or 5300 bd. ft. to an 8" top.

4. Mill waste available for chipping equal 16 per cent of the cubic input of round wood.

5. One bundle of cants (i.e., shipping unit) equal 2900-3000 bd. ft. mill tally or 3400-3515 bd. ft. actual bd. ft. content (i.e., 1 cu. ft. = 12 bd. ft.).

Milling Assumptions

1. Minimum cant mill size unless specified 200,000 bd. ft. per day cant tally.

2. Maximum mill size integrated operation, 200,000 bd. ft. Scribner Decimal C of log inputs unless otherwise specified.

3. Mill operates 225 days per year.

4. Normal daily shift eight hours.

5. Average number of employees required not including raw material acquisition: Cant mill, yard and output handling = 18 men. Integrated with chipping = 22 men. Office help = 2. Total = 24 employees not including management.

Cost and Price Assumptions

1. Interest on capital investment calculated using seven percent.

2. Where possible, all goods or services priced wholesale f.o.b. Haines unless otherwise specified.

3. Cost of electrical power taken as 4¢ per kilowatt hour.

4. All taxes, insurance, and overhead on labor and employees taken as 20 percent of hourly wage.

5. Sawlogs f.o.b. mill cost $36 per M bd. ft., pulplogs $30 per M bd. ft. Logging costs taken at $29 per M bd. ft. with $3 per M bd. ft. included for profit and risk. Stumpage per M bd. ft.: sawlog $7 and pulpwood $1.

SOURCE: See Appendix C.

APPENDIX B

ASSUMPTIONS AND METHOD OF CALCULATING INSTALLATION COSTS FOR THE MANUFACTURE OF PULPCHIPS

Production Assumptions

(a) Daily inputs of sawlogs with residual waste for chipping, M bd. ft.

(b) Daily inputs of logs for pulpchips only, M bd. ft.

(c) Number of days of operation per year.

(d) Estimated chip recovery in bone dry tons.[1]

(e) Number of days of operation per year.

Installation Costs[2]

(1) Major Equipment (chipper, barker, etc.)	__________
(2) Accessory Equipment (chip screens, electrical equipment, etc.)	__________
(3) Handling Systems (waste and chip conveyors, blowing systems, revisions in mill input handling, etc.)	__________
(4) Buildings and Capital Improvements (housing for new equipment or improvements in current buildings necessary, etc.)	__________
(5) Installation and shipping (labor, supervision, misc. materials, and all necessary shipping expenses)	__________
Total Installed Costs	__________

[1] Based on chip recovery as discussed in Chapter IV and shown in Cases I and II Chapter IV.

[2] Depending on production assumptions, part of the cost of the debarker could be charged against sawmilling. This would be justified if the debarker increases sawmilling capacity, reduces sawmilling costs or improves product price by increasing quality. In this Appendix the method shown includes a debarker in the cost of chipping as current sawmilling does not require a debarker, but chipping does. In order to adjust for debarker benefits which accrue to sawmilling, three methods could be used: (1) allocate or proportion individually the cost calculations by category, (2) allow some selected percentage deduction on total fixed cost and total variable cost, or (3) deduct any variable cost saving (or an estimate of same) in lumber production which results from savings in saw maintenance, quality improvement, etc. from total chip production costs.

APPENDIX C

METHOD OF CALCULATING COSTS FOR THE MANUFACTURE OF PULPCHIPS AND SHEET FOR COST INFORMATION

COST CALCULATIONS:

Fixed Costs

(1) Depreciation (annual) ______________

(based on installation cost, assumed salvage value and useable life of equipment)

$$\text{Annual Depreciation} = \frac{I - R}{N}$$

I = Installation cost
R = Salvage value at N years

Daily depreciation ______________

(2) Interest Charges on Investment ______________

(Annual interest charges on investment. If the firm invests its own capital this charge can be considered on opportunity cost -- i.e., income foregone by not investing the capital in securities or some other investment)

Daily Interest ______________

$$\text{Annual Interest} = [\text{Rate}] \times \left[\frac{(IR)(N+1)}{2N} + R\right]$$

(3) Taxes and Insurance

(Annual taxes and Insurance resulting from new Installation)

Daily Taxes and Insurance ______________

(4) Maintenance Costs

(Included in fixed costs are costs of maintenance that are incurred over time regardless of operation - i.e., repairs due to weather and climate such as painting and deterioration of wood ramps, supports, etc.)

Daily Maintenance ______________

Total Annual Fixed Costs ______________

Total Daily Fixed Costs ______________

Variable Costs (based on 8 hour operating day)

(1) Labor (Includes all increases in labor due to installing debarker and chipper. Includes daily wages, workmen's compensation and social security, etc.) Daily ________________

(2) Power (Includes cost of all increased power needs of the mill; for electric motors 1 h.p. per hour = .746 kilowatt hours;[3] check on reduced power rates for volume consumption.) Daily ________________

(3) Maintenance and Repair (Includes cost of labor, parts and lubricants for maintaining and repairing new facilities where maintenance and repairs are the result of operation.) Daily ________________

Total Daily Variable Cost ________________

Total Cost of Chipping and Barking

Daily ________________

Cost per Unit ________________

[3] "Machinery's Handbook," The Industrial Press, N.Y. 1937, p. 1553.

SOURCE: See p. 130.

COST CALCULATIONS, SUMMARY SHEET

Production: ____________ bone dry tons per day

Operating Days: ____________ per year.

Type of Cost	Daily Cost	Cost per Ton
	(dollars)	
Fixed Costs		
Depreciation		
Interest		
Taxes and Insurance		
Maintenance		
Total Fixed Costs		
Variable Costs		
Labor		
Power		
Maintenance and Repair		
Total Variable Costs		
Total Cost of Chip Production		

SOURCE: Dowdle (14), Herrick (22), Bell (48), Flann (52), (54), Hall (80), Swan (95), Black Clawson-Sumner, Inc. (119), Cargate Westminster Industries, Ltd. (121), Nicholson Manufacturing Co. (124).

