Final Report

Land Settlement Alternatives For The Chugach Region: Effects On Public Values Of Transferring Public Lands To Private ownership

Volume I

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PREFACE

This report is the final product of a study conducted from April through October 1981 by a team of University of Alaska researchers under contract to the U.S. Forest Service. Three university units contributed faculty and professional staff members to the study team: the Institute of Social and Economic Research (ISER), the Arctic Environmental Information and Data Center (AEIDC), and the School of Agriculture and Land Resources Management.

ISER had responsibility for the overall design of the study, analysis of congressional intent, and the evaluation of land settlement alternatives. AEIDC conducted the environmental and management analyses of the alternatives and prepared the maps and overlays comprising a companion volume to this report. The School of Agriculture was responsible for technical development and mapping of the land ownership patterns that would result from alternative settlements.

ISER study team members were Thomas A. Morehouse, political scientist and principal investigator for the project; Matthew D. Berman, economist; Gunnar Knapp, economist; and Linda Leask, research associate and project editor. AEIDC participants included Sal V. Cuccarese, biologist; Margaret S. Floyd, biologist; David L. Spencer, biologist; and Larry S. Underwood, ecologist. The School of Agriculture members were Christopher R. Low, project coordinator, and Dean R. Yoesting, sociologist.

Mary Aho, Diane Crowne, Ray Norman, and Jim Nathan of AEIDC prepared the graphics. Catherine Dwyer and Darla Siver of ISER and Deborah Topp of AEIDC typed numerous drafts of working papers and study reports.

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I. INTRODUCTION

Purposes and Background

The main purpose of the study presented in this report was to develop and apply a method for evaluating three proposed alternatives for fulfilling the land entitlements of Chugach Natives, Inc., under the 1971 Alaska Native Claims Settlement Act. The alternatives were proposed to the Chugach Lands Study Group by Chugach Natives, Incorporated (CNI), the U.S. Forest Service, and the Department of the Interior. The Chugach regional corporation represents about 2,000 Natives in the Prince William Sound-Chugach National Forest region of southcentral Alaska.

Because ANCSA restricted Native land selections from national forests, because of previous state land selections in the region, and because of the topography of the area, CNI was forced to choose its 373,000-acre entitlement from lands that were neither similar nor proximate to village lands. CNI appealed to Congress and to the Interior Department to allow more regional and village selections in the Chugach National Forest. Consequently, the Alaska National Interest Lands Conservation Act of 1980 (ANILCA) authorized the Chugach Native regional and village corporations to make new selections from more valuable national forest lands. The act also established a study (under section 1430) to identify additional lands that might be made available for CNI's selection both within and outside the forest.

Section 1430 of ANILCA required that the "Chugach Region Study" be carried out by the Secretary of the Interior, the Secretary of Agriculture, the Alaska Land Use Council, Chugach Natives, Inc., and the State of Alaska. Representatives of these parties formed the Chugach Lands Study Group (CLSG) and a technical committee in early 1981. Each CLSG member was free to conduct its own in-house study work and hire consultants for further support.

The U.S. Forest Service in Alaska, representing the Secretary of Agriculture, contracted with the University of Alaska to research the legislative history of ANCSA and ANILCA and to conduct an independent economic, social, environmental, and management analysis of some of the Chugach land settlement proposals that would emerge from the CLSG study process. The result of that contract is this final report. At the same time, the Chugach Lands Study Group proceeded with its own official study, which was carried out independently of the university study reported here.

During the course of the section 1430 CLSG study, nine official land settlement proposals were submitted for CLSG consideration.* Chugach Natives, Inc., submitted a set of five overlapping options in June, 1981; the Departments of Agriculture and Interior responded with a "federal alternative" in August; and CNI responded with a "CNI

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*Three other "unofficial" proposals were also presented to the CLSG: two proposals from a coalition of conservationist organizations, and one from the Cordova Lands Coalition, a private group of Cordova area residents.

alternative" in September. Finally, later in September, the federal departments presented two further alternatives that fell considerably short of CNI's demands. Thus, the Chugach Lands Study Group had failed to reach agreement as of this writing.

Scope and Limits

This report describes a method (or, more precisely, a set of methods) for analyzing all of the land settlement alternatives, and it analyzes three of them: two of CNI's central options, which emphasize in-region, national forest, and state timber lands, and the first federal alternative, which attempts to build a settlement agreement on an exchange with the State of Alaska that would transfer valuable state timber lands to CNI. (We selected these three alternatives for analysis in consultation with the U.S. Forest Service.)

Our analysis of the alternatives focused primarily on the effects on public values of transferring public lands to private ownership in the Chugach region. We examined timber, mineral, and real estate values; likely effects on recreation and hunting and fishing activities; a broad range of possible environmental effects; and implications for resource management and public access. We thus brought four disciplinary perspectives (economic, social, environmental, and resource management) to bear on the three land settlement alternatives. In addition, we constructed two "benchmark" alternatives to use as analytical tools in evaluating and comparing the land settlements proposed by members of the Chugach Lands Study Group.

The key features of this analytical framework--the disciplinary analyses and the benchmark comparisons--are directly based on statutory provisions and legislative histories of the Alaska Native Claims Settlement Act and the Alaska National Interest Lands Conservation Act.

With some important exceptions, we did not focus on potential benefits of land settlement alternatives for the Chugach Natives. We did not attempt to deal with Native cultural and traditional values attached to the land, nor with how CNI's proposals in particular might protect or enhance those values. These are obviously significant concerns, but they fell outside the scope of our analysis. We did, however, estimate economic values that the Chugach Natives might gain, as well as the public revenues that might be lost, from transfers of public land to CNI ownership. It is also important to note that CNI made its land selection proposals under the section 1430 study primarily on the basis of potential economic values of those lands.

As stated earlier, our main concern was to determine the probable effects on public values of transferring public land to private ownership. We did this keeping in mind the balance that Congress tried to maintain between public and private ownership values when it passed the settlement act and the lands act.

Organization of the Report

Chapter two reviews statutory provisions and legislative histories of ANCSA and ANILCA, focusing on the Chugach Native case and congressional intent. It also briefly examines other cases of Native land and selection rights exchanges to suggest the different problems and range of settlement options that have emerged during the decade since ANCSA was passed.

Chapter three describes our methodology in detail. We explain how and why the benchmark alternatives were developed and how they are used in the analysis. Further, we discuss the objectives and methods of each of the four disciplinary analyses.

Chapter four describes selected geographic, economic, and resource features of the specific land areas making up the three proposed settlement alternatives and the two benchmark alternatives.

Chapters five through eight present the detailed economic, social, environmental, and management analyses of the specific land selections comprising the CNI and federal alternatives; these chapters also include comparative evaluations of the alternatives as total land patterns.

A number of technical appendixes, referenced throughout this volume, comprise Volume II of our report. These appendixes include important information on our methods, assumptions, and sources.

II. THE NATIVE CLAIMS ACT AND THE ALASKA LANDS ACT

This chapter examines how Congress attempted to strike a balance between transfer of public lands to the Chugach Natives and retention of such lands for their public values. This examination requires, first, a review of the land withdrawal and Native selection provisions of the Alaska Native Claims Settlement Act (ANCSA) and, second, analysis of the Chugach village and regional land provisions of the Alaska National Interest Lands Conservation Act (ANILCA). These latter provisions must be viewed not only against the background of the settlement act, of which they are exceptions; they should also be seen in the light of actual cases of land and selection right exchanges authorized by Congress during the decade since the settlement act was passed.

In this perspective, the Chugach lands provisions of ANILCA can be viewed as a further stage of adaptation and compromise of the conflicts surrounding enactment of ANCSA in 1971, just as ANCSA itself appears as a critical stage in a series of events first set in motion by the Alaska Statehood Act of 1959.

The following three sections of this chapter deal with the land settlement provisions of ANCSA, the Chugach village and region lands provisions of ANILCA, and six cases of land and selection rights exchanges between federal, state, and Native land managers in other

Native regions of Alaska. A final section summarizes and draws conclusions about the intent of Congress in the present case of the Chugach Natives.

The Land Settlement Provisions of ANCSA

The land settlement provisions of ANCSA compromised the conflicting interests of Alaska Natives, represented by the Alaska Federation of Natives (AFN) and the Native regional associations, the State of Alaska, federal land conservation agencies, and environmental organizations. Their conflicts revolved at various times around questions of how much land should be awarded to Alaska Natives, where it should be located, and what subsistence, economic, or other values it should have. Reacting to the Natives' land settlement proposals, federal agencies (particularly the National Park Service, Fish and Wildlife Service, and Forest Service) and conservationist groups sought to restrict encroachments on established and prospective federal conservation units in Alaska, while the State of Alaska wanted to protect its statehood land selections and remaining selection rights. Congress resolved some of the most extensive of these conflicts in the public lands withdrawal and Native land selection provisions of ANCSA. Other differences among the interested parties would arise repeatedly in the implementation of the law and the enactment of further legislation.

Land Withdrawals for Native Selection

ANCSA land withdrawal and selection provisions resolved the question not only of how much land Native corporations would receive, but perhaps more importantly, where the lands would be located. Section 11(a) of ANCSA withdrew federal lands in 25 townships immediately surrounding all eligible Native villages, and the village and regional corporations established under the act were to select the 40 million acres awarded to them by Congress from those withdrawals. Where lands available around the villages were insufficient because of topography or the presence of state-selected lands or protected federal reserves, Congress directed the Secretary of the Interior to withdraw "deficiency" areas from the nearest unreserved federal lands. Congress further specified that, in making this deficiency withdrawal, "the secretary shall, insofar as possible, withdraw public lands of a character similar to those on which the village is located and in order of their proximity to the center of the Native village."[1]

In tying Native withdrawals directly to village locations, Congress resolved part of the conflict between Native groups and the State of Alaska. The state and Senator Ted Stevens wanted to restrict Native selections to existing village sites to avoid conflicts with existing or planned state selections in areas further removed from the villages, particularly state selections the Interior Department had tentatively approved at Prudhoe Bay.[2] The final version of the legislation did allow Native corporations to select limited acreage that had been tentatively approved for state selection, but only if that

land fell within the townships immediately surrounding villages. This provision was a compromise between the AFN, which wanted access to any tentatively approved state lands, and the State of Alaska, which wanted all tentatively approved selections protected.[3]

The final conference committee report on ANCSA points out "that lands granted under the act should be granted as soon as possible and that the areas from which they would be granted should be immediately identifiable. For this reason, the conference report does not provide for a 'free floating' selection."[4] In 1970, Senator Fred Harris of Oklahoma had introduced an amendment on behalf of the AFN which would have awarded the Natives 40 million acres they could have chosen anywhere in the state. In opposing this amendment, Senator Henry Jackson of Washington argued:

> I think what the Senate has to face up to in connection with this vote is whether or not they are going to give a grant of 40 million acres which can be selected anywhere in Alaska; 40 million acres could and would tie up the economic development of Alaska. Under the proposed amendment these selections could be made in such a way so to severely damage the best interests of all people in the United States. It could affect conservation measures, national parks and forests, and hinder proper State and Federal land-use planning.[5]

Thus, in addition to protecting state interests, ANCSA also placed restrictions on lands the Natives could select from federal conservation units and other reserves. Native corporations could select no lands at all from national parks and most defense withdrawals; the

corporations could not acquire subsurface rights in the National Petroleum Reserve and in wildlife refuges; and they could select only limited acreage--not more than three townships or 69,120 acres--from the refuges and the national forests.[6]

These restrictions on Native selections from existing federal reserves were a compromise between those who wanted federal parks, refuges, and forests completely closed to Native selection and those who wanted them wide open. Senator Jackson, in 1971 hearings on the Senate's ANCSA bills referred, for example, to a "problem that we are running into every day, and that is the conflict between trying to meet and fulfill our environmental and conservation requirements in the long term, and reconcile it in this case with a just, fair and honorable settlement for the Natives . . . we just can't willy-nilly turn over huge land allotments, without regard to the rights of other citizens." He also stated at another point in his committee's hearings: "There is going to be a headlong clash on some of the claims involving our policy on conservation."[7]

One of the Natives' attorneys, in Senate hearings as early as 1968, spoke directly to the problem faced by the Chugach Natives: "I think it is also important that the committee realize that we must be able to get into the withdrawn areas because the villages are there . . . The same thing is true . . . in the Cordova area, Chugach National Forest. The villages there cannot get any land, and this 40 million acres [proposed by AFN] is going to have to include some

kind of provision so that these people can get the land in the withdrawn areas."[8] Later, in the same hearing, Senator Jackson, referring to a land proposal of the Administration, responded to this concern as follows:

> In section 17 the Secretary, recognizing that there is a need for native communities in national forest areas to get some lands, has taken the device which is in the Alaska Statehood Act, which provides 400,000 acres of national forest lands for community expansion and under the Secretary's proposal it says the native groups will qualify as such communities for the purposes of this. We have gone beyond that and said that he shall--that the Secretary of Agriculture in this case, shall grant 100,000 acres. We would really prefer 200,000 acres . . . . We think the native groups certainly should get at least this much. However I would point out that under this language we now have with even only 100,000 acres, the Village of Kake would be able to receive national forest lands under two classifications. First as a municipal corporation under Alaska Statehood, and secondly, the natives of Kake as a business corporation, would be able to obtain it under the provisions of this section. So, I think we can probably live with 100,000 acres.
>
> Of course, I recognize in any event we are still likely to have problems with the Secretary of Agriculture, because at least in the past it has been extremely difficult for the communities in Southeast Alaska where there are national forests to obtain any of these lands even though the Statehood bill so provided for over 10 years.[9]

In the end, concerning the larger conflicts between Native selections and federal reserves, the final report of the principal House committee stated (in words similar to those in the counterpart Senate report):

> The committee found no principle in law or history, or in simple fairness, which provides clear guidance as to where the line should be drawn for the purpose of confirming or denying title to public lands in Alaska to Alaskan Natives. The lands are public lands of the United States. The Natives have a claim to some of the lands . . . .
>
> [Also to be considered] is the interest of all of the people of the Nation in the wise use of the public lands. This involves a judgment about how much of the public lands in Alaska should be transferred to private ownership, and how much should be retained in the public domain.[10]

The final report of the Senate Interior Committee on the Senate's version of ANCSA commented in more detail on why Native selections were specifically restricted in the national forests:

> To prevent major changes in management, in recognition of the previous judgment awarded the Tlingit-Haida Indians by the Court of Claims, and primarily in view of the higher value of forest lands when compared with most other land areas in Alaska, villages located in the Tongass and Chugach National Forests would be entitled to receive one township only regardless of their eligible Native population (emphasis added).[11]

The final version of the bill agreed to by the conference committee raised this limit to three townships, but the reasons given here for restricting these selections remained intact, especially in the case of the southeast region of the Tlingit-Haida.

Objectives and Limits of Native Selections

Given the general restrictions ANCSA finally placed on what lands would be open for Native selection (i.e., around or near the villages, limited or no selections from federal reserves or state lands), what specific lands from these available areas did Congress expect or

intend the Natives to select, and for what purposes? The significance of this question arises from various Native regional corporations' efforts (including those of Chugach Natives, Inc.) in the period after ANCSA's enactment to improve their access to economically valuable lands; several have sought and won new selection rights in areas other than those originally set aside by the Secretary of the Interior.[12]

Some perspective on the broad issue of ANCSA intent is provided in the following statement by the counsel for the Association of American Indian Affairs, which was quoted by Senator McGovern on the Senate floor in 1970:

> The key starting point in consideration of any proposed settlement is recognition of the principle that the Federal Government is not dealing with ordinary "social welfare" legislation under which the United States will provide, and the Native beneficiaries receive, a variety of gratuitous funds, goods and services. This legislation involves property rights. The primary objectives of a just and equitable bill, therefore, must be (a) to enable the Natives to retain a reasonable share of their aboriginal property and (b) to pay the Natives just compensation for the lands, interest in lands and other rights which they are being required to give up, and only as a corollary, (c) to foster or establish an economic setting in which serious Native social welfare problems are either prevented or corrected.[13]

In the light of this statement, to which the AFN subscribed, ANCSA may be viewed essentially as a payment in land and money for lands claimed and rights extinguished. Certainly Congress intended that the corporations established to administer the land and money would be able to use those assets to improve living conditions for Alaska Natives. But there were no guarantees (and certainly no

requirements) in ANCSA that the corporations would ultimately prove to be economically successful. Congress did provide, however, that those regional corporations that were successful in resource development ventures would be required to share the bulk of their earnings with all of the other corporations.[14] Thus, Congress anticipated that certain corporations would be more fortunate in their land and resource base than others and provided for sharing of the resource wealth.

Beyond the economic returns that Native corporations might gain from at least some of the land, several other uses and values that might guide Native land selections were noted in the Senate's final pre-conference report on ANCSA: land might be selected to confirm title to homesites, business sites, and campsites; to provide areas for community expansion and protection; to protect subsistence uses of the land; and for other purposes.[15] There is little question, however, that Congress did expect the Native corporations to select available lands primarily for their economic value. The committee report on the House's final pre-conference version of ANCSA stated:

> The 40,000,000 acres is a generous grant by almost any standard . . . . The acreage occupied by villages and needed for normal village expansion is less than 1,000,000 acres. While some of the remaining 39,000,000 acres may be selected by the Natives because of its subsistence use, most of it will be selected for its economic potential (emphasis added). The land selected is not required to be related to prior use and occupancy, which is the basis for a claim of aboriginal title. Moreover, there will be little incentive for the Natives to select lands for subsistence use because during the foreseeable future, the Natives will be able to continue their present subsistence uses regardless of whether the lands are in federal or state ownership.[16]

Thus, Congress anticipated that the Native village and regional corporations would select most of their 40 million acres for economic potential, and that the land would provide an economic base for the corporations. We have seen, however, that Congress also specifically limited Native selections to areas around villages wherever possible, and placed definite limits on lands that might be selected from federal reserves, including national forests. And in limiting lands that might be selected from the forests, Senate committee members noted that the relatively high value of forest lands was one justification for such restrictions.

1975 Land Exchanges

Two of the regional corporations very early found that state selections, national forests, and other federal reserves substantially covered the most valuable lands in their regions, and in 1975 Congress adopted amendments to ANCSA to resolve those land selection problems. Cook Inlet Region, Inc., obtained congressional approval of a land trade with state and federal agencies, and Sealaska won rights to select ANCSA section 14(h)(8) lands in the Tongass National Forest.[17] The House committee report on these amendments noted that it was not the intent of Congress under ANCSA to convey "mountaintops or glaciers, or otherwise valueless lands" to the Native corporations.[18]

Further, to facilitate the Cook Inlet land exchange, Congress amended section 22(f) of ANCSA, which in its original form, required

that any land exchanges between federal agencies and Native corporations "be on the basis of equal value." As amended in 1975, this formerly restrictive section now permitted many kinds of exchanges, including exchanges of selection rights as well as of lands; of state lands (including mineral rights) as well as of federal lands; and for "other public purposes" as well as exchanges that would consolidate land holdings or facilitate the management or development of land. Most significantly, exchanges could now be made for other than equal value "when the parties agree to an exchange and the appropriate Secretary determines it is in the public interest."[19]

Chugach Village and Region Land Provisions of ANILCA

The Alaska National Interest Lands Conservation Act of 1980[20] included two provisions (sections 1428 and 1429) that authorized the Native corporations in the Chugach region to select lands from the Chugach National Forest to fulfill their land entitlements under sections 12(b) and 14(h)(8) of ANCSA. An additional provision (section 1430) required a study of lands for "possible future selection [by Chugach Natives, Inc.] under section 12(c)" of ANCSA.[21] With these provisions, the Senate Committee on Energy and Natural Resources stated that it "recognize[d] the difficult and longstanding land ownership and land use problems in the Chugach region."[22]

The major problems faced by the Native regional and village corporations in the Chugach region were summarized by the Chugach Lands Study Group:

> Because of [ANCSA's] restrictions and prohibitions on Native selections within national forests, and because the Chugach National Forest covers the heart of the region, Chugach village and regional corporations were unable to fulfill their respective entitlements with lands close to areas of traditional use and occupancy. The deficiency areas withdrawn for selection by the region under section 12(c) and section 14(h)(8) of ANCSA were predominantly non-coastal, inaccessible and of little apparent economic value--that is, "mountaintops and glaciers."[23]

In 1975 CNI filed a suit against the Secretary of the Interior, charging that the existing deficiency withdrawals were in violation of ANCSA. In 1977, CNI and the Department of the Interior reached an out-of-court settlement of part of the suit, allowing the regional corporation to make its 12(c) selections in less than whole townships.[24] The unresolved part of the suit involved CNI's contention that the national forest limitations on village selections of ANCSA 12(a) land did not apply to village "second round" selections of 12(b) land and should not, in Chugach's case, be applied to regional corporation selections of 14(h)(8) and 12(c) lands. Rather than pursuing these remaining contentions in court, CNI decided to seek a legislative remedy.[25]

Chugach Natives, Inc., thus proposed three amendments to the Alaska National Interest Lands Conservation bill then being considered by Congress: one allowing 47,000 acres of village 12(b) selections in the national forest; a second permitting 33,000 acres of regional corporation 14(h)(8) selections, also in the national forest; and a third that, in an early version, called for exchange of 300,000 acres of 12(c) selection rights for 200,000 acres and, in a subsequent

proposal, 600,000 acres of 12(c) selection rights for 125,000 acres.[26] The first two of these amendments were adopted as sections 1428 and 1429 of ANILCA. The third, pertaining to 12(c) selections, ultimately took the form of the section 1430 study provision rather than a direct approval of a 12(c) selection rights exchange.

An answer to why Congress decided on a study provision rather than a direct grant to CNI of new selection rights for regional 12(c) lands is suggested in the following statement of the Senate Committee on Energy and Natural Resources in its final report on the ANILCA bill:

> In general, the Committee adopted those provisions supported by at least three of the four parties primarily affected by or concerned with the Settlement Act--the Natives, the State of Alaska, the Administration, and the Alaska Coalition. The committee considered and adopted on that basis, several proposals authorizing specified Native Corporations to exchange lands or selection rights to lands within Alaska, or to negotiate for such exchanges.[27]

Agreement among at least three of the principal parties resulted in adoption of the 12(b) and 14(h)(8) amendments in the Chugach case (as well as similar exchanges or adjustments in several other Native corporation cases), and the opposition of three parties to CNI's earlier proposed 12(c) selection rights exchange led to adoption of the section 1430 study provision instead of a direct grant of new selection rights. To protect its own interests and selection rights, the state of Alaska opposed CNI's 12(c) deficiency proposals dealing with specific lands; the Alaska Coalition objected to selection of

wilderness, wildlife, and scenic areas under any of the proposed amendments; and the Department of Agriculture consistently opposed further selections from the Chugach National Forest, and held that if there were to be any exchanges, they should be on a "value-for-value basis."[28]

Sections 1428 and 1429

A sufficient rationale for and consensus on CNI's requests for new 12(b) and 14(h)(8) selection rights enabled Congress to take direct action in authorizing them. The Senate Committee on Energy and Natural Resources explained its action as follows:

> The region covers virtually all of the Prince William Sound area, from the southwestern tip of the Kenai peninsula to Icy Bay, near Yakutat, and includes five coastal villages. Although the region boundary extends inland, the Chugach people are dependent upon traditional coastal pursuits for their livelihood and there is no historic or anthropological data to suggest that they ever used or occupied any inland areas. Thus, the Chugach people have desired to fulfill their land entitlement under ANCSA with coastal lands.
>
> The Chugach National Forest encompasses the heart of the region--most of the coastal lands in the Prince William Sound area, including the Chugach villages of Chenega, Eyak and Tatitlek. Because ANCSA restricted and in some sections prohibited, Native selection of national forest land, the Secretary identified deficiency areas in the region for village and regional selection. However, these deficiency areas are located inland, on the northern side of the Chugach Mountains and are not of similar kind and character to the lands traditionally used and occupied by the Chugach people. Because of these land ownership patterns and problems in the Chugach region, the Committee determined that National forest lands were required to be made available for selection by the Chugach people in order to provide a fair and just land settlement for the Chugach region under the purposes and policy of the Settlement Act.[29]

Thus, in section 1428 of ANILCA, Congress awarded approximately 47,000 acres in new selection rights in the national forest to the villages of Chenega, Eyak, and Tatitlek. And in section 1429, it awarded some 33,000 acres in new selection rights, also in the national forest, to CNI. In each case, however, Congress prohibited selections because of "certain environmentally sensitive areas" and "certain key national values" in western Prince William Sound and the Copper River Delta area. Also in both sections, Congress protected certain public interests and values identified by the State of Alaska in connection with its own land selections under section 6(a) of the statehood act. Finally, CNI's 14(h)(8) land selections under the new authority of section 1429 were made "subject to the proposal or the legislation implemented pursuant to the study mandated in section 1430."[30]

There is little other legislative history on sections 1428 and 1429 beyond that recounted above. A State of Alaska official, however, contributed an account of the state's interests in and understanding of these sections (as well as of section 1430) in a memorandum submitted to the Chugach Lands Study Group.[31] Noting the "high resource values and a number of legitimate and differing interests" in Prince William Sound, the memorandum states that "through its direct support of the ANCSA section 12(b) and 14(h)(8) amendments . . . the state felt it had met its basic goal of helping to correct an inequitable situation."[32]

Section 1430

Sections 1428 and 1429 of ANILCA guaranteed that the Chugach Natives would acquire 80,000 acres in the Chugach National Forest to add to the 207,000 acres of village selections from the forest permitted under ANCSA's section 12(a). Section 1430 opened the way to possible additional selections in the national forest by CNI, but it gave no guarantees on the number or values of such acres that might ultimately be selected. Instead, section 1430 established for the affected parties a negotiation or bargaining process in the form of a "study of the land ownership and use patterns in the Chugach region.[33] The Senate Committee report states that section 1430

> Establishes a one year study to identify adequate and appropriate lands to be made available to the Chugach Regional Corporation for selection pursuant to Section 12(c) of the ANCSA.
>
> Subsection (a) directs the Secretary of the Interior, the Secretary of Agriculture and the Alaska Advisory Coordinating Council, in conjunction with the Chugach Regional Corporation and the State of Alaska, to study land ownership and use patterns in the Chugach Region and identify lands in the Region or out of the Region for conveyance to the Chugach Regional Corporation. In addition, the study participants may consider cash in lieu of land and any other option that may achieve the purposes and objectives of the study.
>
> Subsection (b) is intended to provide standards for identifying lands suitable for section 12(c) selection by the Regional Corporation. Recognizing that the Chugach Natives are coastal people, it is intended that the lands identified should be coastal lands . . . .
>
> Subsection (c) reflects the desirability of public review and comment in the study process and directs that at least three public hearings be held . . . .

> Subsection (d) mandates that the study shall be completed and the President shall submit a report to Congress within one year of the date of this Act. It is the intent of the Committee that the report shall include an analysis of all alternatives considered during the study, including but not limited to social, economic and environmental factors . . . .[34]

The broadest study objectives stated in section 1430(a) are "to obtain a fair and just land settlement for the Chugach people; and realization of the intent, purpose and provisions of the Alaska Native Claims Settlement Act by the Chugach Natives, Incorporated." The most specific objective is "to identify lands . . . which can be made available for conveyance to Chugach Natives, Incorporated." The lands to be identified include, but are not limited to, Chugach National Forest lands; they also include other lands, in or outside the Chugach region, and state lands, but they are not to include private lands.[35] The lands so identified are required to be "to the maximum extent possible, lands of like kind and character to those traditionally used and occupied by the Chugach people and shall be, to the maximum extent possible, coastal accessible, and economically viable."[36]

The study, however, is not confined to assessing land ownership alternatives only; the study participants are also directed "to consider monetary payment in lieu of land and to consider all other options which the participants in the study consider to be appropriate to achieve the objectives set forth above."[37]

Three other objectives included in section 1430(a) concern land management: the study should help "[consolidate] land ownership

patterns in the Chugach region; improve the boundaries of and identify new conservation system units;" and "facilitate the management or development of the land."[38]

The lands finally identified in the section 1430 study are subject "to guidelines contained in section 1302(h) of [the Alaska National Interest Lands Conservation Act] and in section 22(f) of the Settlement Act, as amended."[39] As discussed earlier, section 22(f) of ANCSA facilitated the Cook Inlet and other exchanges of land and selection rights between the federal and state governments and Native corporations. Also, as amended, it permits such exchanges for other than "equal value" when the parties involved agree to such an exchange and the Secretary of Interior determines it is in the public interest. Section 1302(h) of ANILCA essentially repeated these stipulations, but specifically added that exchanged lands could include "lands within conservation system units and within the National Forest system."[40]

Exchanges of land, selection rights or other interests in land would seem to be subject to "agreement" at some level regardless of the measures of value involved. It is in any case clear that the section 1430 study of possible exchanges is essentially a negotiation process among affected parties whose concepts of values in land and mandates to protect or enhance those values can usually be expected to differ.[41]

Exchanges of Land and Selection Rights

Between 1975 and 1980, the federal government and Native village and regional corporations reached land exchange agreements in more than a dozen cases (including two with state participation), and Congress ratified these agreements in amendments to the Alaska Native Claims Settlement Act and in the Alaska Lands Act. In authorizing Native corporations to exchange lands or selection rights, or to negotiate for such exchanges, Congress intended "to further and fulfill the purposes of the Settlement Act; in addition, the exchanges would, in some cases, allow national interest lands to remain in public ownership, consolidate and rationalize land ownership patterns in Alaska and resolve or obviate the need for litigation."[42] Below we comment briefly on six of the more significant of these land exchange cases, with more detailed treatment of each of them presented in Appendix B.

The first, the largest, and the most complex exchange agreement was reached in 1975 between Cook Inlet Region, Inc. (CIRI), the Department of the Interior, and the State of Alaska. More than one million acres were involved in the trade, as CIRI, the regional corporation representing Natives around Anchorage and on the Kenai Peninsula satisfied its land entitlement under sections 12(c) and 14(h)(8) of ANCSA with federal wildlife refuge, state, out-of-region, and other lands. CIRI and its villages in turn gave up selection rights to lands that later became part of the Lake Clark National Park and

Preserve. Also in 1975, Sealaska Corporation and the federal government agreed that the regional corporation for Southeast Alaska could select its 200,000-acre 14(h)(8) entitlement from specified areas of the Tongass National Forest. These two exchanges were approved in 1976 amendments to ANCSA.

Congress ratified four other agreements, two involving new selections from national forests, in Title XIV of the 1980 Alaska National Interest Lands Conservation Act. Koniag, Inc. and its village corporations, representing Natives on Kodiak and Afognak islands, obtained 280,000 acres of Chugach National Forest land on Afognak Island in exchange for 340,000 acres on the Alaska Peninsula that were subsequently incorporated into the national wildlife refuge system. And the urban corporations representing Natives in Juneau and Sitka gave up their selection rights in areas that were subsequently incorporated in the Admiralty Island National Monument; the Sitka Natives received lands on the northern end of Admiralty, outside the reserve, and the Juneau Natives accepted acreage elsewhere in the Tongass National Forest.

The lands act also authorized the Arctic Slope Regional Corporation to select lands in the National Petroleum Reserve and the Arctic National Wildlife Refuge, should these two federal reserves be opened for oil and gas development; the corporation also won rights to an oil and gas potential area that otherwise would have become part of the Gates of the Arctic National Park. In exchange, Arctic Slope

corporation gave up selection rights in an area subsequently incorporated in a new national park. Also under the lands act, Doyon, Ltd., the corporation representing Interior Natives, obtained new 12(c) selection rights in a three-way exchange with the State of Alaska and the Department of the Interior. In this exchange, all three parties were able to consolidate and, from their individual perspectives, to improve their holdings.

In the Cook Inlet, Koniag, Arctic Slope and Doyon exchange cases, the Native corporations gave up selection rights to lands some federal agencies and conservation groups wanted to include in national wildlife refuges, parks, or other reserves, and received in return lands with greater economic potential. The State of Alaska took part in the Cook Inlet and Doyon exchanges, and in return for relinquishing certain lands to the regional corporations, received federal lands otherwise closed to state selection. Thus, in these four cases, each of the participants used lands attractive to the other parties as "bargaining stock."

The Admiralty Island case involved at base relatively simple trades of timber lands of equivalent value within the Tongass National Forest. In this case, unlike in other exchanges, the Native groups held rights to economically valuable lands, and gave up those lands only for equally valuable lands.

The Forest Service had a series of disagreements with the Native corporations of Angoon, Juneau, and particularly Sitka, over the amounts and locations of the specific lands to be exchanged in the Admiralty Island case. These disagreements were finally resolved at higher administrative levels and by Congress in section 506 of ANILCA.[43] The Forest Service also initially objected to Sealaska's selection of 14(h)(8) lands in the Tongass National Forest and to Koniag's acquisition in 1980 of Chugach National Forest lands in exchange for lands that became part of the national wildlife refuge system.[44] In these latter cases, the national forest system itself received nothing in return for the lands lost. Again, decisions at higher administrative levels and in Congress overruled the initial objections of Forest Service officials, upon whom the agreements ultimately were imposed.

Table II-1 summarizes several provisions, including but going beyond the "equal value" exchanges specified in section 22(f) of ANCSA, of the six land trades discussed above. These provisions are discussed in detail in Appendix B.

Of the exchange options mentioned in section 1430 of ANILCA for the Chugach regional study (e.g., forest lands and out-of-region lands), only the payment of cash in lieu of land has not been included in any agreement made to date between Native corporations and federal and state governments.

TABLE II-1. PROVISIONS OF SELECTED EXCHANGE AGREEMENTS BY REGION

Provisions	Cook Inlet	Sealaska	Admiralty (SE)	Koniag	Arctic Slope	Doyon
1. State lands	X					X
2. Out-of-region lands	X					
3. National wildlife refuge lands	X				X	X
4. National forest lands		X	X	X		
5. National park lands (dual withdrawal)					X	
6. Borough lands				X		
7. Federal surplus property	X					
8. "Equal value" timber exchange			X			
9. Joint regional-village timber ownership				X		
10. "Acre-equivalent" value formula	X					
11. Subsurface rights only	X				X	
12. Restricted surface rights			X			
13. Federal regulation of development				X	X	X
14. Public access agreements				X	X	
15. Wildlife protection easement					X	

Summary and Conclusions

The Alaska Native Claims Settlement Act compromised some of the basic conflicts over Alaska's land between Alaska Natives, the federal government, the State of Alaska, and interest groups, but left many differences among them to be worked out in future political-legal encounters and decisions. ANCSA limited Native land selections to areas around the villages, for the most part, in an effort to protect public values in existing and planned federal reserves and state selections. Also, the act specifically limited the amount of acreage that could be selected from the national forests and other federal reserves. Finally, ANCSA required that deficiency withdrawals be both similar in character to the lands on which the villages were located and withdrawn from the nearest unreserved federal lands. Thus, Congress sought to strike a balance between transfer of public lands to private ownership and retention of such lands in the public domain.

In placing these conditions on ANCSA withdrawals and conveyances, Congress did not intend to require Native corporations to select "valueless" lands. Congress instead expected the Native corporations to select lands for their economic potential whenever possible. In fact, Congress's recognition of the Native interest in economically valuable lands prompted the restriction on selections of national forest lands because of their "higher value when compared with most other land areas in Alaska."

The Chugach Natives were nonetheless at a distinct disadvantage under ANCSA land selection rules. The Chugach National Forest occupied the coastal core of the region, previous state selections further reduced the economically valuable timber and other lands available for selection outside the forest, and the topography of the region was dominated by mountains, glaciers, and ocean waters. Thus, Congress enacted sections 1428, 1429 and 1430 of the Alaska National Interest Lands Conservation Act. Section 1428 permitted the Chugach villages, and section 1429 permitted the regional corporation, to make further land selections in the national forest. In both cases, however, additional forest selections were prohibited in certain environmentally sensitive and public interest areas identified by federal agencies, conservation groups, and the State of Alaska.

Section 1430, in contrast to sections 1428 and 1429, did not authorize new selection rights in the forest or elsewhere. Rather, it established a study and negotiation process to determine what exchanges of land or selection rights might be agreed upon by the affected parties--principally the Forest Service and Chugach Natives, Inc. In enacting section 1430, Congress did not impose any specific terms for a land exchange agreement, and it did not require that any agreement be reached. Rather, section 1430 authorized a negotiating process, and in the possible absence of agreement between the parties, left the way open to further litigation, future legislation by Congress, or both.

Notes

1. Alaska Native Claims Settlement Act, sec. 11(a)1-3 (P.L. 92-203).

2. See Mary Clay Berry, The Alaska Pipeline: The Politics of Oil and Native Land Claims (Bloomington and London: Indiana University Press, 1975), pp. 148-9, 155.

3. Hearings before the Senate Committee on Interior and Insular Affairs on S.35 and S.835, 92nd Cong., 1st sess., (March 16, 1971), p. 301; Hearings before the Senate Committee on Interior and Insular Affairs on S.1830, 91st Cong., 1st sess., pt. 2 (August 7-8, 1969), pp. 344-351.

4. H.R. Rep. No. 92-746, 92nd Cong., 1st sess., (1971), p. 43.

5. Congressional Record, S11440, July 15, 1970 (Remarks of Senator Jackson).

6. Alaska Native Claims Settlement Act, secs. 11(a)(1) and 12(a)(1).

7. Hearings before the Senate Committee on Interior and Insular Affairs on S.35 and S.835, 92nd Cong., 1st sess., (March 16, 1971), p. 274; and Hearings on S.35, S.835 and S.1571, pt. 2 (April 29, 1971), p. 453.

8. Hearings before the Committee on Interior and Insular Affairs on S.2906, S.1964, S.2690, S.2020, and S.3856, 90th Cong., 2nd sess., pt. 2 (July 12, 1968), p. 571.

9. Ibid., p. 583. There was, of course, similar recognition of the conflict between Native selections and conservation lands on the House side. See, for example, Hearings before the House Committee on Interior and Insular Affairs on H.R. 13142, H.R. 10193, and H.R. 14212, 91st Cong., 1st sess., Serial No. 91-8 (October 17-18, 1969), pp. 557-59, 592-93.

10. H.R. Rep. No. 92-523, quoted in U.S. Code, Congressional and Administration News, 92nd Cong., 1st sess., p. 2194 (1971); Senate Report No. 92-405, 92nd Cong., 1st sess., (October 21, 1971), p. 76.