APPENDIX D

WEIGHT RECOVERY TESTS FOR THE CONVERSION
OF SITKA SPRUCE LOGS INTO CANTS, HAINES, ALASKA, JULY 1967

Total tests: 3

Total logs:	26 feet plus trim	11
	40 feet plus trim	5
	47 feet plus trim	1
	52 feet plus trim	36
	TOTAL	53

Average top diameter - 13.8 inches

Average butt diameter - 20.8 inches

Bureau scale (Scribner Decimal C)
Gross 21,550 board feet
Net 20,510 board feet

Cant scale (mill tally)
34,259 board feet

Overrun: (1) Gross Scribner Decimal C = 59 per cent
(2) Net Scribner Decimal C = 67 per cent

Units of cants (bundles) - 11

Mill tally per bundle - 3,114 board feet

Total loaded log truck weights - 243,290 pounds
Total empty log truck weights - 76,505 pounds
Total weight of logs - 166,785 pounds

Total loaded cant truck weights- 203,510 pounds
Total empty cant truck weights - 70,971 pounds
Total weight of cants - 132,539 pounds

Log weight per thousand board feet Scribner Decimal C (Gross) - 7,739 pounds
Cant weight per thousand board feet cant scale (mill tally) - 3,869 pounds

Percentage total log weight lost in milling: 20.5%
(i.e., weight loss, logs to cants)

Cant recovery as a percentage of log weight: 79.5%

SOURCE: Study estimates.

APPENDIX E

ESTIMATED EMPLOYMENT BASED ON MAJOR OCCUPATION,
HAINES AREA OF ALASKA, SUMMER, 1967

ESTIMATED EMPLOYMENT BASED ON MAJOR OCCUPATION,

HAINES AREA OF ALASKA, SUMMER 1967[1]

Type of Employment	Number of Employees		Percent	
Forestry and Forest Products				
Logging and Hauling	93		16	
Milling	52		9	
		145		25
Fishing and Fish Products				
Fishing	90		15	
Processing	35		6	
Miscellaneous Products	10		2	
		135		23
Trade and Services				
Retail-Wholesale Trade	75		13	
Services	86		14	
		161		27
Government				
Federal	58		10	
State	16		3	
Local[2]	29		5	
		103		17
Longshoring	44		7	
Miscellaneous n.e.c.	5		1	
TOTAL ESTIMATED EMPLOYMENT		593		100

[1]Not including Skagway and vicinity but including Federal U.S. employees stationed at pipeline station across the Canadian border.

[2]Includes school system

n.e.c. - not elsewhere classified

SOURCE: Records, City of Haines and Port Chilkoot, 1967. Field Interviews, Haines Area of Alaska, Summer, 1967, including government agencies at locations other than Haines.

APPENDIX F

SPECIFICATIONS OF HAINES MARU, 1967

Home Port: Osaka

Length: 123 meters

Beam: 19.2 meters

Tonnage: 11,831 kt. (gt. 4337.08, nt. 4060.59)

Horse Power: MRC 4600 at 176 rpm

Hatch Combing Size: (Eight hatches in a series of four pairs opposite each other):

No. 1 hatches, 14.28 by 5.5 by 3.0 meters
No. 2 hatches, 17.25 by 6.35 by 3.0 meters
No. 3 hatches, 17.25 by 6.35 by 3.0 meters
No. 4 hatches, 17.25 by 6.35 by 3.0 meters

Hole Dimensions (Inside):

No. 1 hole, 21.4 by 16.2 by 4.4 meters.
No. 2 hole, 23.2 by 16.2 by 10.2 meters.
No. 3 hole, 23.2 by 16.2 by 10.2 meters.
No. 4 hole, 23.2 by 16.2 by 10.2 meters.

Volume Capacity: 13,355.02 cubic meters.

Board Foot Capacity (approx.): 4.1 million bd. ft. cant tally (2.9 million bd. ft. in holds, 1.2 on deck)

Basic Estimated Loading Time: 4 work days

Estimated Average Speed (1st & 2nd voyage): 13 to 14 knots

Round Trip Voyage Time (1st & 2nd voyage): 32 to 38 days

Nautical Miles of Voyage (1st trip): approx. 8200 nautical miles

SOURCE: Interview and ships' blueprints.

APPENDIX G

TIME STUDY ON LOADING THE HAINES MARU AUGUST 8 TO AUGUST 12, 1967
(COMMENCED LOADING AFTERNOON OF AUGUST 8 AND SAILED AFTERNOON OF AUGUST 12)

August 8th
(Cant loading, holds 1 and 2)[1]

Hold #1				Hold #2			
4.40	5.25	3.50		4.10	3.55	5.50	4215
2.50	3.25	3.35		7.30	6.15	2.45	5.15
4.30	8.45			3.40	3.45		

August 9th
(Cant loading, holds 1, 2, 3, and 4)

Hold #1				Hold #2		
2.15	3.05	2.25		4.25	6.50	5.25
4.05	3.40	5.35		3.10	4.00	3.15
6.10	3.50			12.00	3.35	

Hold #3				Hold #4		
3.12	3.10	2.20	1.37	3.59	4.26	4.25
2.03	2.51	4.43	16.45	3.15	3.45	2.15
3.13	2.22			2.16	2.43	7.05

August 10th

(Cant loading; holds 2, 3, 4; top of hold, almost filled)

Hold #2

3.00	3.40	2.25	5.05	3.00	3.15	9.25

Hold #3

5.13	4.10	2.57	9.02	5.00	2.36

Hold #4

3.13	3.16	15.48	7.42

[1]Time in minutes and seconds to load one bundle of cants.

August 10, 1967
(Deck loading on top of holds 1 and 2)

Hold #1

3.18	9.35	4.06	4.39	6.42	7.34

Hold #2

3.13	8.10	2.06	3.19	2.12

August 11, 1967
(Deck loading over holds 3 and 4)

Hold #3

7.10	2.50	3.45	3.00	7.50

Hold #4

3.15	4.45	3.35	5.45	3.50

Total Sample Time: 7.0872 hours

Total Sample Bundles: 91

Total Sample Volume: 263,900 board feet, mill tally

Volume per hour: 37,236 board feet (per hold or per crew -- Haines Maru has four.)