11. Ibid, p. 65

12. See discussion below of changes in original entitlement rights in six land exchange cases.

13. Congressional Record, S4825, March 3, 1971 (Remarks of Senator McGovern).

14. Section 7(i) of ANCSA provides that "seventy per centum of all revenues received by each Regional Corporation from the timber resources and subsurface estate patented to it . . . shall be divided annually . . . among all twelve Regional Corporations . . . [on the basis of population]." Since the Chugach region has a relatively small Native population (about 2,000 enrolled stockholders) their share of 7(i) money would also be relatively small.

15. Senate Report No. 92-405, 92nd Cong., 1st sess., (1971), pp. 76-77.

16. H.R. Report No. 92-523, quoted in U.S. Code, Congressional and Administrative News, 92nd Cong., 1st sess., p. 2195 (1971).

17. Amendments to Alaska Native Claims Settlement Act, secs. 10, 12 (P.L. 94-204).

18. H.R. Report No. 94-729, 94th Cong., 2nd sess., (1975). Quoted in Chugach Land Study Group, "Background Analysis and Legislative History of Sections 1429 and 1430 of Public Law 96-487, the Alaska National Interest Lands Conservation Act" (June, 1981), pp. 3-4.

19. Amendments to Alaska Native Claims Settlement Act, sec. 17 (P.L. 94-204). Also, H.R. Report No. 94-729, 94th Cong., 2nd sess., (1975), pp. 34-35. For the full text of section 22(f) as amended, see Appendix A.

20. P.L. 96-487.

21. Senate Rept. No. 96-413, 96th Cong., 1st sess., (November 1979, p. 262.

22. Ibid.

23. Chugach Lands Study Group, "Background and Analysis", p. 6.

24. "Amended Stipulation and Agreement," Chugach Natives, Inc. and Secretary, U.S. Department of the Interior, U.S. District Court for the District of Columbia (February 10, 1981).

25. See U.S. Forest Service, "Draft Environmental Statement on the Chugach Natives, Inc. and Koniag, Inc. Land Adjustment Proposal in the Chugach National Forest", Series No. R10-35 (July 1978), pp. 25-26; also, Testimony of David J. Walsh, counsel, Chugach Natives, Inc. in Hearings before the House Committee on Interior and Insular Affairs on H.R. 39, 96th Cong., 1st sess., Serial No. 96-13 (February 1979), pp. 1122-1134.

26. Ibid., pp. 1130-1131.

27. Senate Report No. 96-413, 96th Cong., 1st sess., (November 14, 1979), p. 256.

28. Memorandum from Chip Dennerlein to Commissioner Robert LeResche, Department of Natural Resources, Subject: "Chugach Regional Study--An Overview of the State's Role in ANILCA Negotiations", May 22, 1981; Hearings before the House Committee on Interior and Insular Affairs on H.R. 39, 96th Cong., 1st sess., Serial No. 96-13 (February 1979), pp. 1245-1246; and Senate Report No. 96-413, 96th Cong., 1st sess., (November 1978), pp. 364-365.

29. Senate Report No. 96-413, 96th Cong., 1st sess., (November 14, 1979), pp. 262-263.

30. Ibid., p. 326.

31. Memorandum from Dennerlein to LeResche, May 22, 1981.

32. Ibid., p. 2. Specifically with reference to the 14(h)(8) lands provision, the memorandum states:

> Basically, the state viewed the ANCSA section 14(h)(8) amendment as a means to ensure that the regional corporation received a "fair and just" settlement of land, whether or not the Chugach Region Study resulted in changed land ownership patterns. In supporting the section 14(h)(8) amendment, the state was aware that certain federal agencies objected to any additional selections by Chugach Natives, Inc., from lands within the Chugach National Forest. Chugach Natives, Inc. was concerned that, given the long-standing opposition to further selection on the part of several entities, a study provision alone might founder and result in a never-ending disagreement and no resolution on the issue. Seeing merit in this concern, the state supported the section 14(h)(8) amendment. However, the state never viewed the section 14(h)(8) amendment as the optimal solution of the problem. It served as insurance for Chugach Natives, Inc. should the study prove unsuccessful. In fact, during the course of Congressional hearings and negotiations the section 14(h)(8) amendment was referred to informally as the "break away" provision.

33. Alaska National Interest Lands Conservation Act, sec. 1430(a) (P.L. 96-487).

34. Senate Report No. 96-413, 96th Cong., 1st sess., (November 14, 1979), p. 327.

35. Alaska National Interest Lands Conservation Act, sec. 1430(a) (P.L. 96-487). For the full text of sections 1430(a) and (b), see Appendix A.

36. Alaska National Interest Lands Conservation Act, sec. 1430(b) (P.L. 96-487).

37. Alaska National Interest Lands Conservation Act, sec. 1430(a) (P.L. 96-487).

38. The first two management objectives are stated in section 1430(a); the third is stated in section 22(f) of ANCSA, which section 1430(a) incorporates by reference.

39. Ibid.

40. Amendments to Alaska Native Claims Settlement Act, sec. 17 (P.L. 94-204); Alaska National Interest Lands Conservation Act, sec. 1302(h) (P.L. 96-487). For the full texts of these sections, see Appendix A below.

41. As viewed by one authoritative state official, "the [section 1430] study is purposely wide open with no guarantees. It will require hard work and good faith on the part of all parties. The complexity of the situation is illustrated by the fact that while Chugach Region, Inc. was the first corporation to approach the state concerning possible amendments to the Alaska Lands legislation, the Chugach amendments were the most difficult to negotiate of all the Native amendments in the bill." (Memorandum from Dennerlein to LeResche, May 22, 1981.)

42. Senate Report No. 96-413, 96th Cong., 1st sess., (November 14, 1979), p. 256.

43. See Senate Report No. 96-413, 96th Cong., 1st sess. (November 14, 1979), pp. 365-366 for a statement of the position of the Department of Agriculture on the Angoon and Sitka exchanges.

44. Ibid., pp. 364-365. Also see Senate Report No. 95-1300, 95th Cong., 2nd sess., (October 9, 1978), pp. 365-367.

III. METHODOLOGY

This chapter describes our methodology for analyzing five land settlement alternatives for Chugach Natives, Inc.: (1) option C and (2) option D, both submitted to the Chugach Lands Study Group by CNI on June 23, 1981; (3) an initial federal alternative, submitted to the study group by the Departments of Agriculture and Interior on August 20, 1981; and two hypothetical benchmark alternatives, (4) the "no-forest" alternative, and (5) the "status quo" alternative, developed by the University of Alaska's School of Agriculture and Land Resources Management.

All of these alternatives focus on the regional corporation's section 12(c) and 14(h)(8) land entitlements under the Alaska Native Claims Settlement Act and the Alaska National Interest Lands Conservation Act, and they are described in detail in chapter four. These are also the lands subject to the section 1430 study required by the Alaska Lands Act.

Although this report is one step removed from the congressionally mandated section 1430, "Chugach Region Study," carried out by the Chugach Lands Study Group, we have heeded the Senate Energy Committee's directive, in its final report on the Alaska Lands Act, to analyze social, economic and environmental implications of transfer to

CNI of certain lands.* We have in addition included land and resource management issues specified in section 1430 itself, as described in the previous chapter.

The following sections discuss our general approach to the analysis, including the rationale for and uses of the no-forest and status quo benchmark alternatives, how the two benchmark alternatives were developed, and the specific methods used in the economic, social, environmental, and management analyses.

General Approach

One of Congress's objectives for the section 1430 Chugach region study is "to obtain a fair and just land settlement for the Chugach people." Congress, however, did not define what might constitute a "fair and just" settlement, except perhaps as an end result of the legislation it passed and the settlement negotiations it had set in motion within the frameworks of both ANCSA and ANILCA. Thus, we used the land selection processes established by these acts to establish benchmarks for evaluating proposed settlement alternatives.

We call these two benchmark cases the "status quo" and "no-forest" alternatives. The status quo alternative is made up of lands that CNI might select under existing ANCSA rules (i.e., no 12(c)

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*Senate Rept. No. 96-413, 96th Cong., 1st sess. (November 14, 1979), p. 327.

selections from the national forest), but with the addition of 14(h)(8) lands from the national forest, as authorized by section 1429 of ANILCA. By authorizing these 14(h)(8) selections within the national forest and directing that a study be undertaken, Congress recognized that CNI should receive a better land selection than was possible under the original terms of ANCSA. Thus, the hypothetical best settlement that CNI might receive under ANCSA rules, but now including 14(h)(8) lands from the forest, may serve as a lower benchmark for the range within which a "fair and just" settlement might lie.

The no-forest alternative includes lands that would have been available to the Chugach Natives if ANCSA had contained no restrictions on Native land selections from the national forest. In such a case, more valuable lands might have been available for selection by CNI. Partly because the Chugach villages are coastal, some of CNI's lands would have had to come from deficiency areas. Further, mountainous and glaciated areas near the villages would have limited the amount of valuable acreage still available to CNI after the villages completed their own selections.

Because coastal townships often cover large areas of water, we allowed for deficiency withdrawals in our no-forest alternative, but we did not identify additional deficiency lands that might have been made available as a result of possible political and legal appeals by Chugach Natives, who could have claimed that the remaining lands near

villages were of little or no economic value. Thus, while the no-forest alternative may be a "higher" benchmark than the status quo for our analytical purposes, it does not necessarily represent a settlement ceiling or an upper limit for the range of a "fair and just" settlement for Chugach Natives, Inc.

We used these benchmark cases discussed below as evaluation tools only, and not as settlement standards. Each of the three settlement alternatives actually proposed by CNI and the federal agencies are compared with each other and with the two benchmarks. This procedure allowed us (1) to assign comparative economic, social, environmental, and management values to each alternative and (2) to estimate the alternatives' comparative effects, given certain assumptions about future conservation, development, and other management programs of the public or private landowners. Also, within this comparative framework, we attempted to distinguish between effects associated with particular land settlement alternatives and effects that might be expected to occur regardless of land owner. We should emphasize, finally, that the strengths and usefulness of the analyses lie primarily in the comparisons of the estimated values imputed to economic, social, environmental, and management variables, rather than in the values themselves.

The analyses presented in chapters five through eight below proceed in two stages: (1) analysis of individual selection areas or tracts that are possible components of an overall land settlement for

Chugach Natives, and (2) analysis of entire land ownership alternatives, which are made up of different combinations of selection areas. (Approximately 50 selection areas, together with the five settlement alternatives analyzed in this report, are described in detail in chapter four.)

The Benchmark Alternatives

Status Quo Alternative

We developed the hypothetical status quo benchmark alternative from lands that are currently open to CNI selection: existing 12(c) deficiency areas outside the national forest and 14(h)(8) lands within the national forest, as authorized in section 1429 of ANILCA. Below, we describe assumptions made and methods used in constructing a status quo alternative to include about 340,000 acres of 12(c) lands and 33,000 acres of 14(h)(8) lands.

This alternative represents, insofar as possible and within the limits noted, the preferences for conveyance expressed by CNI in the past. In particular, the "Stipulation and Agreement" between Chugach Natives and Cecil B. Andrus, effective February 10, 1981, specifically identifies certain lands within the Icy Bay regional deficiency area to which CNI seeks title; these lands are included as part of the alternative. Other correspondence on file with the Bureau of Land Management indicates CNI's preference for the Controller Bay triangle, which was outside the Chugach National Forest when ANCSA was enacted.

In constructing the status quo alternative, we had to take into account selections of Chugach's village corporations; in some cases, those villages have selected acreage in the deficiency areas from which we drew 12(c) acreage for CNI.

Section 1428 of ANILCA authorizes the villages of Chenega, Tatitlek and Eyak to make their 12(b) selections inside the Chugach National Forest. We assumed that, consistent with the desires of Chugach Natives for forest land, these villages would make all their 12(b) selections (about 47,000 acres) within the national forest, and thus none of this acreage would come from existing deficiency areas.

Eyak and Tatitlek each had rights to select five townships, only three of which could fall in the national forest, under section 12(a) of ANCSA. The remaining townships were to be selected from deficiency withdrawal areas outside the national forest, and the two villages have already indicated their selection preferences in these deficiency areas. In constructing the status quo alternative, we assumed that the villages would in fact receive the deficiency lands they want and those townships would not, therefore, be available for CNI to select as 12(c) lands.

As noted above, in this status quo alternative we included those selections that CNI has in fact chosen from existing deficiency withdrawals; these include tracts at Icy Bay, Carbon Mountain, and Cape Yakataga. For most of the balance of CNI's 12(c) entitlement, we

chose deficiency lands along the route of the proposed Copper River Highway, through the Copper and Tasnuna River valleys. Much of the land along this route has already been selected by Chugach's village corporations, and these regional lands would abut those village selections. Finally, we included relatively small selections from deficiency withdrawals around the White, Duktoth, and Kaliakh rivers.

TABLE III-1. SUMMARY OF LANDS IN THE STATUS QUO ALTERNATIVE

Description	Acres	
Icy Bay	47,750	
Cape Yakataga	1,078	
Carbon Mountain	25,757	
Controller Bay	10,174	
White River	6,500	
Duktoth River	19,000	
Kaliakh River	29,000	
Copper River Valley	165,500	
Tasnuna River Valley	31,500	
Subtotal		336,259
14(h)(8) Selections	33,962	
Total		370,221

Also part of the status quo alternative are about 33,000 acres CNI is entitled to under section 14(h)(8) of ANCSA. The Alaska Lands Act authorized CNI to select those lands within the forest, subject to conditions set forth in section 1429 of the act. In both this alternative and the no-forest alternative, we included the same two tracts, Patton Bay and McKinley Lake, as 14(h)(8) selections. We chose these two selections from a list of potential 14(h)(8) lands nominated by CNI. Since CNI assigned no priorities to its 14(h)(8) nominations, we chose the two nominations with the highest economic value. Acreage at Patton Bay and McKinley Lake roughly equals CNI's 14(h)(8) entitlement.

No-Forest Alternative

This hypothetical alternative includes lands that would have been available for CNI's 12(c) selections had the 1971 Alaska Native Claims Settlement Act not restricted land selections in the Chugach National Forest. Such lands would essentially fall in specified withdrawal areas around the villages of Tatitlek, Eyak and Chenega; we also designated a deficiency area in northern Prince William Sound, to satisfy Chugach's remaining 12(c) entitlement. This hypothetical alternative, like the status quo alternative, also includes 14(h)(8) lands, which the Alaska Lands Act authorized CNI to select from the national forest. We made two main assumptions in constructing the no-forest alternative:

1. The withdrawal and selection procedures contained in the ANCSA statute and regulations would be followed.

2. No allowance would be made for political or legal modification of the withdrawal areas, modifications that might have occurred in reality. Thus, the alternative assumes (a) no negotiations between CNI and the village corporations on which lands CNI would prefer within the village selection areas (the villages have first choice and the remainder would be available for CNI selection); and (b) no appeals by CNI to the Secretary of the Interior or to Congress to substantially increase deficiency withdrawals in more valuable areas.

We also followed several statutory guidelines in determining the village and regional land selections:

1. Village withdrawal areas were designated in accordance with section (11)(a) of ANCSA. The shape of the withdrawal areas was defined by Congress.

2. As part of their land entitlement, village corporations were required to select the township(s) in which villages were located.

3. Three types of lands were to be selected from the village withdrawal areas:

a. Village 12(a) entitlements, based on village populations;

b. Village 12(b) "second-round" entitlements;

c. Regional 12(c) entitlements, based on the region's land area.

4. Under section 11(a)(3) of ANCSA, in cases where lands withdrawn under section 11(a)(1) (village withdrawal areas) were insufficient to permit a village or regional corporation to select its full entitlement, the Interior Department was required to withdraw an area three times the deficiency. These deficiency areas were to be similar in character to the lands where the villages were located, and as near as possible to the villages.

5. Regional 12(c) selections could be made only from within alternate, noncontiguous townships.

6. Section 22(l) of ANCSA prohibits village and regional corporations from selecting lands within two miles of any first-class city; this restriction affected selections in the Tatitlek area near Valdez.

7. Section 14(h)(8) of ANCSA allocates certain lands not reserved for other purposes to regional corporations on the basis of population.

The entitlements of Chugach regional corporation and its three villages in the national forest, based on the above assumptions and guidelines, are as follows:

1. Village 12(a) entitlements:

Village	Entitlement (In Townships)	Acres
Chenega	3	69,120
Eyak	5	115,200
Tatitlek	5	115,200

2. Village 12(b) entitlements: approximately 47,000 acres.

3. Regional 12(c) entitlements: approximately 340,000 acres.

4. Regional 14(8)(h) entitlements: approximately 33,000 acres.

The three villages within the Chugach National Forest and CNI have combined entitlements of approximately 720,000 acres. Of this total, about 35,800 acres are within "core" townships--townships in which the villages are located--and, therefore, the respective village corporations must select them. Each of these three villages has selected about three townships of 12(a) lands within their withdrawal areas. We assumed that these forest selections would remain the same, even if there were no forest lands restrictions. If there were no such limitations, however, Eyak and Tatitlek would be able to select four additional townships from the national forest. (Existing restrictions have forced them to select those four townships outside the forest.)

The three villages in the national forest are also entitled to an estimated 47,000 acres under section 12(b) of ANCSA. The villages of Eyak, Tatitlek, and Chenega have identified approximately 115,000

acres of potential 12(b) lands in the national forest. We assumed that their 47,000 acre 12(b) entitlement would be taken from lands currently designated for 12(b) selections, and that the bulk of the additional 12(a) entitlement for Eyak and Tatitlek would come from the remainder of the 12(b) acreage identified by the villages.

Regional corporations must make their 12(c) selections from alternate, noncontiguous townships within village withdrawal areas. In this case, our assumptions about previous village selections left only about 259,800 acres available for regional selection within the three village withdrawal areas. There was no 12(c) acreage available for the regional corporation around the villages of English Bay or Port Graham, Chugach's two villages outside the national forest. So we selected all CNI's 12(c) acreage around the three villages in Prince William Sound and in a deficiency area west of Tatitlek. ANCSA specified that when deficiency withdrawals are needed, those withdrawals must be three times the acreage actually needed. In consultation with the Forest Service, we designated a hypothetical deficiency withdrawal of approximately 240,000 acres, three times the 80,200 acres of 12(c) deficiency lands CNI would otherwise have received around its villages.

The most interesting aspect of this hypothetical no-forest alternative is the character of the 12(c) lands included. While the hypothetical selections around the three villages are certainly more

proximate to village locations than are the existing out-of-forest deficiency areas, these lands still include areas that are relatively mountainous, glaciated, and non-coastal--characteristics common to many of the existing deficiency withdrawals. On the other hand, our hypothetical deficiency area is to a much greater extent coastal accessible, traditionally used, and economically viable than existing withdrawals. We recognize, however, that CNI would not necessarily have accepted lands around its villages had such lands been open to them; given the quality of lands that would have been open to them around their villages, CNI might very well have appealed to the Interior Department or Congress for more economically viable lands. Thus, lands in this no-forest alternative do not necessarily represent lands CNI might ultimately have acquired.

As in the status quo alternative, the 14(h)(8) selections included in this no-forest alternative are Patton Bay and McKinley Lake, because these are the most valuable of the potential 14(h)(8) lands nominated by CNI. We assume that the regional corporation would want lands of the highest economic potential available to them.

TABLE III-2. SUMMARY OF LANDS IN NO-FOREST ALTERNATIVE

Description	Acres	
Eyak Selections 12(c)	104,000	
Tatitlek Selections 12(c)	48,600	
Chenega Selections 12(c)	107,200	
Deficiency Area Selections	80,400	
Subtotal		340,200
14(h)(8) Selections	33,962	
Total		374,162

Methodology for Economic Analysis

This section discusses the methodology used in chapter five for economic analysis of the five land settlement alternatives, including the two benchmarks described immediately above.

One purpose of a land settlement is to provide an economic resource base for the Chugach Native corporation. While the settlement has other purposes, such as providing for Native ownership of culturally and historically important lands, we were not able to evaluate nonmonetary values, such as cultural and historical values. Rather, we used the yardstick of present market value to compare the extent to which different land settlements meet the goal of providing an economic resource base for the corporation.

The proposed land settlement alternatives would also have a variety of effects on the public at large, and to the extent that we could, we assessed these effects on the general public. There is no suitable "yardstick," such as market value, to measure these diverse public impacts. Instead, we looked at a variety of effects separately. We were able to make numerical estimates of employment changes that could result from a land settlement. In other cases, we could only broadly describe the nature of these effects.

Our economic analysis is divided into two sections: (1) analysis and comparison of the market value of alternatives, and (2) analysis

and comparison of effects of the alternative settlements on the public, including effects on economic development, employment, public revenues, public expenditures, recreation, and wilderness. The methodology used in both sections is discussed below.

Definitions of Value

Our economic analysis is based on market value of the various selection areas. In order to properly interpret our value estimates, it is critical to understand the difference between market value and the monetary value to a given owner.

The "monetary value" of a selection area to a given owner is the valuation placed by the owner on the stream of monetary returns which the property might generate. Different owners might choose different management strategies, face different taxes, and discount future income differently. This could result in different valuations of the monetary returns provided by the property. In the case of CNI, the ANCSA section 7(i) requirement that resource revenues be shared with other regional corporations would lower the monetary value to CNI of the flow of resources from lands received in a settlement.

"Market value" is the value for which a given piece of property could be sold. This is what the highest bidder would pay for the property.

Our analysis of values in chapter five is, as noted above, based on market value--the value for which CNI could sell various selection areas. There are several important points to keep in mind in interpreting our estimates of market values. First, the monetary value to CNI of a given selection area may be lower than its market value, for reasons such as the section 7(i) revenue-sharing provision of ANCSA or a high discount rate on future revenues. As a result, the market value may overstate the value of the monetary returns to CNI which a particular selection area would provide.

Second, the total value of a selection area to CNI might exceed its market value, possibly by a considerable amount, due to the non-monetary returns, such as cultural and historical values, which the property might provide. As a result, a cash settlement equal to the market value of a given selection area should not be viewed as having the same value to CNI as the land itself.

Analysis of Market Values

To assign market values to the land settlement alternatives, we began by estimating market values for timber, minerals, and real estate on the more than 50 individual selection areas. We then summed the values of the individual selection areas to calculate values for the alternatives. A problem which arises in this approach is that the size of the total alternative may affect the values of the selection areas comprising it. For instance, any individual selection area may contain only a small volume of timber, the sale of which would have no

effect on the price of timber. However, the simultaneous sale of all of the timber in an entire land settlement alternative might depress the market price for timber. Thus, the value of the whole alternative (the price for which it could be sold) might be less than the value of its parts, calculated individually.

While we recognize this "aggregation effect," it is difficult to assess its importance, or the degree to which the values of the alternatives might be less than the sum of the values of the individual selection areas. In the discussion below of the procedures used to estimate values, we address this question separately for timber, mineral, and real estate values.

Our assignment of resource values in this report is highly speculative, because of a lack of data, our inability to predict future mineral and energy resource discoveries and future prices of these resources, and the "aggregation" problem discussed above. To emphasize and allow for this uncertainty, we calculated low, medium, and high estimates for timber, mineral, and real estate values on each selection area. The medium values are those that we consider to be most likely, while the low and high values define a broad range within which values are likely to fall. However, no statistical significance is attached to this range. Despite the speculative nature of our estimates, they do allow us to broadly compare the relative values of the alternatives.

We estimated medium timber values on individual selection areas as the current market value of standing timber, on the basis of timber volume and operable commercial forest area, assuming prices comparable to those for past timber sales in the Tongass and Chugach National Forests, and allowing for inflation and the primary processing requirement for timber harvested on federal lands. Our estimation results and methodology are discussed in Appendix C.

Our estimated timber values for individual selection areas reflect prices which were actually bid for the right to harvest similar tracts of timber over five-year periods. We did not need to specify a discount rate or harvest schedule, because these were implicit in timber purchasers' bids for the right to harvest timber over five-year periods. However, as discussed in Appendix C, aggregating these values for entire land settlement alternatives may overstate the total value of the timber. This is because the individual value estimates depend on the assumption that all the timber could be harvested within a five-year period without depressing the price of timber. Large volumes of timber, such as are included in CNI's option C, probably could not be harvested in five years without depressing the market price. The extent to which the aggregated values may overstate the actual value is uncertain. Large volumes of timber would, in fact, be harvested over a period longer than five years, thus reducing the depressing effect on price but requiring the discounting of more distant returns. However, to the extent that the real price of timber is rising, the extent to which more distant returns would have to be discounted would be reduced.

In summing our timber values for individual selection areas, we did not attempt to correct for the overstatement of values which would result from this aggregation effect, since our purpose in estimating total values of the alternatives was to compare relative values. However, the aggregation effect would also tend to somewhat overstate differences in relative values, since this effect would be more significant for the larger volumes of timber included in the more valuable alternatives.

We calculated low and high timber values as half and twice the medium values, respectively. This broad range reflects the uncertainty of timber inventory data, fluctuations in timber prices, and the limitations of our estimation procedure. Data were not available for federal lands outside of the national forest; however, it is likely that timber values on these lands are minimal.

We calculated mineral values by projecting the present value of lease sales, royalty payments, and mining venture profits for existing and projected discoveries. These calculations and a summary of past mining in the Chugach region are presented in appendixes D and E. Due to lack of data and the uncertainty of future discoveries and price trends, these value estimates are highly speculative. With the exception of the "high" estimates, mineral values account for only a small share of the estimated total values of the land settlement alternatives. Due to the small size of projected mineral production, the aggregation effect does not appear to be important for mineral values.

In calculating medium real estate values, we used topographical maps to estimate the area of usable land--reasonably flat, low-lying, dry land--within each selection area. In addition, we estimated the areas of waterfront and roadfront usable land. We used information provided by an assessor for land sales in the Chugach region to assign best estimates of the value per acre of usable land for each selection area. We assigned waterfront and roadfront lands values roughly five times as great as land not fronting on water or roads. Assigned real estate values were generally lower on lands with timber or mineral value, reflecting the decline of recreational values concurrent with development of these resources. We calculated low and high values as half and twice the medium estimates.

The aggregation effect is likely to be very important in determining actual real estate values of lands transferred from public to private ownership. The more land that is transferred from public to private ownership, the lower will be the value per acre on these lands. We attempted to account for this effect to some extent by assigning somewhat lower real estate values than might be realized if individual selection areas were sold separately. Due to lack of data on large land sales, and the uncertainty of the changes in land markets which might occur following a land settlement, our real estate values are highly speculative. We discuss the assignment of real estate values in appendix F.

Analysis of Effects on the Public

Evaluation of the effects on the public of alternative land settlements is complicated by the variety of effects and the heterogeneity of the public. Different groups will be affected differently by a land settlement. Most members of the public, such as those who do not live in or visit Alaska, will be affected primarily by the loss of federal revenues from timber sales and mineral leases. Among Alaskans, some people will lose the use of lands on which they presently enjoy recreation, hiking, hunting, and fishing. Conversely, some may find their access to remaining public lands improved as a result of development following a land settlement. Development may increase local tax collections, but may also increase the cost of required public services. New jobs may be created, but not everyone will welcome attendant increases in population. Some members of the public may feel that important wilderness values would be jeopardized by the transfer of certain lands from public to private ownership.

Thus, it is not possible to calculate a specific total loss or gain to the "public" resulting from a land settlement. The weighing of different individuals' preferences is a political rather than a technical question. Instead, we discuss separately effects in five areas of concern: employment, public revenues, public expenditures, recreation, and wilderness. Only in the case of employment were we able to quantify these effects.

We began by developing assumptions about the most likely changes in the economic development of the Chugach region under each of the five land settlement alternatives. These assumptions gave us a framework for comparing the effects of different alternatives on employment, public revenues, public expenditures, recreation, and wilderness.

We calculated employment effects for each alternative by multiplying the levels of activity assumed in the development scenarios for the timber, mining, and recreation industries by employment coefficients for each industry. To discuss effects of each alternative on federal, state and local government revenues, we examined sources of changes in taxes, timber sales receipts, and mineral leases and royalties. The effects of the various alternatives on recreation and wilderness are discussed in other chapters of this study; however, we also briefly addressed these issues from an economic perspective.

Methodology for Social Analysis

This section describes how we examined probable social consequences of the five land ownership alternatives developed for the Chugach region. We covered primarily two major issues--recreation and subsistence--in the social analysis. The recreation and subsistence values of the Chugach region are extremely high: the region provides excellent opportunities for dispersed recreation and for subsistence gathering. Development of the region's natural resources may

seriously affect both of these values for Natives and non-Natives. Other kinds of social effects likely to result from transfer of public lands to private owners are difficult to predict or to quantify; to the extent that we could, we also looked at broad social changes that could follow such land transfers.

We did not focus on the pre-ANCSA or current culture of the residents, nor compare past cultural patterns with projected patterns after lands have been transferred to CNI.

Major social changes are already occurring among the Native and non-Native populations of the Chugach region. Unemployment is up, dependence on subsistence is down in some areas, and local residents are being forced to migrate to larger urban areas to find jobs. Natural resource development will have both positive and negative effects, and such development will occur to some extent regardless of land ownership.

Analysis of Recreation Values

Our framework for analyzing the recreation values is the Recreation Opportunity Spectrum (ROS). (Clark and Stankey, 1979b, and USDA, Forest Service, 1980b.)* The ROS describes recreational opportunities as ranging from primitive to urban.

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*All references used in the social analysis are listed at the end of chapter six below.

There are three kinds of recreation opportunities included under the ROS: (1) activity opportunity, (2) setting opportunity, and (3) experience opportunity. In the social analysis we focused on the setting opportunity, with six factors emerging as important for analysis (Clark and Stankey, 1979b):

1. Access
2. Other nonrecreational resource uses
3. On-site management
4. Social interaction
5. Acceptability of visitor impacts
6. Acceptable level of regimentation

Below, we briefly describe each of these six factors as they relate to the Chugach study region.

Access: The ease of access can be controlled by land owners and managers. Currently in the Prince William Sound area, access to recreation areas is almost entirely by air or water, and once users have arrived at the recreation sites, they are limited principally to trails. The topography and type of vegetation in various areas help define the conveyances that can be used, and different kinds of users would prefer different kinds of access, from well-developed paved roads, to gravel roads, to trails and cross-country travel.

Nonrecreational resource uses: This factor considers the extent to which nonrecreational uses (mining, logging, real estate development) are compatible with outdoor recreation. Some uses (logging) severely conflict with opportunities for primitive experiences, while

in other cases some developments might even enhance recreation opportunities; for example, logging roads could open areas for lodges and depots for fuel and supplies.

On-site management: On-site management includes site modification, such as facilities, traffic barriers and landscaping. In the Chugach region study area, limited on-site management has occurred. Very few facilities are available, except for a few cabins operated by the Forest Service or located on mining claims. A very limited number of lodges also exists in the area.

Social interaction: An appropriate amount of social interaction contributes to the recreation experience: generally, the more primitive the setting, the less recreationists expect to see other recreationists. Both topography and ease of access can greatly influence how many people visit a site. The types of use found at a particular setting may be more important in defining social carrying capacity than the amount of use; a greater diversity of uses can be accommodated in more urban settings than in primitive settings.

Acceptability of visitor impacts: Recreational use inevitably impacts an area. Impacts can be on resources (trampled vegetation, frightened wildlife, water pollution) or on people (noise, inappropriate activities). Generally, users will tolerate greater impacts in urban than in primitive recreational settings.

Acceptable regimentation: The nature, extent, and level of control owners exert over recreational use varies considerably. Primitive settings usually have a minimum of regulation and control, while urban experiences are more structured. As primitive areas become more popular, regulations must be increased.

These six factors work in combinations to create particular opportunity settings at particular locations. Within the Chugach region study area, we looked at existing recreational opportunities at specific locations. Given certain assumptions of land-ownership changes and use patterns, we then estimated impacts on user groups.

Analysis of Subsistence and Other Social Issues

The framework for analysis of subsistence and other social issues is not as clearly delineated as that for recreation. We did, however, look at existing subsistence uses and their economic significance. To the extent we could, we also discussed broader social changes likely to follow transfer of public lands to CNI.

Methodology for Environmental Analysis

Relatively few quantitative biological studies have been conducted within the Chugach region. Most have centered on the highly productive Copper River Delta, the expanding sea otter population in Prince William Sound, and the fisheries resources of the region. Few of these are relevant to our environmental analysis of the five land

ownership alternatives. Difficult access to the region, precipitous terrain, dense vegetation, heavy precipitation, and lack of overall direction and interest by resource agencies have combined to limit research. Most data gathered to date is subjective, and should be interpreted cautiously.

We conducted a search for all relevant biologically oriented resource data. As noted above, the data base is not large. Following the literature review, we compiled maps depicting species distribution. Species selected for analysis were those we deemed to have wide public interest; these include all of the region's large-bodied terrestrial mammals, the bald eagle, the trumpeter swan, other water birds and seabirds, and anadromous fish. Several of the species we selected are often used as indicators of environmental quality. We placed emphasis on delineating, where known, seasonal concentration areas, winter range, breeding grounds, and similar sensitive areas.

We prepared maps depicting distribution of each species and species group. These were overlaid on maps depicting the various proposed selection areas. We then generated value matrices ranking each selection area against each species' presence and relative abundance in the area in question, the local habitat quality, the regional importance of the area's habitat, the presence or absence of seasonal concentration areas, and the presence of winter range.

The matrices (Cuccarese and Floyd 1981)* provided a rapid and concise overview of the biological attributes of each selection area and provided the basis for our discussion of likely effects on the biota, should development take place. Our analysis is from a strictly ecological perspective, evaluating changes likely in wildlife and plant communities as a consequence of development.

Development scenarios prepared by the study team provided a common base line for the environmental analyses. In addition, CNI (1981) provided some information as to the types of development contemplated for each selection area. The study team developed timber and mineral resource overlays which were also useful in the environmental analysis.

Several publications were of particular importance to this study. Hansen et al. (1971), Isleib and Kessel (1973), Timm (1975, 1976), and Bucaria (1979b), provide insight into the distribution and abundance of various species and species groups of birds; Burris and McKnight (1973) and Elkins and Nelson (1954) document game transplants in the region. Prince William Sound Aquaculture Corporation (1981) identifies sites under consideration for hatchery development. Alaska Department of Fish and Game (1973, 1975, 1976, 1978a, b) delineate fish and wildlife distribution, known spawning areas of anadromous fish, and known seasonal concentration areas. Culbertson (1973),

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*All references used in the environmental analysis are listed at the end of chapter seven below.

Bucaria (1979a, b), and U.S. Forest Service (1970) provide concise summations of the vertebrate resources of the Chugach National Forest, while Evans and Cuccarese (1977) delimit zones of habitat quality for various species throughout the region. We gleaned additional information from annual reports of survey-inventory activities compiled by the Alaska Department of Fish and Game.

This analysis is a minimal assessment of environmental change likely to result from development of this region. Development of tracts not included in the land settlement alternatives analyzed in this report would create additional effects on the region's biota. We did not consider these additional effects. It is important to note, also, that development of some tracts will likely proceed whether they remain in government hands or they are transferred to CNI. For example, timber harvest in the Yakataga area will probably continue regardless of owner.

Methodology for Management Analysis

This section describes the methods we used to evaluate how each of the land settlement alternatives could influence resource management and public access in the Chugach region. In chapter eight, we discuss how specific areas within the region might be managed, how adjacent and proximate land management jurisdictions may interact, and how public access might affect and be affected by various resource development and management schemes. Below, we describe our approach and methods.

Approach

Two alternative management schemes could be applied to specific portions of the Chugach region: single-use management and multiple-use management. Single-use management might take one of several forms. Certain tracts could be dedicated as wilderness under definitions established under the Wilderness Act and managed for the sole purpose of preserving wilderness values. Under this management regime, the development of other resources would not be allowed because such activities would detract from the wilderness character of the lands. An alternative single-use management regime could stress the preservation or improvement of critical habitat for key species of fish and wildlife. Under this management option, manipulative activities that would enhance habitat might be allowed, but human activities that degraded habitat could be prohibited. Finally, some areas could be managed solely for the development of certain resources, such as the harvest of timber or the extraction of hard rock or petroleum minerals, in such a manner that values associated with wilderness, wildlife, or habitat preservation would be sacrificed.

By contrast, multiple-use management, such as that which is required on national forest lands, presents an alternative to single-use management for much of the Chugach region. Under this management regime, a variety of different activities might be allowed simultaneously in a given land area. For example, some combination of timber harvest, hard rock mineral and petroleum extraction, protection

and preservation of fish and wildlife habitat, and development of tourism and recreational facilities might be allowed. Such multiple-use management usually entails some sacrifice in values, or an increase in the cost of developing resources.

Which management scheme will be applicable to particular tracts within the Chugach region depends to a great extent on the land ownership pattern that is finally established. However, all land owners and managers will be under pressure to recognize and allow access to values associated with or isolated by their lands. These pressures come from diverse, often conflicting, interest groups; e.g., those subscribing to resource development versus resource preservation, to private exploitation versus public access and enjoyment. A Chugach land settlement may reduce but will not eliminate these pressures. Thus, even after a settlement, numerous management options will continue to confront each land owner and manager.

We also analyzed each land settlement alternative for its implications for public access. Public access is a major concern in the region. Land ownership patterns and resource management schemes can have profound effects on public access to lands. Traditionally, access to many areas in the Chugach region has been by boats, planes, or trails, and these means of access are likely to continue to be important in the foreseeable future. Resource development may lead to construction of new roads, railroads, and runways, which in turn could change the access problems considerably throughout the region. Under

some circumstances, public access across private lands may be restricted and public lands could thus be isolated.

Methods

Our analysis of the management and access implications of alternative land ownership patterns is based on four assumptions:

1. The resources of the Chugach region are of national and international significance.

2. Public interests in the region are high and heterogeneous. These interests will create pressures on managers to favor certain resources over others, and emphasis is likely to shift from one interest group to another.

3. Certain management schemes will be more appropriate to one group of land owners than another.

4. The State of Alaska will continue to manage wildlife, but responsibilities for managing habitat will rest primarily with the land owners.

These assumptions imply that management of the Chugach region will be complex, and that no single resource management scheme will be likely or appropriate for all of its subregions. Also, decisions on management will reside with the land owners, subject to the pressures placed on them by public interests and federal and state regulations.

The analysis discusses: where significant resources are, types of land ownership proposed, likely management regimes, and potential interactions among areas under different regimes.

The central questions we analyzed were: what kinds of management are most likely for a particular area, given that it has specific resources and will be owned or managed by a particular group or agency? and what are the likely consequences of such management for other owners and users in the larger affected area? We also discussed environmental implications of patchwork management. How would specific resources likely be affected by various management schemes? Finally, we also looked at access as a management problem. If a particular area is to be managed as wilderness, for example, what kinds of access are required and appropriate?

In summary, in the management analysis we examined each of the alternative land ownership patterns and described likely kinds of management schemes and their effects, given the social and economic goals, resource values, and regulatory mandates of each of the owners and managers.