Total Volume per hour: 4 crews: 148,944 board feet

Estimated loading time for Haines Maru, which sailed with 3.914 million board feet would be 26.278 hours, using four crews and booms. (This would be the minimum time, as it does not include any delays -- just normal working speed, all four crews working, with no allowance for weather, accidents, breakdowns, contingencies, etc.)

If normal hours (i.e., based on union wages incurred) to load the Haines Maru are 32 hours (using four crews), on this basis, loading efficiency might be considered 82 percent.

NOTE: However, the average capacity of the Haines Maru (based on the seven voyages made to Haines in 1967) was 4,065,700 board feet. This would require 27,297 hours for loading. Hence, efficiency based on 32 hours for loading would be 85 per cent.

APPENDIX H

SURVEY OF REAL PROPERTY, PROPERTY CONDITIONS
AND PUBLIC AND COMMERCIAL ESTABLISHMENTS ACCESSIBLE BY ROAD,
HAINES AREA OF ALASKA, JULY 1967

Commercial Enterprise	Number
Sales Oriented	
Service Stations	5
Food Markets	3
General Merchandise	3
Restaurants	4
Hardware or Building Materials	2
Sporting Goods	1
Drug Store	1
Bar or Liquor Store	7
Hotel or Motel[1]	6
Furniture	1
Clothing	1
Propane	1
Bulk oil, gas, fuel	2
Gift Shop	3
	40
Service Orientated	
Shipping and Receiving	1
Theater	1
Bank	1
Real Estate and Insurance Office	1
Public Accountant Office	1
Travel Service Office[2]	1
Airlines Office[3]	1
Beauty Shop[3]	1
Laundromat[3]	1
Ferry Ticket Office[3]	1

Commercial Enterprise	Number		
Service Oriented (Cont'd)			
Power Company	1		
Bowling Alley	1		
		11	
			51
Miscellaneous Commercial			
Hangar or airplane maintenance	2		
Private Equipment maintenance garage	1		
Garage (not elsewhere classified)	1		
Office Shack (n.e.c.)	1		
Commercial, under construction	3		
Commercial, (n.e.c.)	3		
Commercial, abandoned	7		
Pier and warehouse	1		
Boat slip and repair	1		
Warehouse	5		
Warehouse, abandoned	4		
			29
Ft. Chilkoot, Fort Buildings n.e.c.			
Miscellaneous Use (garage, warehouse, etc.)	7		
Unclassified	7		
			14
Miscellaneous Businesses Operated from Homes			
Miscellaneous Busi			
Garage, equipment or boar repair, retail product or service, etc.)	7		
			7
Private Structures[4]			
House (Good Condition)	46		
(Fair Condition)	77		
(Poor Condition)	90		

Private Structures	Number		
House (cont'd)			
(Unoccupied or Abandoned)	26		
		239	
Mobile Homes			
(Good Condition)	14		
(Fair Condition)	17		
(Poor Condition)	10		
		41	
Shacks			
(Occupied)	26		
(Abandoned or Unoccupied)	44		
		70	
Apartment Dwelling (2 or 3 units)	6		
Houses under Construction	4		
		10	
			360

Government Facility		
Federal:		
Communications System Building	1	
Telephone Exchange	1	
Post Office	1	
Federal Aviation Agency Complex	1	
U.S. Customs Office	1	
U.S. Army Oil Depot	1	
Dock (public use)[5]	1	
		7
State:		
Department of Highways Maintenance Depot	1	
Travel Information Office	1	

Government Facility	Number		
State: (cont'd)			
Weight scales	1		
Ferry Terminal and dock	1		
Magistrates Office and Court	1		
Division of Lands Office	1		
State Police Office	1		
Campgrounds	3		
		11	
Local:			
City Hall	1		
Library	1		
Community Hall	2		
School	1		
School (B.I.A.)	1		
		6	
			17

Miscellaneous Community Faciiities		
Churches	6	
Water and Sewer System	1	
Legion Hall	1	
Elks Club	1	
Boat Harbor	1	
Volunteer Fire Department	1	
Airstrip	1	
Campground (n.e.c.)	1	
		13

Natural Resource Based Industry

Sawmill and Office	2	
Cannery Complex	1	
		3

Human Resource Enterprise

Native Arts and Crafts[6]	3	
Community Theatre[6]	1	
Community Auditorium[7]	1	
Native Exhibition Hall	1	
		6

GRAND TOTAL	500
(Adjusted for dual establishments	490

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[1] One motel under construction

[2] Combined or located in another commercial establishment

[3] Combined with home dwelling

[4] Includes town and rural homes with or without outbuildings and attached or integrated mobile homes. Mobile homes visibly indicating use as main dwelling entered separate. Shacks considered as small structures, usually in a state of poor repair used as dwelling or visibly indicating past or intermittent use as a dwelling. Shacks occupied are those serving as a dwelling. Unoccupied includes both abandoned and possible intermittent use (i.e., hunting).

[5] Lutak dock; administered by U.S. Army Corps of Engineers

[6] Adapted from old Fort Chilkoot structure

[7] Remodeled Fort Chilkoot Structure

Good Condition: Modern or well kept dwellings in good state of repair. Maintenance of grounds and outbuildings.

Fair condition: Less than above, possible classification "average" or "adequate"; visibly better than below.

Poor Condition: Old or dilapidated structure in poor state of repair; little or no maintenance; grounds, if any, unkept; frequently littered, etc.

SOURCE: Field Survey, Haines area. July 13, 14, 19, 1967.

APPENDIX I

TAPER FACTORS APPLICABLE TO MAJOR SPECIES
IN THE HAINES AREA OF ALASKA

Introduction and Method:

Recent studies by the University of Alaska in the Haines area of Alaska provided data supplemental to study objectives, but useful in estimating taper of stems and logs.[1] Species measured were primarily Sitka spruce, but some hemlock and cottonwood data were also taken.