IV. SELECTION AREAS AND LAND SETTLEMENT ALTERNATIVES

This chapter briefly describes each of the approximately 50 selection areas that are included in the three proposed and two hypothetical land settlement alternatives we analyzed, and lists the selection areas that make up each of the five alternatives. All selections and alternatives discussed in this report are graphically shown in a companion volume of maps and overlays.

Earlier chapters of this report describe the origins and purposes of the various alternatives, and later chapters analyze the economic, environmental, and other implications of transfer of these public lands to Chugach Natives, Inc. This chapter sets the stage for analyses to follow, by briefly describing where the individual selections are, what agencies currently manage them, what natural resources are found in the areas, what uses are currently made of the lands, and whether CNI itself or federal departments have nominated the various selections. In describing these selections, we distinguish between those that have actually been proposed by CNI or the federal government as acreage that could be used to fulfill CNI's land entitlement, and those selections that are included in our hypothetical benchmark alternatives. In a second section of the chapter, we broadly describe the overall characteristics of each of the settlement alternatives, and list selections and acreages included in each alternative.

Proposed Selection Areas

Southeast Alaska timber lands (112,385 acres)

Outside the Chugach region, this selection is made up of valuable timber lands CNI would like to acquire in the Tongass National Forest in Southeast Alaska, including acreage near Yakutat, on Chichagof and Prince of Wales islands and around Stephens Passage, southeast of Juneau. Generally, this selection covers lands the Forest Service plans to log at some future time. A number of important salmon streams cross these tracts.

Yakataga (State) timber lands (70,000 - 100,000 acres)

This selection includes lands the State of Alaska either owns or has selected along the northern Gulf of Alaska around Cape Yakataga. The state will agree to give up these valuable lands to CNI only if the federal government in exchange offers the state certain federal lands. As of this writing, the state has not agreed to exchange any of its Yakataga lands; the Departments of Agriculture and Interior have proposed that about 100,000 acres in this area be transferred to CNI, while CNI itself has nominated about 70,000 acres. The state has previously clearcut much acreage in this general area.

In-Region Prior Withdrawals

The four selections described below--Icy Bay, Cape Yakataga, Copper River and Carbon Mountain--fall in areas the Interior Department opened for CNI selection before the Chugach lands study began,

and while CNI has characterized most of the existing withdrawals as undesirable, the regional corporation wants these specific tracts. The Departments of Agriculture and Interior also included these four selections in the federal alternative.

Icy Bay (47,750 acres): This tract along the northern Gulf of Alaska just east of Cape Yakataga is already being conveyed to CNI, which hopes to find oil and gas in the area. The selection abuts the Wrangell-St. Elias National Park and Preserve.

Cape Yakataga (1,078 acres): This acreage around the Federal Aviation Administration's airstrip at Cape Yakataga was formerly part of an FAA navigation site and is now being conveyed to CNI. The 4,900-foot airstrip here is one of the few along the northern Gulf of Alaska, and the acreage surrounding it thus has significant real estate value.

Copper River (9,212 acres): This selection includes three scattered parcels along the Copper and Tasnuna rivers and on the route of the proposed Copper River Highway, to link Cordova and Valdez. These parcels abut village corporation lands along the proposed route, and CNI ownership of this acreage would put most of the lands along the prospective highway in Native ownership.

Carbon Mountain (25,757 acres): Just east of the Chugach National Forest, this selection covers part of the Bering River coal field and surrounding areas where CNI hopes to find commercial

deposits of coal. This area is now roadless and difficult to reach; coal mining here would require development of a transportation system. Streams, lakes, and marshes bounded by steep mountains characterize the general area, which is an important habitat for anadromous fish and migratory birds.

State-Selected Lands

The five selections described below--Shotgun Cove, Glacier Island, Port Etches, Horseshoe Bay and Jack Bay--are all tracts CNI hopes to acquire in the Chugach National Forest in Prince William Sound, and the federal departments also included four of these selections in their federal alternative. The five selections fall within larger areas the State of Alaska has selected for establishment of marine parks. The state would give up some acreage at each of these sites, if the federal government offered the state certain federal lands. With the acreage retained at each site, the state would establish marine parks, while CNI in some instances would be required to use lands it received strictly for recreational development and in some instances for any type of development the corporation chose. All five sites are popular recreation areas.

Shotgun Cove (100 acres): This small but potentially very valuable selection is at Shotgun Cove near Whittier, where the City of Whittier plans to build a small boat harbor. The Forest Service has already approved state selection of several hundred acres at Shotgun Cove; if the state gives up part of its acreage to CNI, the Native corporation would use the land for commercial development.

Glacier Island (225 acres): This selection covers a small island just off Glacier Island, near Columbia Glacier in northern Prince William Sound. The state hopes to establish a marine park here, but the Forest Service has not yet approved state selection of lands in this area. If the state did acquire this acreage and agreed to give up a portion to CNI, the Native corporation would use the land for commercial recreational development. Many tourists come by boat and plane to see Columbia Glacier each summer.

Port Etches (225 acres): On Hinchinbrook Island in Prince William Sound, Port Etches is a protected anchorage used by hunters and others who come to the island by boat. The Forest Service has not yet approved state selection of about 2,500 acres around Port Etches, but if the state did receive this land and agreed to give up a portion to CNI, the Native corporation would likely be restricted to commercial recreational development at this site. Hinchinbrook Island has one of the largest deer populations in the sound, and significant numbers of brown bears also inhabit the island.

Horseshoe Bay (1,230 acres): This selection includes acreage at Horseshoe Bay on Latouche Island, about 60 miles southeast of Seward. The Forest Service has already approved state selection of lands at Horseshoe Bay; CNI hopes to acquire part of that acreage, which abuts lands belonging to Chenega village corporation. A private developer has previously sold some tracts on Latouche Island for recreational homesites, and CNI believes lands in this selection are suitable for similar uses.

Jack Bay (1,095 acres): This selection includes lands at Jack Bay along Valdez Arm, about 14 miles southwest of Valdez. Jack Bay is a popular recreation site for Valdez residents and others; a number of anadromous fish streams are in this area, and during spawning runs brown and black bears concentrate around the bay. CNI hopes to acquire some state-selected acreage at Jack Bay for industrial development; the Forest Service has approved the state's selection of lands at Jack Bay.

Small Federal Holdings

This category of selections is made up of nine parcels of land currently managed by several federal agencies, with the Bureau of Land Management and the Alaska Railroad holding most of the total acreage. CNI hopes to acquire all or some of these parcels under a provision of the Alaska Native Claims Settlement Act that requires federal agencies to evaluate their land holdings and make available for Native selection any lands not needed in the operation of federal installations. The Departments of Agriculture and Interior support CNI's request for acreage at some of these sites.

Whittier BLM Lands (333 acres): The Bureau of Land Management currently manages this potentially valuable acreage just east of the dock facilities at Whittier; a road linking Whittier and the planned small boat harbor at nearby Shotgun Cove will cross this land.

Seward BLM Lands (.5 acres): This very small selection with high real estate value is in the city of Seward; a state Department of Fish and Game warehouse currently stands on the site. The federal Bureau of Land Management manages this parcel.

Cordova Federal Reserve (1.3 acres); Cordova Lutheran Homesite: (2.5 acres): These small parcels with high real estate value are both on the Cordova Highway in Cordova; the BLM manages these lands, and a state Department of Transportation building stands on one of the parcels.

Miles Lake (685 acres): Miles Lake is in the Chugach National Forest northeast of Cordova, on the route of the Copper River Highway. The federal government has reserved some lands around the lake specifically for public recreation use. CNI hopes to acquire the tract for commercial recreational development.

Other Small Federal Holdings (2,879 acres): The most valuable other small federal holdings CNI hopes to acquire include about 800 acres of Alaska Railroad lands at Whittier, Seward and Valdez, and the airstrip at Cape Yakataga; as described under "In-Region Withdrawals" above, CNI is receiving conveyance to lands around this airstrip. Additional selections include about 2,000 acres the Federal Aviation Administration currently manages on Middleton Island, in the Gulf of Alaska 80 miles southwest of Cordova; this acreage includes a 1,900-foot airstrip.

14(h)(8) Selections and Overselections

The Chugach regional corporation is entitled to about 33,000 acres under section 14(h)(8) of the Alaska Native Claims Settlement Act, and section 1429 of the Alaska Lands Act authorized the corporation to select that acreage from the Chugach National Forest. CNI has submitted to the Interior Department a list of selections totalling about 78,000 acres in the national forest, from which the corporation hopes to receive its 33,000 acres. As of this writing, CNI had not set priorities on selections from this list, so for our analysis we assumed that the corporation would set highest priority on the two nominations we judged most valuable: the timber lands at Patton Bay and McKinley Lake--which together roughly total CNI's 14(h)(8) entitlement.

We designated the balance of the selections on CNI's list as "14(h)(8) Overselections," and we also analyzed these selections, partly because we could not be positive which selections CNI would set highest priority on, and also because in its option D the corporation proposed that any of these tracts which did not go toward its specific 14(h)(8) entitlement be considered for inclusion in CNI's larger land entitlement, authorized under section 12(c) of the settlement act.

14(h)(8) Selections

Patton Bay (19,354 acres): The Bureau of Land Management has begun adjudicating this CNI selection of timber lands around Patton

Bay on the southeast coast of Montague Island. The Forest Service characterizes acreage at Patton Bay as the largest concentration of high quality timber in Prince William Sound. The area is used by hunters and others; the Forest Service maintains five public recreation cabins here. Large numbers of deer and a significant number of brown bears populate Montague Island. Aside from the valuable timber stands CNI could log at Patton Bay, the area also has potential for commercial recreational development.

McKinley Lake (14,608 acres): This selection is made up of valuable timber lands around McKinley Lake, near Cordova. The area is connected with Cordova by road, and hunters and others use the area heavily. Bears, moose and mountain goats populate the region, and large numbers of salmon spawn in McKinley Lake and streams in the area. Aside from its potential for logging, the area also has potential for commercial recreational development.

14(h)(8) Overselections

This group of selections covers various areas of the Chugach National Forest in Prince William Sound, but the designated tracts are concentrated on islands in the sound. These islands are among the most heavily used recreation areas in the sound, and include important salmon streams and habitats of deer, bears, eagles and other wildlife. Seals and sea otters are found in many of the islands' bays. CNI hopes to acquire these lands chiefly for timber harvest and commercial recreational development.

Whalen Bay (2,709 acres): Whalen Bay is off Port Fidalgo on the eastern shore of Prince William Sound, about 30 miles northwest of Cordova. The area around the bay includes timber stands.

Constantine Creek (3,683 acres): This area of valuable timber lands is on the west side of Hinchinbrook Island, about 35 miles from Cordova. This selection is just east of state-selected lands CNI hopes to acquire at Port Etches, described under "State-Selected Lands" above.

St. Matthews Bay (1,585 acres): A timbered area on Port Gravina, about 25 miles northwest of Cordova, this selection includes a number of anadromous fish streams and sees recreational use by boaters and others.

Latouche Island (13,367 acres): This selection covers much of Latouche Island, and abuts state-selected lands CNI hopes to acquire at Horseshoe Bay on the western side of the island--described under "State-Selected Lands" above. Latouche Island is about 60 miles southeast of Seward; copper was mined on the island in the early 1900s, but the island now appears to have higher potential for real estate development than for copper mining. A private real estate developer has sold some tracts on the island, and CNI hopes any lands it acquired on the island would have similar real estate value.

Cordova Airport (97.5 acres): This small selection covers Chugach National Forest lands around the Cordova Airport, about 10 miles outside Cordova. CNI hopes to acquire this acreage for its real estate value.

Copper River Highway (1,405 acres): This elongated selection near Cordova begins where CNI's McKinley Lake selection--described above--ends, and follows the route of the Copper River Highway east for about 25 miles. CNI wants this highway frontage for its real estate value.

Gibbon Anchorage (1,607 acres): On Green Island about 22 miles east of Chenega, the Gibbon Anchorage area is used by deer hunters and fishermen, and the U.S. Fish and Wildlife Service has for a number of years conducted sea otter studies there. The area has potential for recreational development.

Hook Point (1,105 acres): Hook Point is on the east coast of Hinchinbrook Island about 23 miles southwest of Cordova. This selection includes a protected anchorage and a Forest Service cabin; residents of Cordova in particular use this area. CNI wants this acreage for commercial recreational development.

Macleod Harbor (2,927 acres): On the northwest coast of Montague Island, the Macleod Harbor selection includes a private lodge and airstrip, under permit from the Forest Service. This selection covers

harvestable timber stands, and has potential for commercial recreational development.

Stockdale Harbor (1,195 acres): Stockdale Harbor, on the northwest corner of Montague Island, is used by salmon fishermen, hunters and others. The area has potential for recreational development, and there is some harvestable timber around the harbor.

Bettles Island (240 acres): This selection is a small island off Evans Island at the north end of Elrington Passage. State ferries traveling through Prince William Sound pass through Elrington Passage, and stop at Port San Juan on Evans Island, near this selection. CNI wants the island for commercial recreational development.

Louis Bay (685 acres): Louis Bay is on the northeast end of Knight Island, in western Prince William Sound; this area sees heavy recreational use. Harvestable timber surrounds the bay.

Northeast Arm, Mummy Bay (287 acres): At the south end of Knight Island, this scenic bay is about 11 miles from Chenega and sees much recreational use by boaters and others. CNI wants this selection for recreational development.

Iron Mountain (13,564 acres): On the east coast of Knight Island, this relatively large selection includes lands where CNI hopes to find copper. The selection also includes commercial timber stands.

Chugach National Forest, East of Copper River

The following group of selections--Bering River coal field, Martin River timber lands, Kushtaka Lake timber lands, Katalla, and Controller Bay--covers about 160,000 acres in the Chugach National Forest east of the Copper River. Much of this broad area is made up of steep mountains and narrow valleys covered by streams and marshy areas that are important habitats for anadromous fish and migratory birds. The coastal wetlands in particular are nesting areas of trumpeter swans, Canada geese and other waterbirds. Moose, bears and mountain goats are found throughout most of this region. CNI wants these lands for their timber, as well as for their potential oil, gas and coal deposits. No roads exist in this region, and logging, coal mining or other resource developments would require construction of a transportation network.

Bering River coal field (48,657 acres): This selection which CNI wants for its coal deposits is centered around Monument Mountain, about 25 miles northeast of Katalla, and is just west of CNI's Carbon Mountain selection, described earlier.

Martin River timber lands (26,580 acres): This selection runs from the Copper River on the west to CNI's Bering River coal field selection on the east. The Native corporation hopes to acquire this land for its rich timber; the Forest Service estimates there may be as many as several hundred million board feet of timber in this selection. Much of the timber in this area is on steep slopes; low-lying

acreage in this tract is generally wet, and includes habitats of a number of species of fish and wildlife.

Kushtaka Lake timber lands (8,751 acres): These timber lands lie around Kushtaka Lake, about 20 miles northeast of Katalla, and just south of CNI's Bering River coal field selection described above.

Katalla (66,405 acres): Along the northern Gulf of Alaska about 50 miles southeast of Cordova, this selection covers an area where oil was discovered in the early 1900s, and which is still believed to have oil and gas potential. Important salmon and migratory bird habitat is found along this coastal area.

Controller Bay (10,174 acres): Just east of Katalla and about 60 miles southeast of Cordova, Controller Bay is seasonally used by millions of waterfowl, including trumpeter swans and Canada geese, and other waterbirds. CNI believes a hunting lodge or other recreational developments would be feasible here, and also that the area has oil and gas potential.

Bremner River mouth (13,549 acres)

This selection covers an area north of where the Bremner River flows into the Copper River, about 50 miles east of Valdez; this area is within the Wrangell-St. Elias National Park and Preserve, and includes important trumpeter swan nesting areas. The selection has potential for recreational development.

Icy Bay Addition (12,868 acres)

This selection would extend northward the 47,000-acre tract now being conveyed to CNI at Icy Bay; CNI selected the original Icy Bay tract for its oil and gas potential. This selection abuts the Wrangell-St. Elias National Park and Preserve, and will be added to the park if not conveyed to CNI.

Nelson Townsite (2,000 acres)

At the mouth of Orca Bay about 10 miles north of Cordova, this acreage is managed by the Bureau of Land Management. The Departments of Interior and Agriculture have proposed that this tract be included in CNI's land entitlement. The area has potential for homesite or recreational development.

Snow River (960 acres)

This tract on the Seward Highway near the town of Seward has high real estate value, and the Departments of Interior and Agriculture have proposed that this acreage be included in CNI's land entitlement. This selection is in the Chugach National Forest.

Hypothetical Selection Areas

The lands described below are not in fact "selections," as are those described above, because CNI has not asked for, nor has the federal negotiating team offered, the acreage described from this point on. The following are hypothetical selections, made by the

university's School of Agriculture and Land Resources Management in constructing its two benchmark alternatives, the no-forest and status quo alternatives. These two alternatives are not intended as proposed settlements of Chugach regional corporation's land entitlement, but rather as benchmarks against which to measure land selections which the Chugach Lands Study Group is actually considering. The status quo alternative includes tracts from areas that the Interior Department has in fact withdrawn for CNI selection--but CNI's dissatisfaction with existing withdrawals was the impetus for the Chugach lands study. The no-forest alternative includes lands the Interior Department would have withdrawn for CNI selection, had the Alaska Native Claims Settlement Act not placed restrictions on Native selections in national forests. Such withdrawals would, under ANCSA rules, have been within specified areas around existing villages--with village corporations having first choice of these lands. Methods the university study team used in constructing these benchmark alternatives are described in chapter three.

Chenega, Tatitlek, Eyak, and Deficiency Area Selections

These four selection areas are from the hypothetical no-forest alternative. They include lands around CNI's three villages in the national forest, and a deficiency area in northern Prince William Sound.

Chenega Selections (107,200 acres): The village of Chenega is on the southern coast of Chenega Island, in western Prince William Sound. Most of the coastal lands within the withdrawal area around Chenega

have been selected by the village corporation, but some coastal lands on Knight and Bainbridge islands would have been available for CNI, had the regional corporation been able to select in this area. Much of the land that would have been left for the regional corporation is mountainous and glaciated country along the eastern Kenai Peninsula, roughly from Port Nellie Juan on the north to Bainbridge Island on the south. We estimated that around five percent of this acreage is usable, including some timber stands and a number of sites with potential for recreational development.

Tatitlek Selections (48,600 acres): The village of Tatitlek is on Tatitlek Narrows in eastern Prince William Sound, southwest of Valdez. Most coastal lands in the area around Tatitlek have been selected by the village corporation. Lands that would have been left for the regional corporation to select include largely mountains and glaciers north and east of Tatitlek. Our analysis showed that little of this acreage is usable, including some harvestable timber and a few sites that might be suitable for recreational development.

Eyak Selections (104,000 acres): Eyak is just southeast of Cordova in eastern Prince William Sound, and as is the case in the Chenega and Tatitlek selection areas, most of the coastal lands around Eyak have been selected by the village corporation. Had the regional corporation been able to select in this area, some coastal acreage in the estuarine complex between the Eyak and Glacier rivers would have been available; this estuarine complex is a nesting area for trumpeter

swans, Canada geese and other waterfowl, and a number of salmon streams cross the area. There is some potential for establishment of a hunting lodge and related facilities in this coastal area. The balance of the lands that would have been available for CNI selection around Eyak are scattered, mountainous parcels. We estimated that only a few thousand acres in these parcels would have been usable, including some harvestable timber stands.