The diameter-length relationship was established for 532 stems, logs, or tops residual to logging. Pieces in order to be measured had to have a minimum length of six feet and a minimum top diameter of six inches. Length observations ranged from six feet to eighty feet and averaged 23 feet. Approximately ten percent of the observations were small downed trees. The results are shown in the following Table A.

A diameter-length relationship was also established for merchantable logs in the mill yards. Sample logs were predominately spruce. Log lengths were 52 feet, 47 feet, and 40 feet, which were reduced by bucking to mill input lengths of 26 feet and 20 feet. Average log top diameter was approximately 16 inches for spruce (378 observations) and 14 inches for hemlock (66 observations). Results are shown in Table B.

TABLE A. TAPER FACTORS FOR LOGGING RESIDUE

Species	Taper[2]	No of Observations
Spruce	5.8	300
Hemlock	6.1	181
Cottonwood	5.7	51

TABLE B. TAPER FACTORS FOR MILL LOGS

Species	Taper by Log Length[3] A	B	C	Number Observations
Spruce	5.6	7.5	6.4	378
Hemlock	5.5	7.4	6.3	66

[1]Project (1): Marketing Chips for Pulpwood from the Haines area of Alaska
Project (2): Forest Utilization Alternatives for the Haines area of Alaska

[2]Length in feet associated with one inch change in diameter

[3]A. Lower 20 to 26 foot portion of log.
B. Upper 20 to 26 foot portion of log.
C. 40 to 52 foot log.

Results:

The results shown in Tables A and B should be used with caution. In regard to Table A, the factors shown are not applicable for taper factors near the top of the tree as the logging residue sampled in Haines was heavily weighted with stem segments coming from the lower part of the stem. Table A only indicates in a general way that all stem portions sampled as logging residue have a taper factor of about six feet per inch of diameter. Table B should be fairly representative for medium sized spruce sawlogs (average top diameter of 20 to 26 foot logs sampled 16.2 inches) because of the large sample. Considerably more taper is found in the lower than the middle portion of the stem. Table B may not be representative for hemlock due to the small sampling. Also, on the average, the hemlock sampled was smaller in size, having an average top diameter of 13.7 inches.

Some 38 spruce logs were sampled that had noticeable butt flare. The length over which the butt flare occurred was related to the change in diameter over this length. It was found that for every one foot of butt flare (in length) the end diameter increased on an average .93 inches over the diameter at the point where noticeable flaring started to occur.

APPENDIX J

YEARLY ANALYSIS OF EMPLOYMENT DATA, 1962-1966,
DERIVED FROM THE STATISTICAL QUARTERLIES
OF THE ALASKA DEPARTMENT OF LABOR

TABLE J-1

MONTHLY EMPLOYMENT IN PERSONS,
LYNN CANAL-ICY STRAITS LABOR MARKET AREA, 1962-1966

SOURCE: Statistical Quarterly, Alaska Department of Labor

1966

JOB CLASSIFICATIONS	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
MINING	*	*	*	*	*	*	*	*	*	*	*	*
CONTRACT CONSTRUCTION	*	*	*	*	*	*	*	*	*	*	*	*
MANUFACTURING	42	51	59	68	201	281	511	469	276	203	103	112
TRANS, COMM, & UTIL	221	204	253	295	316	324	360	337	343	229	270	250
WLSALE & RETAIL TRADE	76	78	78	87	97	97	114	121	126	88	92	90
FINANCE, INS, REAL EST	10	12	9	13	9	15	13	14	13	11	12	14
SERVICES	26	27	29	32	42	60	65	62	43	33	29	29
FEDERAL GOVERNMENT	76	75	72	73	75	77	71	67	69	69	66	68
STATE & LOCAL GOV'T	184	171	172	137	139	143	135	176	157	147	163	163
TOTAL NON-AGRI INDUS	638	619	675	716	898	1023	1293	1271	1055	785	745	729
TOTAL INSURED BY STATE	231	223	283	354	532	655	933	879	675	415	366	345

1965

JOB CLASSIFICATIONS	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
MINING	*	*	*	*	*	*	*	*	*	*	*	*
CONTRACT CONSTRUCTION	11	20	30	42	40	44	55	45	53	26	24	16
MANUFACTURING	27	31	40	63	129	219	449	431	206	87	118	57
TRANS, COMM, & UTIL	251	240	234	304	349	315	308	388	364	265	336	260
WLSALE & RETAIL TRADE	60	58	60	76	89	111	113	111	104	92	83	77
FINANCE, INS, REAL EST	9	13	12	15	11	18	11	8	9	*	*	*
SERVICES	20	21	20	27	27	43	46	47	45	35	30	30
FEDERAL GOVERNMENT	75	75	71	70	71	73	90	86	84	85	84	82
STATE & LOCAL GOV'T	128	132	131	127	114	115	115	145	162	149	161	168
TOTAL NON-AGRI INDUS	581	590	598	725	836	948	1188	1271	1028	749	845	701
TOTAL INSURED BY STATE	233	237	250	380	496	611	831	879	629	368	447	304

*Not reported, probably negligible or not clearly assigned to Labor Market area.

SOURCE: Statistical Quarterly, Alaska Department of Labor.

1964

JOB CLASSIFICATIONS	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
MINING	*	*	*	*	*	*	*	*	*	*	*	*
CONTRACT CONSTRUCTION	9	4	4	27	71	91	92	85	81	87	38	21
MANUFACTURING	38	32	40	56	163	232	414	448	179	105	74	38
TRANS, COMM, & UTIL	242	253	289	248	308	333	294	288	350	326	263	261
WLSALE & RETAIL TRADE	58	57	56	70	78	95	104	104	97	68	72	66
FINANCE, INS, REAL EST	9	10	9	9	9	9	8	8	8	8	7	7
SERVICES	26	27	26	33	39	42	52	53	46	32	31	30
FEDERAL GOVERNMENT	84	84	83	92	99	99	99	103	100	100	103	99
STATE & LOCAL GOV'T	133	137	127	126	122	112	112	115	125	131	128	135
TOTAL NON-AGRI INDUS	614	621	649	686	927	1057	1202	1227	989	858	717	660
TOTAL INSURED BY STATE	249	252	288	312	551	689	865	883	648	479	337	280

1963

JOB CLASSIFICATIONS	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
MINING	*	*	*	*	*	*	*	*	*	*	*	*
CONTRACT CONSTRUCTION	*	*	*	10	12	7	16	32	44	45	37	14
MANUFACTURING	19	19	32	49	197	253	542	525	186	140	79	32
TRANS, COMM, & UTIL	72	86	94	117	109	126	125	445	237	117	161	159
WLSALE & RETAIL TRADE	54	54	50	54	71	85	100	89	94	70	70	73
FINANCE, INS, REAL EST	8	8	9	8	11	10	12	11	18	14	12	11
SERVICES	11	12	18	16	20	34	44	47	28	22	21	21
FEDERAL GOVERNMENT	83	82	86	86	90	96	94	96	94	90	90	87
STATE & LOCAL GOV'T	8	13	12	13	19	14	*	*	*	11	14	12
TOTAL NON-AGRI INDUS	558	596	625	671	845	954	1245	1545	1018	703	775	695
TOTAL INSURED BY STATE	117	215	240	286	456	552	887	1184	636	439	407	327

*Not reported, probably negligible or not clearly assigned to Labor Market area.

SOURCE: Statistical Quarterly, Alaska Department of Labor.

1962

JOB CLASSIFICATIONS	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
MINING	*	*	*	*	*	*	*	*	*	*	*	*
CONTRACT CONSTRUCTION	*	*	*	*	*	*	50	49	19	20	8	4
MANUFACTURING	45	56	53	79	181	284	423	378	198	153	81	46
TRANS, COMM, & UTIL	87	103	97	137	118	167	123	117	166	110	86	85
WLSALE & RETAIL TRADE	52	50	50	47	62	94	78	80	73	71	72	52
FINANCE, INS, REAL EST	8	10	9	9	10	11	10	11	12	9	8	8
SERVICES	11	14	15	15	20	29	34	36	35	25	36	26
FEDERAL GOVERNMENT	72	69	74	80	85	89	81	84	84	87	86	83
STATE & LOCAL GOV'T[1]	248	282	256	*	*	*	11	4	3	5	6	13
TOTAL NON-AGRI INDUS	644	675	656	739	865	1093	1166	1121	953	846	739	645
TOTAL INSURED BY STATE	248	282	256	328	452	684	761	706	535	426	327	234

[1] The state and local government figures appear to be in error for January, February and March of this year, for they are the same as the figures given for total insured by the state for this time period.

* Not reported, probably negligible or not clearly assigned to the Labor Market area.

SOURCE: Statistical Quarterly, Alaska Department of Labor.

TABLE J-2

INDEXES OF MONTHLY EMPLOYMENT,
LYNN CANAL - ICY STRAITS LABOR MARKET AREA, 1962-1966

SOURCE: Statistical Quarterly, Alaska Department of Labor

1966

JOB CLASSIFICATIONS	YRLY AVER X̄=100	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MINING	NA												
CONTRACT CONST	NA												
MANUFACTURING	198	21	26	30	34	102	142	258	237	139	103	52	57
TRANS, COMM & UTIL	284	78	72	89	104	111	114	127	119	121	81	95	88
WLSALE & RETAIL TRADE	95	80	82	82	92	102	102	120	127	133	93	97	95
FINANCE, INS, REAL ES	12	83	100	75	108	75	125	108	117	108	92	100	117
SERVICES	40	65	68	73	80	105	150	163	155	108	83	73	73
FEDERAL GOVERNMENT	72	106	104	100	101	104	107	99	93	96	96	92	94
STATE & LOCAL GOV'T	157	117	109	110	87	89	91	86	112	100	94	104	104
TOTAL NON-AGRI INDUS	971	73	71	77	82	103	117	148	146	121	90	86	84
TOT INSURED BY STATE	491	47	45	58	72	108	133	190	179	137	85	75	70

1965

JOB CLASSIFICATIONS	YRLY AVER $\bar{X}$=100	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MINING	NA												
CONTRACT CONSTRUCTION	34	32	59	88	123	118	129	161	132	156	76	71	47
MANUFACTURING	154	18	20	26	41	84	142	292	280	134	56	77	37
TRANS, COMM, & UTIL	301	83	80	78	101	116	105	102	129	121	88	112	86
WLSALE & RETAIL TRADE	86	70	67	70	88	104	129	131	129	121	107	97	90
FINANCE, INS, REAL EST	9	100	144	133	167	122	200	122	89	100	*	*	*
SERVICES	33	61	64	61	82	82	130	139	142	136	106	91	91
FEDERAL GOVERNMENT	79	95	95	90	89	90	92	114	109	106	108	106	104
STATE & LOCAL GOV'T.	138	93	96	95	92	83	83	83	112	117	108	117	122
TOTAL NON-AGRI INDUS	838	69	70	71	86	100	113	142	152	123	89	101	84
TOT INSURED BY STATE	472	49	50	53	80	105	129	176	186	133	78	95	64

*Not reported, probably negligible or not clearly assigned to Labor Market area.

SOURCE: Derived from Appendix J-1 and Statistical Quarterly, Alaska Department of Labor.