Deficiency Area Selections (80,400 acres): Two of Chugach's village corporations, English Bay and Port Graham, lie outside the national forest, but no land was available to the regional corporation around these villages, partly because the State of Alaska owned land near the villages at the time the settlement act was passed. We decided that, if there had been no restrictions on Native selections in the national forest, the Interior Department would most likely have withdrawn for CNI selection a deficiency area in northern Prince William Sound. The deficiency selections we identified are roughly between Columbia Glacier on the east and Unakwik Inlet on the west. These selections include mountainous country, but also low-lying coastal acreage, including a number of scenic bays and Glacier Island, a popular recreation site. Important salmon streams cross this region, which also includes habitats of bears, bald eagles and mountain goats. This broad area includes valuable timber stands, and a number of sites potentially suitable for recreational development.

Copper River Valley, Tasnuna River Valley,

White River, Duktoth River, Kaliakh River Selections

This group of selections is from the status quo alternative, which includes parcels we selected from areas now withdrawn for CNI selection outside the national forest.

Copper River Valley (165,500 acres);

Tasnuna River Valley (31,500 acres): These two selections, largely drawn from withdrawal areas that CNI has characterized as undesirable, do incorporate some acreage that the regional corporation wants: 9,000 acres on the route of the proposed Copper River Highway--described above under "In-Region Withdrawals"--and 13,000 acres at the Bremner River mouth, also described above. The selections generally follow the Copper River Valley north from Miles Lake to the junction of the Copper and Tasnuna Rivers, and then west along the Tasnuna River to within about 30 miles of Valdez. This is generally remote, mountainous country, and any development would probably be roadside concessions along the planned highway. Before the Alaska Lands Act was passed, most of the upper Copper River was outside the national forest, but that act expanded the Chugach National Forest to include much of this area; the Bremner River mouth acreage is within the Wrangell-St. Elias National Park and Preserve.

White River (6,500 acres); Duktoth River (19,000 acres); Kaliakh River (29,000 acres): These three selections are from existing withdrawal areas northwest and east of Cape Yakataga. They are all inland, difficult to reach and largely covered with mountains and glaciers. The three rivers produce some salmon, and the general area is populated by bears and mountain goats. The Duktoth River selection includes some harvestable timber.

Land Settlement Alternatives

Option C

CNI's option C is largely made up of valuable timber lands from the Tongass and Chugach National Forests and from state-owned acreage around Cape Yakataga; option C is the most valuable of the three proposed alternatives, and is far more valuable than either of the two benchmark alternatives we developed to measure the proposed alternatives against. Option C also nominates tracts in the eastern part of the Chugach National Forest that may contain commercial deposits of coal, oil and gas, as well as other lands with mineral potential outside the national forest. Also included in this option are recreation tracts in Prince William Sound, as well as a number of small but valuable federal holdings generally in or near communities.

About 150,000 acres of this option lie east of the Copper River in an area of the Chugach National Forest that the Alaska Lands Act declared should be managed for the protection of fish and wildlife;

the area includes nesting and breeding areas of waterfowl, important salmon streams and habitats of moose, bears, and mountain goats. Tracts included in Prince William Sound and other areas of the Chugach National Forest are recreation areas used by residents of southcentral Alaska. Selections in option C are:

Southeast Alaska timber lands (112,385 acres)

Yakataga (State) timber lands (70,000 acres)

In-Region Prior Withdrawals

- Icy Bay (47,750 acres)
- Cape Yakataga (1,078 acres)
- Copper River (9,212 acres)
- Carbon Mountain (25,757 acres)

State-Selected Lands

- Shotgun Cove (100 acres)
- Glacier Island (200 acres)
- Port Etches (225 acres)
- Horseshoe Bay (575 acres)
- Jack Bay (500 acres)

Small Federal Holdings

- Whittier BLM land (333 acres)
- Seward BLM land (.5 acre)
- Cordova (Fed. Reserve) (1.3 acres)
- Cordova (Lutheran Homesite) (2.5 acres)
- Miles Lake (685 acres)
- Other Small Federal Holdings (2,879 acres)

14(h)(8) Selections

- Patton Bay (19,354 acres)
- McKinley Lake (14,608 acres)

Bering River coal field (48,657 acres)

Martin River timber lands (surface only) (26,580 acres)

Kushtaka Lake timber lands (surface only) (8,751 acres)

Katalla (66,405 acres)

Bremner River mouth (surface only) (13,549 acres)

Option D

CNI's option D includes most of the same selections as does the corporation's option C, described above, but option D excludes timber lands from the Tongass National Forest and includes many more recreation tracts in the Chugach National Forest in Prince William Sound. Because option D does not include valuable timber lands from the Tongass National Forest, it is less valuable than CNI's option C, but still more valuable than the federal alternative and far more valuable than either of the two benchmark alternatives we developed.

Recreation tracts included in option D are among the most heavily used in Prince William Sound. Selections in option D are:

Yakataga (State) timber lands (70,000 acres)

In-Region Prior Withdrawals

- Icy Bay (47,750 acres)
- Cape Yakataga (1,078 acres)
- Copper River (9,212 acres)
- Carbon Mountain (25,757 acres)

State-Selected Lands

- Shotgun Cove (100 acres)
- Glacier Island (200 acres)
- Port Etches (225 acres)
- Horseshoe Bay (575 acres)
- Jack Bay (500 acres)

Small Federal Holdings

Whittier BLM land (333 acres)
Seward BLM land (.5 acre)
Cordova (Fed. Reserve) (1.3 acres)
Cordova (Lutheran Homesite) (2.5 acres)
Miles Lake (685 acres)
Other Small Federal Holdings (2,879 acres)

14(h)(8) Selections

Patton Bay (19,354 acres)
McKinley Lake (14,608 acres)

14(h)(8) Overselections

Whalen Bay (2,709 acres)
Constantine Creek (3,683 acres)
St. Matthews Bay (1,585 acres)
Latouche Island (13,367 acres)
Cordova Airport (98 acres)
Copper River Highway (1,405 acres)
Gibbon Anchorage (1,607 acres)
Hook Point, Hinchinbrook Island (1,105 acres)
Macleod Harbor (2,927 acres)
Stockdale Harbor (1,195 acres)
Bettles Island (240 acres)
Louis Bay (685 acres)
Northeast Arm, Mummy Bay (287 acres)
Iron Mountain (13,564 acres)

Bering River coal field (48,657 acres)

Martin River timber lands (26,580 acres)

Kushtaka Lake timber lands (8,751 acres)

Katalla (66,405 acres)

Bremner River mouth (13,549 acres)

Controller Bay (10,174 acres)

Icy Bay Addition (12,868 acres)

Federal Alternative

The federal alternative generally includes, with modifications, a portion of the selections CNI named in its options C and D. The two largest and most valuable selections in the federal alternative are state-owned timber lands around Cape Yakataga and coal fields in the eastern Chugach National Forest. Tracts east of the national forest that may contain deposits of coal and oil are also included in this alternative, as are some of the Prince William Sound recreation tracts and small federal holdings included in CNI's options C and D. Largely because it excludes valuable timber tracts included in CNI's options, the federal alternative is less valuable than those options, but considerably more valuable than either of the two benchmark alternatives we developed. The federal alternative includes:

Yakataga (State) timber lands (100,000 acres)

In-Region Prior Withdrawals

- Icy Bay (47,750 acres)
- Cape Yakataga (1,078 acres)
- Copper River (9,212 acres)
- Carbon Mountain (25,757 acres)

State-Selected Lands

- Shotgun Cove (100 acres)
- Glacier Island (200 acres)
- Horseshoe Bay (1,230 acres)
- Jack Bay (1,095 acres)

Small Federal Holdings

- Whittier BLM land (333 acres)
- Seward BLM land (.5 acre)
- Cordova (Fed. Reserve) (1.3 acres)

Cordova (Lutheran Homesite) (2.5 acres)
Miles Lake (685 acres)

Bering River coal field (48,657 acres)

Nelson Townsite (2,000 acres)

Snow River (960 acres)

No-Forest Alternative

This hypothetical alternative includes lands that we determined would most likely have been available for CNI to select around its villages, had there been no restrictions on such selections from the national forest, and also lands the Alaska Lands Act authorized CNI to select from the national forest. The lands that would have been open to CNI around its villages are largely mountainous and glaciated areas around Prince William Sound, with little low-lying or coastal acreage and little economic potential, as compared with lands in the three proposed alternatives. Some timber lands and some recreational sites are included in this alternative, particularly in northern Prince William Sound.

By far the most valuable selections in this alternative are timber lands at Patton Bay on Montague Island and McKinley Lake near Cordova; these are tracts we judged CNI is most likely to name as its selections under section 14(h)(8) of the settlement act. The no-forest alternative includes:

14(h)(8) Selections

Patton Bay (19,354 acres)
McKinley Lake (14,608 acres)

Eyak Selections (104,000 acres)

Tatitlek Selections (48,600 acres)

Chenega Selections (107,200 acres)

Deficiency Area Selections (80,400 acres)

Status Quo Alternative

This hypothetical alternative includes lands that are currently withdrawn for CNI selection--which consist largely of acreage CNI has said it does not want, but includes the limited acreage CNI has selected from those existing withdrawals. Timber lands at Patton Bay and McKinley Lake, which we believe CNI is most likely to select for its 14(h)(8) entitlement, are also included in this alternative. Lands which CNI has selected from existing withdrawals are largely east of the Chugach National Forest and on the northern Gulf of Alaska; these lands have potential for mineral development. Selections we identified in this alternative include a broad area along the Copper and Tasnuna River valleys, including some potentially valuable acreage along the route of the proposed Copper River Highway; much of this land is remote and mountainous, with limited low-lying acreage. Also included in this alternative are tracts inland from Cape Yakataga; these tracts are generally mountainous but may include some harvestable timber. This alternative is the least valuable of the five

alternatives we have looked at, with the Patton Bay and McKinley Lake tracts contributing most of the total value. The status quo alternative includes:

Icy Bay (47,750 acres)

Cape Yakataga (1,078 acres)

Carbon Mountain (25,757 acres)

14(h)(8) Selections

Patton Bay (19,354 acres)
McKinley Lake (14,608 acres)

Controller Bay (10,174 acres)

White River (6,500 acres)

Duktoth River (19,000 acres)

Kaliakh River (29,000 acres)

Copper River Valley (165,500 acres)

Tasnuna River Valley (31,500 acres)

V. ECONOMIC ANALYSIS

This chapter presents an economic analysis and comparison of the five land settlement alternatives that are the focus of this report. These alternatives are options C and D, proposed by Chugach Natives, Inc.; the federal alternative developed by the Departments of Agriculture and Interior; and the no-forest and status quo alternatives, the two hypothetical alternatives we developed as benchmarks against which to measure economic and other effects of the three proposed alternatives. Methods we used in making this analysis are described in chapter three, and procedures we used in calculating values and effects are described in detail in appendixes C through G. The first section of this chapter discusses the overall market values of each of the alternatives, and the values of each of the individual selection areas included in the alternatives. In a second section, we compare effects on the public of the various settlement alternatives, including effects on economic development, employment, public revenues, public expenditures, recreation and wilderness.

Analysis of Market Values

To assign market values to the land settlement alternatives, we calculated low, medium and high estimates of timber, mineral, and real estate values for each of the more than 50 selection areas included in the three proposed and two benchmark alternatives. These individual resource values, along with the total value of each selection area, are presented in table V-1. (Tables V-3 through V-7 list which of these 50 selections are included in each alternative.)

TABLE V-1. SUMMARY OF VALUES, BY SELECTION AREA AND BY RESOURCE
FIVE LAND SETTLEMENT ALTERNATIVES
(MILLIONS OF DOLLARS)

	Timber Value			Mineral Value			Real Estate Value			Total Value		
Selection Area	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Southeast Alaska timber lands	79.8	159.6	319.2	-	-	-	0	0	0	79.8	159.6	319.2
Yakataga (State) timber lands												
Federal Alternative	54.5	109.0	218.0	0	0	0.3	2.2	4.4	8.7	56.7	113.4	227.1
CNI Options	50.1	100.1	200.2	0	0	0.3	1.8	3.5	7.0	51.8	103.6	207.5
In-Region Prior Withdrawals: Total	-	-	-	0.1	2.7	16.1	4.0	7.9	15.8	4.1	10.6	31.9
Icy Bay	-	-	-	0.1	0.7	6.1	1.0	2.0	3.9	1.1	2.7	10.0
Cape Yakataga	-	-	-	-	-	-	1.6	3.2	6.4	1.6	3.2	6.4
Copper River	-	-	-	-	-	-	1.3	2.6	5.2	1.3	2.6	5.2
Carbon Mountain	-	-	-	0	2.0	10.0	0.1	0.1	0.3	0.1	2.1	10.3
Bering River coal field	4.0	17.9	35.8	0	10.0	60.0	0.2	0.5	1.0	9.2	28.4	96.8
State-Selected Lands												
Shotgun Cove	0.1	0.2	0.4	-	-	-	1.0	2.0	4.0	1.1	2.2	4.4
Glacier Island	0	0	0	-	-	-	0.2	0.4	0.8	0.2	0.4	0.8
Port Etches	0	0	0	-	-	-	0.2	0.5	0.9	0.2	0.5	0.9
Horseshoe Bay	0	0	0	-	-	-	0.5	1.0	2.0	0.5	1.0	2.0
Jack Bay	0	0	0	-	-	-	0.8	1.5	3.0	0.8	1.5	3.0
Small Federal Holdings												
Whittier BLM Land	0	0	0	-	-	-	3.3	6.7	13.3	3.3	6.7	13.3
Seward BLM Land	0	0	0	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1
Cordova (Federal Reserve)	0	0	0	-	-	-	0.1	0.2	0.3	0.1	0.2	0.3
Cordova (Lutheran Homesite)	0	0	0	-	-	-	0.2	0.3	0.7	0.2	0.3	0.7
Miles Lake	-	-	-	-	-	-	0.7	1.4	2.7	0.7	1.4	2.7
Other Small Federal Holdings	-	-	-	-	-	-	5.0	10.0	20.0	5.0	10.0	20.0
14(h)(8) Selections: Total	26.1	52.2	104.4	-	-	-	5.7	11.5	22.8	31.9	63.7	127.4
Patton Bay	16.1	32.1	64.2	-	-	-	1.1	2.3	4.5	17.2	34.4	68.8
McKinley Lake	10.1	20.1	40.2	-	-	-	4.6	9.2	18.3	14.7	29.3	58.6
14(h)(8) Overselections: Total	6.1	11.1	24.2	0	0.6	4.0	5.1	10.2	20.2	10.9	21.9	46.6
Whalen Bay	0.6	1.2	2.4	-	-	-	0.1	0.2	0.4	0.7	1.4	2.8
Constantine Creek	2.0	3.9	7.8	-	-	-	0.1	0.2	0.3	2.1	4.1	8.1
St. Matthews Bay	0.9	1.7	3.4	-	-	-	0.1	0.2	0.4	1.0	1.9	3.8
Latouche Island	0.6	1.2	2.4	0	0.3	2.0	0.8	1.7	3.3	1.4	3.2	7.7
Cordova Airport	-	-	-	-	-	-	0.5	1.0	2.0	0.5	1.0	2.0
Copper River Highway	-	-	-	-	-	-	1.5	3.0	6.0	1.5	3.0	6.0
Gibbon Anchorage	-	-	-	-	-	-	0.4	0.8	1.7	0.4	0.8	1.7
Hook Point, Hinchinbrook Is.	-	-	-	-	-	-	0.3	0.5	1.0	0.3	0.5	1.0
Macleod Harbor	1.2	2.3	4.6	-	-	-	0.2	0.5	0.9	1.4	2.8	5.6
Stockdale Harbor	0.1	0.2	0.4	-	-	-	0.4	0.7	1.4	0.5	0.9	1.8
Bettles Island	-	-	-	-	-	-	0.2	0.5	1.0	0.2	0.5	1.0
Louis Bay	0.2	0.4	0.8	-	-	-	0.2	0.4	0.7	0.4	0.8	1.5
Northeast Arm, Mummy Bay	0.1	0.1	0.2	-	-	-	0.1	0.2	0.4	0.2	0.3	0.6
Iron Mountain	0.1	0.1	0.2	0	0.3	2.0	0.2	0.3	0.7	0.3	0.7	2.9

TABLE V-1. SUMMARY OF VALUES, BY SELECTION AREA AND BY RESOURCE
FIVE LAND SETTLEMENT ALTERNATIVES (Continued)
(MILLIONS OF DOLLARS)

Selection Area	Timber Value			Mineral Value			Real Estate Value			Total Value		
	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
Martin River timber lands	16.7	33.3	66.6	-	-	-	1.4	2.9	5.7	18.1	36.2	72.4
Kushtaka Lake timber lands	5.0	10.0	20.0	-	-	-	0.4	0.7	1.4	5.4	10.7	21.4
Bremner River mouth	-	-	-	-	-	-	0.7	1.5	3.0	0.7	1.5	3.0
Katalla	2.5	4.9	9.8	0.2	1.4	12.2	0.8	1.6	3.2	3.5	7.9	25.2
Controller Bay	-	-	-	-	-	-	0.6	1.2	2.4	0.6	1.2	2.4
Icy Bay Addition	-	-	-	-	-	-	0.2	0.4	0.9	0.2	0.4	0.9
Nelson Townsite	0	0	0	-	-	-	0.2	0.3	0.6	0.2	0.3	0.6
Snow River	0	0	0	-	-	-	1.4	2.9	5.8	1.4	2.9	5.8
Eyak Selections	1.0	2.0	4.0	-	-	-	0.3	0.7	1.3	1.4	2.7	5.4
Tatitlek Selections	0.4	0.8	1.6	0	0.3	2.0	0.2	0.4	0.8	0.6	1.5	4.4
Chenega Selections	1.0	1.9	3.8	0	0.3	2.0	1.6	3.3	6.5	2.6	5.5	12.3
Deficiency Area Selections	6.2	12.3	24.6	-	-	-	7.4	14.8	29.6	13.6	27.1	54.2
White River	-	-	-	-	-	-	0	0	0	0	0	0
Duktoth River	1.9	3.7	7.4	-	-	-	0.2	0.5	0.9	2.1	4.2	8.4
Kaliakh River	-	-	-	-	-	-	0.2	0.3	0.6	0.2	0.3	0.6
Copper River Valley	-	-	-	-	-	-	2.2	4.5	9.0	2.2	4.5	9.0
Tasnuna River Valley	-	-	-	-	-	-	1.2	2.4	4.7	1.2	2.4	4.7

- = Information not available. Assumed to be zero.

The medium values are those which we consider most likely, and throughout this chapter we use those medium values in discussing values of the various alternatives. The low and high values define a broad range within which we feel that values are likely to fall; however, no statistical significance is attributed to this range. In assigning timber and real estate values, we set the low value at half the medium value, and the high value at twice the medium. For minerals, we set the low value at zero and the high value at several times the medium value. This value range is broad because little information exists about resources in some of the selection areas, and also because the uncertainties of future resource discoveries, price trends and land markets make such value estimates highly speculative. However, we feel that the estimates do permit a broad comparison of the relative values among alternatives.

We based our calculations of timber values on timber volumes and operable commercial forest areas, assuming prices and costs comparable to those for past sales in the Tongass and Chugach National Forests, and allowing for inflation and the primary processing requirement for timber logged on federal lands. These calculations are discussed in appendix C. We based our calculations of mineral values, discussed in appendix D, on the present value of projected lease sales, royalty payments and mining venture profits. We based calculations of real estate values on estimated areas of "usable" land--reasonably flat, low-lying, dry land--and on price assumptions for different categories of land. These calculations are discussed in appendix F.

To obtain total values for the three proposed and two benchmark alternatives, we added together the values of the selection areas comprising the alternatives. However, aggregation of parcels in this manner may overstate actual total market values since selling large volumes of timber or large areas of land over a short period might depress their prices. The greater the total timber volume or usable land area of the alternative, the greater the extent to which value might be overstated. However, we did not attempt to adjust the total values of the alternatives for this "aggregation effect," since our main purpose in estimating total values of the alternatives was to compare relative values of the alternatives. However, the aggregation effect would also tend to somewhat overestimate differences in relative values, since the effect would be more significant for the larger volumes of timber and larger areas of land included in the more valuable alternatives.

The total values of the three proposed and two benchmark alternatives are presented in table V-2. Using the medium values to compare market values of the various alternatives, we find that CNI's option C is by far the most valuable alternative, worth nearly $450 million. CNI's option D is worth approximately $300 million. The value of the federal alternative is a little more than half (55 percent) that of option D, or about $170 million. The benchmark alternatives are considerably less valuable than any of the proposed alternatives; the no-forest and the status-quo alternatives are worth approximately $100 million and $85 million, respectively.

TABLE V-2. COMPARISON OF TOTAL VALUES, BY ALTERNATIVE

(MILLIONS OF DOLLARS)

	Low	Medium	High
CNI Option C	216.6	446.5	953.0
CNI Option D	148.5	310.4	683.7
Federal Alternative	78.6	169.4	389.5
No-Forest Alternative	50.1	100.5	203.7
Status Quo Alternative	41.0	84.3	176.1

Tables V-3 through V-7 show total value by selection area for each alternative. As shown in table V-3, the Southeast Alaska timber lands, worth nearly $160 million, account for more than one-third the total value of option C; the value of this selection alone exceeds the total value of either the no-forest or status-quo alternative, and nearly equals the total value of the federal alternative. The Yakataga timber selection, worth $104 million, accounts for 23 percent of the value of option C, and this single selection is also worth more than either of the two benchmark alternatives. The 14(h)(8) selections--Patton Bay and McKinley Lake--are worth more than $160 million and account for 14 percent of the total value of option C.

Options C and D include many of the same selections, but as shown in table V-4, option D excludes the Southeast Alaska timber lands and adds the 14(h)(8) overselections, Controller Bay, and the Icy Bay addition, as well as subsurface rights to the Martin River, Kushtaka Lake, and Bremner River mouth selections. Because the total value of

TABLE V-3. SUMMARY OF VALUES, BY SELECTION AREA
CNI OPTION C

(MILLIONS OF DOLLARS)

Selection Area	Low		Medium		High	
Southeast Alaska timber lands	79.8		159.6		319.2	
Yakataga (State) timber lands	51.8		103.6		207.5	
In-Region Prior Withdrawals: Total	4.1		10.6		31.9	
Icy Bay		1.1		2.7		10.0
Cape Yakataga		1.6		3.2		6.4
Copper River		1.3		2.6		5.2
Carbon Mountain		0.1		2.1		10.3
Bering River coal field	9.2		28.4		96.8	
State-Selected Lands: Total	2.8		5.6		11.1	
Shotgun Cove		1.1		2.2		4.4
Glacier Island		0.2		0.4		0.8
Port Etches		0.2		0.5		0.9
Horseshoe Bay		0.5		1.0		2.0
Jack Bay		0.8		1.5		3.0
Small Federal Holdings: Total	9.3		18.7		37.1	
Whittier BLM Land		3.3		6.7		13.3
Seward BLM Land		0.1		0.1		0.1
Cordova (Federal Reserve)		0.1		0.2		0.3
Cordova (Lutheran Homesite)		0.2		0.3		0.7
Miles Lake		0.7		1.4		2.7
Other Small Federal Holdings		5.0		10.0		20.0
14(h)(8) Selections: Total	31.9		63.7		127.4	
Patton Bay		17.2		34.4		68.8
McKinley Lake		14.7		29.3		58.6
Martin River timber lands (surface only)	18.1		36.2		72.4	
Kushtaka Lake timber lands (surface only)	5.4		10.7		21.4	
Bremner River mouth (surface only)	0.7		1.5		3.0	
Katalla	3.5		7.9		25.2	
TOTAL	216.6		446.5		953.0	

TABLE V-4. SUMMARY OF VALUES, BY SELECTION AREA
CNI OPTION D

(MILLIONS OF DOLLARS)

Selection Area	Low		Medium		High	
Yakataga (State) Timber Lands	51.8		103.6		207.5	
In-Region Prior Withdrawals: Total	4.1		10.6		31.9	
Icy Bay		1.1		2.7		10.0
Cape Yakataga		1.6		3.2		6.4
Copper River		1.3		2.6		5.2
Carbon Mountain		0.1		2.1		10.3
Bering River coal field	9.2		28.4		96.8	
State-Selected Lands: Total	2.8		5.6		11.1	
Shotgun Cove		1.1		2.2		4.4
Glacier Island		0.2		0.4		0.8
Port Etches		0.2		0.5		0.9
Horseshoe Bay		0.5		1.0		2.0
Jack Bay		0.8		1.5		3.0
Small Federal Holdings: Total	9.3		18.7		37.1	
Whittier BLM Land		3.3		6.7		13.3
Seward BLM Land		0.1		0.1		0.1
Cordova (Federal Reserve)		0.1		0.2		0.3
Cordova (Lutheran Homesite)		0.2		0.3		0.7
Miles Lake		0.7		1.4		2.7
Other Small Federal Holdings		5.0		10.0		20.0
14(h)(8) Selections: Total	31.9		63.7		127.4	
Patton Bay		17.2		34.4		68.8
McKinley Lake		14.7		29.3		58.6
14(h)(8) Overselections: Total	10.9		21.9		46.6	
Whalen Bay		0.7		1.4		2.8
Constantine Creek		2.1		4.1		8.1
St. Matthews Bay		1.0		1.9		3.8
Latouche Island		1.4		3.2		7.7
Cordova Airport		0.5		1.0		2.0
Copper River Highway		1.5		3.0		6.0
Gibbon Anchorage		0.4		0.8		1.7
Hook Point, Hinchinbrook Island		0.3		0.5		1.0
Macleod Harbor		1.4		2.8		5.6
Stockdale Harbor		0.5		0.9		1.8
Bettles Island		0.2		0.5		1.0
Louis Bay		0.4		0.8		1.6
Northeast Arm, Mummy Bay		0.2		0.3		0.6
Iron Mountain		0.3		0.7		2.9
Martin River timber lands	18.1		36.2		72.4	
Kushtaka Lake timber lands	5.4		10.7		21.4	
Bremner River mouth	0.7		1.5		3.0	
Katalla	3.5		7.9		25.2	
Controller Bay	0.6		1.2		2.4	
Icy Bay Addition	0.2		0.4		0.9	
TOTAL	148.5		310.4		683.7	

TABLE V-5. SUMMARY OF VALUES, BY SELECTION AREA
FEDERAL ALTERNATIVE
(MILLIONS OF DOLLARS)

Selection Area	Low		Medium		High	
Yakataga (State) timber lands	56.7		113.4		227.1	
In-Region Prior Withdrawals	4.1		10.6		31.9	
Icy Bay		1.1		2.7		10.0
Cape Yakataga		1.6		3.2		6.4
Copper River		1.3		2.6		5.2
Carbon Mountain		0.1		2.1		10.3
Bering River coal field	9.2		28.4		96.8	
State-Selected Lands: Total	2.6		5.1		10.2	
Shotgun Cove		1.1		2.2		4.4
Glacier Island		0.2		0.4		0.8
Horseshoe Bay		0.5		1.0		2.0
Jack Bay		0.8		1.5		3.0
Small Federal Holdings: Total	4.4		8.7		17.1	
Whittier BLM Land		3.3		6.7		13.3
Seward BLM Land		0.1		0.1		0.1
Cordova (Federal Reserve)		0.1		0.2		0.3
Cordova (Lutheran Homesite)		0.2		0.3		0.7
Miles Lake		0.7		1.4		2.7
Nelson Townsite	0.2		0.3		0.6	
Snow River	1.4		2.9		5.8	
TOTAL	78.6		169.4		389.5	

TABLE V-6. SUMMARY OF VALUES, BY SELECTION AREA
NO-FOREST ALTERNATIVE
(MILLIONS OF DOLLARS)

Selection Area	Low		Medium		High	
14(h)(8) Selections: Total	31.9		63.7		127.4	
Patton Bay		17.2		34.4		68.8
McKinley Lake		14.7		29.3		58.6
Eyak Selections	1.4		2.7		5.4	
Tatitlek Selections	0.6		1.5		4.4	
Chenega Selections	2.6		5.5		12.3	
Deficiency Area Selections	13.6		27.1		54.2	
TOTAL	50.1		100.5		203.7	

TABLE V-7. SUMMARY OF VALUES, BY SELECTION AREA,
STATUS QUO ALTERNATIVE

Selection Area	Low		Medium		High	
Icy Bay	1.1		2.7		10.0	
Cape Yakataga	1.6		3.2		6.4	
Carbon Mountain	0.1		2.1		10.3	
14(h)(8) Selections: Total	31.9		63.7		127.4	
Patton Bay		17.2		34.4		68.8
McKinley Lake		14.7		29.3		58.6
Controller Bay	0.6		1.2		2.4	
White River	0.0		0.0		0.0	
Duktoth River	2.1		4.2		5.3	
Kaliakh River	0.2		0.3		0.6	
Copper River Valley	2.2		4.5		9.0	
Tasnuna River Valley	1.2		2.4		4.7	
TOTAL	41.0		84.3		176.1	

these additions is only $24 million, compared with $160 million for the excluded southeast Alaska timberlands, option D is considerably less valuable than option C.

The federal alternative, shown in Table V-5, shares a number of selections with options C and D: the Yakataga timber lands, the Bering River coal field, the in-region prior withdrawals, and some state-selected lands and small federal holdings. However, it does not include the 14(h)(8) selections and overselections, the Martin River timber lands, and a number of other valuable selections included in options C and D. Those selections included in CNI option D but not in the federal alternative are worth about $145 million, and the selections included in option C but excluded from the federal alternative are worth about $280 million. In contrast, the federal alternative includes only two small parcels, Nelson townsite and Snow River, which are not included in CNI's options; these parcels are worth about $3 million. Thus, the federal alternative is considerably less valuable than either of CNI's options, and it is worth less than 40 percent of option C, the most valuable of the five alternatives we considered.

Our benchmark alternatives, presented in tables V-6 and V-7, are much less valuable than any of the three proposed alternatives. The 14(h)(8) selections alone account for more than 63 percent of the value of the no-forest alternative; most of the remaining lands in the no-forest alternative consist of mountains or glaciers. While some of these lands have timber or real estate potential, we classified less than 10 percent as "usable."

The 14(h)(8) selections account for more than 75 percent of the value of the status quo alternative. The remaining lands within the alternative have relatively low value, with the largest share contributed by the real estate value of lands along the proposed Copper River Highway. As with the no-forest alternative, we classified less than 10 percent of the area of these lands as "usable."

Analysis of Effects on the Public

As discussed in chapter three, evaluation of effects on the public of proposed land settlement alternatives is complicated by the variety of impacts and the heterogeneity of the public. We could not calculate total public "losses or gains" that would result from proposed land settlements alternatives. However, we did look separately at several kinds of potential effects on the public: effects on employment, public revenues, public expenditures, recreation, and wilderness. Different members of the public would likely differ in their assessments of whether such effects would be beneficial or harmful.

Development Assumptions

To discuss effects of the land settlement alternatives, we had to make assumptions about how each would affect economic activity in the Chugach region. How we arrived at these assumptions is discussed below and in appendixes C through G. In general, we based the assumptions on our best judgment about differences in the management of lands under public and private ownership, and other factors affecting development in the Chugach region.

Table V-8 summarizes the "medium" changes we assumed would take place in the Chugach region as of 1990, under the various alternatives. In studying potential employment effects, we also made "low" and "high" assumptions for economic development effects; these assumptions are included in later tables, which show assumed changes in timber, mining, and recreation employment under the various alternatives. We emphasize that these projected effects do not represent changes from the present level of economic activity in the Chugach region, but rather changes from the level of economic activity that would exist in 1990 if there were no land settlement.

We arrived at our timber harvest and processing assumptions by making assumptions about the total volume which might eventually be harvested (available harvest volume), rates of harvest, and allocation of harvests for six groups of selection areas. We assumed CNI would include all timber in available harvest volume, whereas the Forest Service would include only 80 or 90 percent of total volume in available harvest volume. We assumed that CNI would harvest timber from Patton Bay at a rate of 15 MMBF per year, from the Yakataga timber lands at a rate of 25 MMBF per year, and from other timber properties at a rate of 1/30 of available volume per year. We assumed the state would harvest 10 MMBF per year from the Yakataga timber lands, and that the Forest Service would harvest 1/100 of available volume per year on selection areas in the Chugach National Forest. We assumed that all the timber CNI harvested from the Chugach region

TABLE V-8. ASSUMED NET DEVELOPMENT EFFECTS, BY ALTERNATIVE AND BY INDUSTRY, CHUGACH REGION, 1990[a]

(MEDIUM SCENARIO)

	Timber[b]		Mining	Recreational Development[c]			
	Increase in Annual Volume Harvested (MMBF)	Decrease in Volume Processed by Cant Mills (MMBF)	Additional Mining Activities	Large Tourist Lodges	Small Tourist Lodges	Marine Fuel Facilities	Roadside Facilities
CNI Option C	49.8	19.3	Coal Exploration & Development of Bering River coal field; Oil production at Katalla	Glacier Island	Jack Bay Port Etches Miles Lake Bremner River		McKinley Lake
CNI Option D	53.6	20.5	Coal Exploration & Development of Bering River coal field; Oil production at Katalla; Copper mining on Latouche Island	Glacier Island	Jack Bay Port Etches Miles Lake Bremner River	Stockdale Harbor Louis Bay	Copper River Highway
Federal Alternative	20.2	11.9	Coal Exploration & Development at Bering River coal field	Glacier Island	Jack Bay		Snow River
No-Forest Alternative	23.3	5.1	Copper Mining near Tatitlek	Deficiency Area	Deficiency Area	Deficiency Area Chenega Selections)	McKinley Lake
Status Quo Alternative	16.8	2.7			Copper River Valley		McKinley Lake Tasnuna River Valley

[a]Comparisons are with development that would have occurred in the absence of a land settlement.

[b]Includes only harvests and processing within Chugach region. Assumptions are discussed in detail in Appendix C.

[c]Selection areas listed are those on which facilities might be built which might not be duplicated in the same location or elsewhere in the absence of a settlement.

would be exported as round logs, while state and federal harvests would undergo primary processing at cant mills. These assumptions are discussed in greater detail in Appendix G.

We assumed three kinds of changes in mining development would take place as a result of various land settlement alternatives: development of the Bering River coal field, oil exploration and development at Icy Bay and Katalla, and copper mining on Latouche Island and near Tatitlek. These assumptions are similar to those we used to calculate mineral values, as described in Appendix D. However, we assumed here that various developments actually would take place, whereas in calculating mineral values, we assigned fairly low probabilities to all mineral developments.

We assumed four kinds of recreation developments would result from various settlement alternatives: a large tourist lodge, small tourist lodges, marine fuel facilities, and roadside facilities. In the past, recreational development in the Chugach region appears to have been constrained by the lack of private land. However, Chugach's village corporations now own substantial acreage in eastern and southwestern Prince William Sound. We assumed that transfers of land to CNI in these areas would be unlikely to substantially increase overall development of recreational facilities on private lands, although such developments might occur on CNI lands instead of on village lands. In contrast, there is very little private land in central and northern Prince William Sound; we assumed land transfers in these areas would result in increased recreational development.

Under all alternatives except the status quo alternative, we assumed a large tourist lodge would be built on Glacier Island near Columbia Glacier. This lodge would be similar to the Glacier Bay Lodge in Glacier Bay National Park, and would include a large central facility, remote cabins, harbor facilities, and a fleet of excursion and supply vessels. Under all the alternatives, we envision construction of additional small tourist and hunting lodges, either in Prince William Sound or along the Copper River Highway. Due to the remoteness of the selection areas east of the Copper River, we assumed no additional recreation facilities would be developed there by 1990.

Employment Effects

This section examines the potential effects of the five land settlement alternatives on employment in the Chugach region. We developed low, medium, and high estimates of employment in timber, mining, and recreation industries.

We want to emphasize several factors about these employment effects. First, a large share of the additional jobs generated by a land settlement would be seasonal. Logging and tourism-related activities occur primarily during the summer. The benefits of seasonal employment are not as great as those of year-round employment.

Second, some of the additional jobs created in the Chugach region by a land settlement might not go to local residents. For example, few of the loggers currently harvesting timber on state lands at Cape

Yakataga are Alaskans: most live in Washington and Oregon. The majority of employees at Glacier Bay Lodge are college students from outside Alaska who are willing to work at the minimum wage.* Some new employees may settle in the region; others may commute from outside the region or the state. In some cases, CNI might increase the share of local employment by following a policy of hiring residents of the region or shareholders of CNI enterprises, but for many specialized jobs, this would not be possible.

Third, the employment effects of a land settlement would differ over time. We assumed that timber would be harvested faster under CNI ownership than under Forest Service management, and initially, this faster rate of harvest would increase logging employment. However, a faster rate of harvest could not be sustained indefinitely, and eventually harvests and logging employment would decline to levels lower than those which would have occurred under Forest Service management. In mining, employment requirements differ for exploration, construction, and operation phases. Recreational developments provide significant but temporary employment in construction. We estimated employment effects as of 1990 in order to exclude temporary exploration and construction employment. Many of these jobs would not be filled by local residents.

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*Personal communications, Southcentral Timber Company and Jim Goodin, Glacier Bay Lodge, September 22, 1981.

Timber employment effects are presented in table V-9. In calculating employment effects, we assumed logging employment of 2.7 per million board feet of timber harvested and cant mill employment of 2.1 per million board feet processed.* Changes in total timber employment would result from two factors. First, we assumed a higher level of timber harvest under CNI than under public ownership, resulting in an increase in logging employment. However, cant mill employment would decline under CNI ownership, since harvests from private land would not be subject to the primary processing requirement; we assumed cant mill processing would decline by the volume which would have been harvested under public ownership.

Our "medium" scenario assumes that total timber employment would increase under all five alternatives, because more logging jobs would be created than cant mill jobs would be lost. The net increase in total employment--the increase in logging jobs minus the decline in cant mill jobs--would be greatest for CNI option D, under which total employment would increase by 102. The increase under CNI option C would be almost as high (94), followed by increases under the no-forest alternative (52), the status quo alternative (40), and the federal alternative (30). However, under all of the alternatives, the number of full-time (cant mill) jobs would decline; this decline would be smallest under the status quo alternative. Thus, whether employment

*These figures are based on figures given in Ronald Glass, An Assessment of the Demand-Supply Situation for Southeast Alaska Timber (Juneau, USDA Forest Service, June 1978, p. 44.)