1964

JOB CLASSIFICATIONS	YRLY AVER $\bar{X}$	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MINING	NA												
CONTRACT CONSTRUCTION	51	18	8	8	53	139	178	180	167	159	171	75	41
MANUFACTURING	152	25	21	26	37	107	153	272	295	118	69	49	25
TRANS, COMM & UTIL	288	84	88	100	86	107	116	102	100	122	113	91	91
WLSALE & RETAIL TRADE	77	75	74	73	91	101	123	135	135	126	88	94	86
FINANCE, INS, REAL ES	8	112	125	112	112	112	112	100	100	100	100	88	88
SERVICES	36	72	75	72	92	108	117	144	147	128	89	86	83
FEDERAL GOVERNMENT	95	88	88	87	97	104	104	104	108	105	105	108	104
STATE & LOCAL GOV'T	125	106	110	102	101	98	90	90	92	100	105	102	108
TOTAL NON-AGRI INDUS	851	72	73	76	81	109	124	141	144	116	101	84	78
TOT INSURED BY STATE	486	51	52	59	64	113	142	178	182	133	98	69	58

1963

JOB CLASSIFICATIONS	YRLY AVER $\overline{X}$	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MINING	NA												
CONTRACT CONSTRUCTION	24	*	*	*	42	50	29	67	133	183	188	154	58
MANUFACTURING	173	11	11	18	28	114	146	313	303	108	81	46	18
TRANS, COMM, & UTIL	154	47	56	61	76	71	82	81	289	154	76	105	103
WLSALE & RETAIL TRADE	72	75	75	69	75	99	118	139	124	131	97	97	101
FINANCE, INS, REAL EST	11	73	73	82	73	100	91	109	100	164	127	109	100
SERVICES	24	46	50	75	67	83	142	183	196	117	92	88	88
FEDERAL GOVERNMENT	90	92	91	96	96	100	107	104	107	104	100	100	97
STATE & LOCAL GOV'T	13	62	100	92	100	146	108	*	*	*	85	108	92
TOTAL NON-AGRI INDUS	852	100	107	112	120	151	171	223	277	182	126	139	125
TOT INSURED BY STATE	442	40	49	54	65	103	125	201	269	144	99	92	74

*Not reported, probably negligible or not clearly assigned to Labor Market Area.

SOURCE: Derived from Statistical Quarterly, Alaska Department of Labor.

1962

JOB CLASSIFICATIONS	YRLY AVER $\bar{X}$	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MINING	NA												
CONTRACT CONSTRUCTION	12	*	*	*	*	*	*	417	408	158	167	67	33
MANUFACTURING	164	27	34	32	48	110	173	258	230	121	93	49	28
TRANS, COMM, & UTIL	116	75	89	84	118	102	144	106	101	143	95	76	74
WLSALE & RETAIL TRADE	65	80	77	77	72	95	145	120	123	112	109	111	80
FINANCE, INS, REAL ES	10	80	100	90	90	100	110	100	110	120	90	80	80
SERVICES	25	44	56	60	60	80	116	136	144	140	100	144	104
FEDERAL GOVERNMENT	81	89	85	91	99	105	110	100	104	104	107	106	102
STATE & LOCAL GOV'T[1]	69	359	409	371	*	*	*	16	6	4	7	9	19
TOTAL NON-AGRI INDUS	845	76	80	78	87	102	129	138	133	113	100	87	76
TOT INSURED BY STATE	437	57	65	59	75	103	156	174	162	122	97	75	54

[1] State and local figures seem to be in error.

* Not reported, probably negligible or not clearly assigned to the Labor Market area.

SOURCE: Derived from Appendix J-1 and Statistical Quarterly, Alaska Department of Labor.

APPENDIX K

YEARLY ANALYSIS OF WAGE DATA, 1962-1966,
DERIVED FROM THE STATISTICAL QUARTERLIES
OF THE ALASKA DEPARTMENT OF LABOR

TABLE K: Average Monthly Wage and Indexes by Quarter, Lynn Canal-Icy Straits Labor Market Area, 1962-1966

TABLE K

AVERAGE MONTHLY WAGE AND INDEXES BY QUARTER,
LYNN CANAL-ICY STRAITS LABOR MARKET AREA, 1962-1966

SOURCE: Statistical Quarterly, Alaska Department of Labor

1966

INDUSTRY CLASSIFICATION/ QUARTERLY PERIODS	AVERAGE MONTHLY WAGE IN $ I	II	III	IV	AVERAGE MONTHLY WAGE	QUARTERLY INDEX NUMBERS I	II	III	IV
MINING	NA	NA	NA	NA					
CONTRACT CONSTRUCTION	NA	NA	NA	NA					
MANUFACTURING	568	522	737	590	604	94	86	122	98
TRANS, COMM, & UTIL	477	471	478	506	483	99	97	99	105
WLSALE & RETAIL TRADE	345	344	356	377	356	97	97	100	106
FINANCE, INS, REAL EST	376	323	398	393	373	101	87	107	105
SERVICES	344	313	406	384	362	95	86	112	106
FEDERAL GOVERNMENT	629	757	704	757	712	88	106	99	106
STATE & LOCAL GOVERNMENT	493	506	451	570	505	98	100	89	113
TOTAL NON-AGRI INDUS	482	489	564	537	521	92	94	108	103
TOTAL INSURED BY STATE	409	442	585	500	484	84	91	121	103

1965

INDUSTRY CLASSIFICATION/ QUARTERLY PERIODS	AVERAGE MONTHLY WAGE IN $ I	II	III	IV	AVERAGE MONTHLY WAGE	QUARTERLY INDEX NUMBERS I	II	III	IV
MINING	NA	NA	NA						
CONTRACT CONSTRUCTION	827	1043	853	653	844	98	124	101	77
MANUFACTURING	496	506	567	567	534	93	95	106	106
TRANS, COMM, & UTIL	486	448	476	757	542	90	83	88	140
WLSALE & RETAIL TRADE	305	281	353	337	319	96	88	111	106
FINANCE, INS, REAL EST	335	332	375	*	261	128	127	143	0
SERVICES	378	359	344	363	361	105	99	95	101
FEDERAL GOVERNMENT	711	783	669	748	728	98	108	92	103
STATE & LOCAL GOVERNMENT	545	509	425	508	497	110	102	86	102
TOTAL NON-AGRI INDUS	514	505	511	505	509	101	99	100	99
TOTAL INSURED BY STATE	442	464	511	448	466	95	100	110	96

*Not reported, probably negligible or not clearly assigned to Labor Market area.

SOURCE: Derived from Statistical Quarterly, Alaska Department of Labor.

1964

INDUSTRY CLASSIFICATION/ QUARTERLY PERIODS	AVERAGE MONTHLY WAGE IN $ I	II	III	IV	AVERAGE MONTHLY WAGE	QUARTERLY INDEX NUMBERS I	II	III	IV
MINING	NA	NA	NA	NA					
CONTRACT CONSTRUCTION	475	1108	1261	1223	4067	44	103	118	114
MANUFACTURING	357	418	549	392	1716	83	97	128	91
TRANS, COMM, & UTIL	465	469	485	473	1892	98	99	103	100
WLSALE & RETAIL TRADE	344	320	328	270	1262	109	101	104	85
FINANCE, INS, REAL EST	307	311	379	456	1453	85	86	104	127
SERVICES	325	305	267	315	1212	107	101	88	104
FEDERAL GOVERNMENT	752	672	646	670	2740	110	98	94	98
STATE & LOCAL GOVERNMENT	523	612	310	536	1981	106	124	67	108
TOTAL NON-AGRI INDUS	521	544	534	530	2129	98	102	100	100
TOTAL INSURED BY STATE	447	521	556	503	2027	88	103	110	99

1963

INDUSTRY CLASSIFICATION/ QUARTERLY PERIODS	AVERAGE MONTHLY WAGE IN $ I	II	III	IV	AVERAGE MONTHLY WAGE	QUARTERLY INDEX NUMBERS I	II	III	IV
MINING	NA	NA	NA	NA					
CONTRACT CONSTRUCTION	*	574	1078	921	2573	0	89	168	143
MANUFACTURING	393	409	510	247	1559	101	105	131	63
TRANS, COMM, & UTIL	345	381	270	441	1434	96	106	75	123
WLSALE & RETAIL TRADE	317	318	338	318	1291	98	98	105	98
FINANCE, INS, REAL EST	377	363	299	302	1341	113	108	89	90
SERVICES	464	374	285	336	1459	127	102	78	92
FEDERAL GOVERNMENT	704	630	738	656	2728	103	92	108	96
STATE & LOCAL GOVERNMENT	228	180	*	334	742	123	97	0	180
TOTAL NON-AGRI INDUS[2]	NA	NA	NA	NA					
TOTAL INSURED BY STATE	400	421	448	437	1706	94	99	105	103

[2] Not included in old classifications.

* Not reported, probably negligible or not clearly assigned to Labor Market area.

SOURCE: Statistical Quarterly, Alaska Department of Labor.

1962

INDUSTRY CLASSIFICATION/ QUARTERLY PERIODS	AVERAGE MONTHLY WAGE IN $ I	II	III	IV	AVERAGE MONTHLY WAGE	QUARTERLY INDEX NUMBERS I	II	III	IV
MINING	NA	NA	NA	NA					
CONTRACT CONSTRUCTION	*	*	968	378	1348	0	0	287	112
MANUFACTURING	295	387	462	305	1449	81	110	128	84
TRANS, COMM, & UTIL	311	303	365	321	1300	96	93	112	99
WLSALE & RETAIL TRADE	234	260	283	282	1059	88	98	107	106
FINANCE, INS, REAL EST	327	336	339	422	1424	92	94	95	118
SERVICES	340	327	322	313	1302	104	100	99	96
FEDERAL GOVERNMENT	652	604	639	652	2547	102	95	100	102
STATE & LOCAL GOVERNMENT	304	*	301	225	830	146	0	145	108
TOTAL NON-AGRI INDUS[2]	NA	NA	NA	NA					
TOTAL INSURED BY STATE	304	402	470	351	1527	80	105	123	92

[2] Not included in old classification.

*Not reported, probably negligible or not clearly assigned to Labor Market area.

SOURCE: Statistical Quarterly, Alaska Department of Labor.

APPENDIX L

YEARLY ANALYSIS OF PAYROLL DATA, 1962-1966, DERIVED FROM THE STATISTICAL QUARTERLIES OF THE ALASKA DEPARTMENT OF LABOR

TABLE L-1

TOTAL PAYROLL AND INDEXES BY QUARTER,
LYNN CANAL-ICY STRAITS LABOR MARKET AREA, 1962-1966

SOURCE: Statistical Quarterly, Alaska Department of Labor

1966

INDUSTRIES	TOTAL QUARTERLY PAYROLL IN $1,000 I	II	III	IV	PCNT	AVERAGE MONTHLY WAGE	QUARTERLY INDEX NUMBERS I	II	III	IV
MINING	NA	NA	NA	NA	3					
CONTRACT CONSTRUCTION	NA	NA	NA	NA						
MANUFACTURING	86	287	926	246	28	368	22	74	240	64
TRANS, COMM, & UTIL	324	440	497	379	30	410	79	107	121	92
WLSALE & RETAIL TRADE	80	97	129	102	7	102	78	95	126	100
FINANCE, INS, REAL EST	12	12	16	15	< 1	14	86	86	114	107
SERVICES	28	42	69	35	3	44	64	95	157	80
FEDERAL GOVERNMENT	140	170	146	154	11	153	92	111	95	101
STATE & LOCAL GOVERNMENT	260	212	211	270	17	238	109	89	89	113
TOTAL NON-AGRI INDUS	930	1290	2041	1214	100[1]	1369	68	94	149	89
TOTAL INSURED BY STATE	301	681	1454	562		750	40	91	194	75

1965

INDUSTRIES	TOTAL QUARTERLY PAYROLL IN $1,000 I	II	III	IV	PCNT	AVERAGE MONTHLY WAGE	QUARTERLY INDEX NUMBERS I	II	III	IV
MINING	NA	NA	NA	NA						
CONTRACT CONSTRUCTION	50	131	131	43	7	89	56	147	147	48
MANUFACTURING	49	208	615	149	20	255	19	82	241	58
TRANS, COMM, & UTIL	352	434	504	652	38	486	72	89	104	134
WLSALE & RETAIL TRADE	54	77	116	85	6	83	65	93	140	102
FINANCE, INS, REAL EST	11	15	10	*	1	9	122	167	111	0
SERVICES	23	35	47	34	3	35	66	100	134	97
FEDERAL GOVERNMENT	157	168	174	188	13	172	91	98	101	109
STATE & LOCAL GOVERNMENT	213	181	183	243	14	180	118	101	102	135
TOTAL NON-AGRI INDUS	910	1268	1783	1160	100[1]	1280	71	99	139	91
TOTAL INSURED BY STATE	318	690	1195	501		676	47	102	177	74

[1] Columns may add to more than 100% due to rounding.

* Not reported, probably negligible or not clearly assigned to Labor Market area.

SOURCE: Statistical Quarterly, Alaska Department of Labor.

1964

INDUSTRIES	TOTAL QUARTERLY PAYROLL IN $1,000 I	II	III	IV	PCNT	AVERAGE MONTHLY WAGE	QUARTERLY INDEX NUMBERS I	II	III	IV
MINING	NA									
CONTRACT CONSTRUCTION	8	209	325	179	13	180	4	116	181	99
MANUFACTURING	39	188	572	85	16	221	18	85	259	38
TRANS, COMM, & UTIL	365	417	452	402	30	409				
WLSALE & RETAIL TRADE	59	78	100	56	5	73	81	107	137	77
FINANCE, INS, REAL EST	9	8	9	10	7	9	100	89	100	111
SERVICES	26	35	40	29	2	33	79	106	121	88
FEDERAL GOVERNMENT	189	193	195	202	14	195	97	99	100	104
STATE & LOCAL GOVERNMENT	208	220	109	211	14	187	111	118	58	113
TOTAL NON-AGRI INDUS	981	1453	1824	1184	100[1]	1361	72	107	134	87
TOTAL INSURED BY STATE	353	807	1333	551		761	46	106	175	72

1963

INDUSTRIES	TOTAL QUARTERLY PAYROLL IN $1,000 I	II	III	IV	PCNT	AVERAGE MONTHLY WAGE	QUARTERLY INDEX NUMBERS I	II	III	IV
MINING	NA	NA	NA	NA						
CONTRACT CONSTRUCTION	*	17	99	88	7	51	0	33	194	173
MANUFACTURING	28	204	638	62	32	233	12	86	274	27
TRANS, COMM, & UTIL	87	134	218	193	21	158	55	85	138	122
WLSALE & RETAIL TRADE	50	67	96	68	10	70	71	96	137	97
FINANCE, INS, REAL EST	9	10	12	11	1	10	90	100	120	110
SERVICES	19	26	34	22	3	25	76	104	135	88
FEDERAL GOVERNMENT	177	171	210	175	25	183	97	93	115	96
STATE & LOCAL GOVERNMENT	8	8	*	9	1	6	133	133	*	150
TOTAL NON-AGRI INDUS[2]	378	637	1307	628	100[1]					
TOTAL INSURED BY STATE	252	545	1212	513		506	50	108	240	101

[1]Columns may add up to more than 100% due to rounding.

[2]Not included in old classifications.

*Not reported, probably negligible or not clearly assigned to Labor Market area.

SOURCE: Statistical Quarterly, Alaska Department of Labor.

1962

INDUSTRIES	TOTAL QUARTERLY PAYROLL IN $1,000 I	II	III	IV	PCNT	AVERAGE MONTHLY WAGE	QUARTERLY INDEX NUMBERS I	II	III	IV
MINING	NA	NA	NA	NA						
CONTRACT CONSTRUCTION	*	*	114	12	5	32	0	0	356	38
MANUFACTURING	45	211	461	86	31	201	22	105	229	43
TRANS, COMM, & UTILITIES	89	128	148	90	17	112	79	114	132	80
WLSALE & RETAIL TRADE	36	53	65	55	8	52	69	102	125	106
FINANCE, INS, REAL EST	9	10	11	11	2	10	90	100	110	110
SERVICES	14	21	34	27	4	24	58	88	142	113
FEDERAL GOVERNMENT	140	153	159	167	24	155	90	99	103	108
STATE & LOCAL GOVERNMENT[3]	261	*	5	5	10	68	384	0	7	7
TOTAL NON-AGRI INDUS	594	576	997	453	100[1]					
TOTAL INSURED BY STATE	261	589	940	348		534	49	110	176	65

[1] Column may add up to more than 100% due to rounding.

[2] Not included in old classifications.

[3] State and Local Government figures seem to be in error.

* Not reported, probably negligible or not clearly assigned to Labor Management area.

SOURCE: Statistical Quarterly, Alaska Department of Labor.

TABLE L-2

ALL NON-AGRICULTURAL PAYROLL BY QUARTERS,
LYNN CANAL-ICY STRAITS LABOR MARKET AREA, 1962-1966

SOURCE: Statistical Quarterly, Alaska Department of Labor

1962 - 1966

YEAR	QUARTERS	TOTAL QUARTERLY PAYROLL ($1,000)	3-Quarter MOVING AVERAGE
1962	I	594	---
	II	576	722
	III	997	675
	IV	453	609
1963	I	378	489
	II	637	774
	III	1,307	857
	IV	628	972
1964	I	981	1,021
	II	1,453	1,419
	III	1,824	1,487
	IV	1,184	1,306
1965	I	910	1,121
	II	1,268	1,320
	III	1,783	1,404
	IV	1,160	1,291
1966	I	930	1,127
	II	1,290	1,420
	III	2,041	1,515
	IV	1,214	---

SOURCE: Derived from Statistical Quarterly, Alaska Department of Labor.

1962 - 1966

YEAR	QUARTERS	TOTAL QUARTERLY PAYROLL ($1,000)	3-QUARTER MOVING AVERAGE
1962	I	45	---
	II	211	239
	III	461	253
	IV	86	192
1963	I	28	106
	II	204	290
	III	638	301
	IV	62	246
1964	I	39	96
	II	188	267
	III	575	283
	IV	85	236
1965	I	49	114
	II	208	291
	III	615	324
	IV	149	283
1966	I	86	174
	II	287	433
	III	926	486
	IV	246	---

SOURCE: Derived from Statistical Quarterly, Alaska Department of Labor.

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