TABLE V-9. ASSUMED NET TIMBER EMPLOYMENT EFFECTS, BY ALTERNATIVE, CHUGACH REGION, 1990

		Change in Volume Harvested Or Processed (MMBF)[a]			Change in Employment[b]		
		Low	Medium	High	Low	Medium	High
CNI Option C	Timber Harvesting (seasonal)	-1.6	49.8	119.2	-4.3	134.5	321.8
	Cant Mill Processing (year-round)	-36.1	-19.3	-4.0	-75.8	-40.5	-8.4
	Total	-	-	-	-80.1	94.0	313.4
CNI Option D	Timber Harvesting (seasonal)	-1.3	53.6	129.0	-3.5	144.7	348.3
	Cant Mill Processing (year-round)	-38.4	-20.5	-4.4	-80.6	-43.1	-9.2
	Total	-	-	-	-84.1	101.7	339.1
Federal Alternative	Timber Harvesting (seasonal)	-7.2	20.2	58.4	-19.4	54.5	157.7
	Cant Mill Processing (year-round)	-23.2	-11.9	-0.9	-48.7	-25.0	-1.9
	Total	-	-	-	-68.1	29.5	155.8
No-Forest Alternative	Timber Harvesting (seasonal)	5.2	23.3	44.7	14.0	62.9	120.7
	Cant Mill Processing (year-round)	-9.0	-5.1	-2.1	-18.9	-10.7	-4.4
	Total	-	-	-	-4.9	52.2	116.3
Status Quo Alternative	Timber Harvesting (seasonal)	4.7	16.8	28.0	12.7	45.4	75.6
	Cant Mill Processing (year-round)	-5.0	-2.7	-1.0	-10.5	-5.7	-2.1
	Total	-	-	-	2.2	39.7	73.5

- = Not applicable.

[a]Low scenario for change in volume harvested assumes high scenario for harvests under public ownership and low scenario for harvests under CNI ownership. High scenario for change in volume harvested assumes low scenario for harvests under public ownership and high scenario for harvests under CNI ownership. Figures are derived from Table G-1, Appendix G.

[b]Assumes 2.7 employees per MMBF harvested, and 2.1 employees per MMBF processed by cant mills.

for residents of the Chugach region increased would depend on whether they obtained more new logging jobs than they lost existing cant mill jobs.

Our "medium" estimates of effects of the various alternatives on recreation employment are presented in table V-10. We derived the figures by multiplying the net increase in facilities by assumed employment coefficients, detailed in a note in table V-10. All five alternatives would create roughly the same number of year-round jobs, ranging between 15 and 21. However, the effects of the various alternatives on seasonal jobs would vary significantly.

CNI option D would result in the greatest increase in total recreation employment (103), due to the construction of small tourist lodges and marine fuel facilities. Employment increases under CNI option C, the federal alternative, and the no-forest alternative would be roughly similar (77, 73, and 79) followed by increases under the status quo alternative (38).

Our assumptions of mining employment effects are presented in table V-11. We assumed operating employment for a Bering River coal field mine would be 150, approximately half again as high as that at the existing Usibelli coal mine at Healy. Operating employment for oil fields at Katalla and Icy Bay was assumed to be 50, about 40 percent higher than that at the existing Swanson River field on the Kenai Peninsula. As a speculative estimate, we assumed operating

TABLE V-10. ASSUMED NET RECREATION EMPLOYMENT AND FACILITY EFFECTS, BY ALTERNATIVE, CHUGACH REGION, 1990

(MEDIUM SCENARIO)

	Net Increase in Facilities					Net Increase in Employment[a]				
	Large Tourist Lodges	Small Tourist Lodges	Marine Fuel Facilities	Roadside Facilities	L	Large Tourist Lodges	Small Tourist Lodges	Marine Fuel Facilities	Roadside Facilities	Total
CNI Option C	1	4	0	1	Seasonal	45	24	0	7	76
					Year-round	5	8	0	8	21
					Total	50	32	0	15	97
CNI Option D	1	4	2	1	Seasonal	45	24	4	7	80
					Year-round	5	8	2	8	23
					Total	50	32	6	15	103
Federal Alternative	1	1	0	1	Seasonal	45	6	0	7	58
					Year-round	5	2	0	8	15
					Total	50	8	0	15	73
No-Forest Alternative	1	1	2	1	Seasonal	45	6	4	7	62
					Year-round	5	2	2	8	17
					Total	50	8	6	15	79
Status Quo Alternative	0	1	0	2	Seasonal	0	6	0	14	20
					Year-round	0	2	0	16	18
					Total	0	8	0	30	38

[a]Assumes total employment of 50 for large tourist lodges, 8 for small tourist lodges, 3 for marine fuel facilities, and 15 for roadside facilities. Of this, year-round employment is 5 for large tourist lodges, 2 for small tourist lodges, 1 for marine fuel facilities, and 8 for roadside facilities.

TABLE V-11. ASSUMED NET MINING EMPLOYMENT EFFECTS, BY ALTERNATIVE
CHUGACH REGION, 1990

	Copper			Coal			Oil			Total		
	Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
CNI Option C	0	0	0	0	150	300	0	50	150	0	150	450
CNI Option D	0	25	100	0	150	300	0	50	150	0	175	550
Federal Alternative	0	0	0	0	150	300	0	0	50	0	150	350
No-Forest Alternative	0	25	100	0	0	0	0	0	0	0	25	100
Status Quo Alternative	0	0	0	0	0	0	0	0	50	0	0	50

employment at a small copper mine would be 25. Exploration for mineral resources and construction of mining, transportation, shipping, and other support facilities would precede the operation of the mines. During the construction phase, employment provided by mining development could be much higher than during the actual operation of these facilities.

Our assumed timber, mining, recreation, and total employment effects under the five alternatives are summarized in table V-12. The increase in both seasonal and year-round employment would be greatest under CNI option D, which would create 155 year-round and 225 seasonal jobs, for a total of 380 additional jobs. CNI option C would create slightly fewer jobs in each category (130 year-round and 211 seasonal) for a total of 341 additional jobs. The federal alternative would provide more year-round jobs than would option C (140) but considerably fewer seasonal jobs (113), for a total of 253 additional jobs. The no-forest alternative and the status-quo alternatives would provide very few full-time jobs (6 and 12 jobs, respectively). Additional seasonal employment under the two benchmark alternatives would also be lower (125 and 65 jobs, respectively), resulting in considerably fewer new jobs than would be created under the three proposed alternatives.

The employment effects summarized in table V-12 are necessarily speculative, based on numerous assumptions about developments under each alternative, and the employment these developments would offer. Reasonable changes in these assumptions could considerably alter the

TABLE V-12. ASSUMED NET DIRECT EMPLOYMENT EFFECTS, BY INDUSTRY AND BY ALTERNATIVE, CHUGACH REGION, 1990

		Change in Timber Employment			Change in Mining Employment			Change in Recreation Employment			Change in Total Employment		
		Low	Medium	High	Low	Medium	High	Low	Medium	High	Low	Medium	High
CNI Option C	Seasonal	-4	135	322	0	0	0	38	76	152	34	211	474
	Year-round	-76	-41	-8	0	150	450	11	21	42	-65	130	484
	Total	-80	94	313	0	150	450	49	97	194	-31	341	957
CNI Option D	Seasonal	-4	145	348	0	0	0	40	80	160	36	225	508
	Year-round	-81	-43	-9	0	175	550	12	23	46	-69	155	587
	Total	-84	102	339	0	175	550	52	103	206	-32	380	1095
Federal Alternative	Seasonal	-19	55	158	0	0	0	29	58	116	10	113	274
	Year-round	-49	-25	-2	0	150	350	8	15	30	-41	140	378
	Total	-68	30	156	0	150	350	37	73	146	-31	253	652
No-Forest Alternative	Seasonal	14	63	121	0	0	0	31	62	124	45	125	245
	Year-round	-19	-11	-4	0	25	100	9	17	34	-10	6	130
	Total	-5	57	116	0	25	100	40	79	158	35	131	374
Status Quo Alternative	Seasonal	13	45	76	0	0	0	10	20	40	23	65	116
	Year-round	-11	-6	-2	0	0	50	9	18	36	-2	12	84
	Total	2	40	74	0	0	50	19	38	76	21	78	200

Note: Totals may not add exactly due to rounding.

total projected employment effects. However, these figures do provide a basis for comparing the alternatives, indicating that the CNI alternatives would create the most new jobs and the federal alternative somewhat fewer, while the benchmark alternatives would create relatively few jobs.

We did not look at the indirect employment effects of these developments, which could also create jobs by boosting population and thus increasing demand for services in the region. However, since much of the income generated in the region is spent outside the region, this "multiplier" effect would probably be very small. Similarly, we did not attempt to estimate the large but temporary employment during construction of mining and recreation projects; we looked rather at numbers of permanent jobs that would likely be created. In the long run, the number of jobs under the CNI alternatives might fall somewhat as timber harvests declined. However, it is possible that this effect could be offset by more intensive forest management.

Public Revenues

The land settlement alternatives would have a variety of effects on future public revenues. Any revenues from timber sales and mineral leases on former state or federal lands would go to CNI rather than public treasuries. However, income and property tax payments would rise. Effects on public revenues would differ at local, state, and federal levels.

The most significant effects on revenue would occur at the federal level. The federal government would lose revenue it would otherwise have received from timber sales and mineral leases on lands transferred to CNI. However, a number of factors would combine to mitigate this cost to the federal government. First, 25 percent of federal revenues from resource sales on national forest lands is paid to the state government, so that part of the revenue loss would be shared by the state. Second, corporate income from timber and mineral developments on private lands would be subject to income taxes; however, due to the capital gains treatment of income from stumpage sales, taxes on timber income might be fairly low. The Bering River coal field appears likely to be developed more rapidly under private than under public ownership, so that revenues (in the form of tax payments) would be realized earlier if the land were transferred to private ownership. Third, personal income tax collections would rise as employment and personal income grew with increased development.

As noted above, the state would lose some resource revenues that the federal government would have shared with the state. Also, if state timber lands at Yakataga were transferred to CNI, the state would lose revenues from any timber sales on those lands. However, the state would gain revenues from lands received from the federal government in exchange for the Yakataga timber lands. In addition, state corporate income taxes would rise. Most of the lands in the five alternatives are outside organized boroughs, so these lands would not be subject to local property taxes. However, increased development would probably raise land values and thus increase the tax base in the city of Cordova.

On balance, the transfer of timber lands to private ownership would probably reduce revenues the government would otherwise have received, while the transfer of mineral lands and lands likely to be developed for recreation would probably boost public revenues. We did not attempt to calculate the net effects of the different alternatives on public revenues. However, it appears likely that CNI option C would result in the greatest loss of future public revenues, because that option calls for the transfer of Southeast Alaska timber lands to CNI. Under CNI options C and D, and to a lesser extent under the federal alternative, this loss in future public timber revenue would be somewhat offset by increased corporate and personal taxes. For the two benchmark alternatives, effects on public revenues would be smaller, as the values of timber resources, as well as the projected levels of development, are lower.

Public Expenditures

At the federal level, the loss in revenues resulting from a transfer of public land to CNI would be partly offset by a decline in management expenses. At the local level, however, more rapid economic development might result in increased public costs for roads, utilities, and education. This increase in expenditures would be roughly proportional to any increase in population.

Several factors would combine to reduce the effects of a land settlement on public expenditures. First, many of the additional jobs created by a settlement would go to residents of the region, and thus

local populations would not increase. Second, other jobs--in particular part-time logging and recreation jobs--might go to people not permanently residing in the region, and these seasonal workers would create few demands on public services. Third, some permanent jobs would be located in remote areas requiring few public services.

The greatest local effects on population and public expenditures would occur in Cordova as a result of development of the Bering River coal field and harvest of timber lands to the east of Cordova. This effect would be roughly similar under CNI options C and D, and somewhat less under the federal alternative, which does not include these timber lands. The two benchmark alternatives would have relatively little effect on government costs.

Recreation Effects

The primary benefit currently provided by much of the public land in the Chugach region is recreation. Recreation would be affected in several ways by the transfer of land from public to private ownership, with different effects on different members of the public. CNI might allow some lands to be used for camping, fishing, and hunting, but users might have to purchase or otherwise pay for the right to use these lands. This would represent a transfer of income from the users of these lands to the new private owners. However, those who wish to purchase private lands might find their opportunities to do so enhanced, with more lands in private ownership.

Another effect on recreation could be loss of access to formerly public lands. Areas effectively closed to public access might be much larger than the area of private land, if CNI controlled road or water access to remaining public lands. As the area of accessible public land declined, recreation would be diverted onto other public lands. The importance of this effect would depend on the extent to which other lands were available and accessible for recreation. If only small areas were closed to public access and numerous uncrowded areas remained, then the effect on public recreation might be minimal. However, the greater the restriction of access relative to the total area, the greater would be the value to users of the recreation opportunities lost. If only small areas of public lands were available for certain kinds of recreation, the value of these lands for public recreation might be very high. In the future, with increasing population, the demand for recreation land will increase. The impacts of a land settlement on public recreation would likely be magnified in the future.

The relative decline in land available for public recreation would be greatest under CNI option D, which includes substantial acreage in popular recreation areas in both Prince William Sound and around Cordova. The McKinley Lake and Copper River Highway selections, linked by road to Cordova, provide recreation and control access to other recreational lands around Cordova, where village corporation selections have already considerably reduced the area of public recreation land. The 14(h)(8) overselections included in option D cover 45,000 acres in Prince William Sound and include some

of the most heavily-used coastal recreation sites in the sound. The no-forest alternative deficiency area selections would greatly reduce public recreation opportunities in the northern area of Prince William Sound.

Other effects on recreation would result from changes in the pattern of development that would be brought about by a land settlement. As discussed above, all of the land settlement alternatives would result in increased private recreational development, with the greatest increase brought about by option D. Increased development might lead to improved transportation services in Prince William Sound, such as expanded public and private ferry services and marine refueling stations. With the construction of tourist lodges and with greater accessibility, public lands could provide recreation for greater numbers of people. However, increased recreation use might lower the quality of recreation for some present users.

Wilderness Effects

Public lands which for practical purposes are now managed as wilderness would be less likely to be kept that way under private ownership. Potential effects of development on wilderness are discussed in other chapters of this report. Simply retaining lands as wilderness is important to some members of the public who do not "use" the land and who may never see it. Individuals' perceptions of the "value" of wilderness vary greatly. However, as with public recreation lands, it appears reasonable to argue that the "value" of particular kinds of wilderness increases as such undisturbed lands

become more scarce. Thus, the effects on the public of transfer of wilderness lands to private ownership would be greatest for those types of wilderness which are most scarce.

VI. SOCIAL ANALYSIS

In this chapter, we analyze likely social effects of Chugach Natives, Inc.'s assuming ownership of lands included in the corporation's options C and D and in the federal alternative, developed by the Departments of Agriculture and Interior. We also compare social effects of transfer of lands in these three proposed alternatives with potential effects of transfer to CNI of lands in our two benchmark alternatives, the status quo and no-forest alternatives.

Under "social effects" we include primarily effects on recreation and subsistence in the Chugach region. These are currently the two most important uses of public lands in the region, and effects on these uses are easier to project than are other kinds of social effects that could result from transfer of public lands to CNI. To the extent that we can, we also discuss broad effects on the region's social systems that could result from transfer of public lands to CNI--but we mainly look at effects on recreation and subsistence in the region.

The communities in the Prince William Sound (PWS) area are small and coastal, with community lifestyles dominated by strong ties to the land and sea. Commercial fishing is a basis for local economies, and both Natives and non-Natives hunt and fish for personal use.

The area around PWS was included in the Chugach National Forest (CNF) in 1907. Although there are numerous inholdings in the region, the area was almost entirely under federal ownership until recent years. The State of Alaska now has selected some acreage in the national forest, as have the village corporations representing Tatitlek, Eyak, and Chenega. Public lands in the region are currently used by local residents and other Alaskans for subsistence gathering and dispersed recreation, including boating, hunting, fishing, and hiking, as well as for viewing scenery, wildlife, and birds. Some timber has been harvested here, and mining has occurred in the past and continues on a small scale. Past and current management of CNF have not, however, emphasized timber production, and the Forest Service has assigned a relatively high priority to management for dispersed recreation. Because CNF is relatively close to Anchorage and accessible to much of the Alaska population, recreation is likely to continue as a major management focus of the forest. However, the demand for timber and mineral resources will likely continue to increase, which will cause some forms of recreation to be displaced (Meiners and Horton, 1977:105).

Below, to place in perspective our discussion of potential social effects of various land settlement alternatives, we first discuss current recreation and subsistence use in the Chugach region. Then we discuss likely social effects of the three proposed and two benchmark alternatives, and compare potential effects of the various alternatives.

Current Recreation Use

Our best source of information on current recreation use in the Chugach region is the 1979 Alaska Public Survey, conducted by a number of federal and state agencies. In this survey, researchers asked roughly 1,300 residents of Southcentral Alaska about the kinds of recreation they took part in, types of game and fish they gathered, how they traveled to recreation sites, what barriers prevented them from taking part in some forms of recreation, and how they felt about the Forest Service's management of the Chugach National Forest. (For details of the study, see Clark and Johnson, 1981, and Yoesting and Clark, 1981.)

Respondents were asked to locate on maps places around the Alaska coast where they had most often gone for overnight trips during the previous year. More than 17 percent of those interviewed indicated that they frequently made overnight trips to coastal locations within the Chugach National Forest, and of that 17 percent, three-quarters were Anchorage residents. Relatively easy access to coastal areas of Prince William Sound have made that part of the Chugach National Forest an important recreation area for residents of Alaska's largest city. Below, we present some of the responses of those who reported that they frequently used coastal recreation sites in the national forest.

Table VI-1 shows kinds of activities popular among those who used coastal areas of the Chugach National Forest. Beachcombing and hiking, saltwater fishing, and motorboating were activities cited by the largest percentages of respondents. Respondents who used the forest averaged between five and six overnight trips to recreational sites during the previous year and spent an average 5.7 hours traveling to their favorite sites.

TABLE VI-1. COASTAL RECREATION ACTIVITIES, CHUGACH NATIONAL FOREST, 1978*

(Percentages of Respondents Participating)

Beachcombing, hiking	59%
Motorboating	35
Saltwater fishing	52
Clamming, crabbing	21
Camping along shore	35
Staying in cabin	15
Hunting along shore	20
Swimming, scuba	9
Kayaking, canoeing	7
Sailboating	6
Other	22

*The numbers show, of the 17 percent of total survey respondents who said they frequented coastal areas of the national forest, what percentages took part in various activities.

SOURCE: Alaska Public Survey, 1979.

Respondents also were asked to name the factors that were important in their selection of favorite coastal recreation sites (see table VI-2). Scenery, natural environments in which to view wildlife

and birds, and good saltwater fishing were among the factors most often named by those who had favorite sites in the Chugach National Forest.

TABLE VI-2. QUALITIES OF FAVORITE RECREATIONAL SITES, CHUGACH NATIONAL FOREST

(Percentage of Respondents Who Cited)

Scenery	90%
Good place to get away from others	84
Good opportunity to view wildlife and birds	84
Undisturbed natural area	82
Good saltwater fishing	82
Good beachcombing, hiking	76
Good boat access, moorage	68
Good clamming, crabbing	62
Road access	55
Good plane access	54
Available campground	54

SOURCE: Alaska Public Survey, 1979.

Respondents were also asked how certain kinds of changes would affect their enjoyment of their favorite sites in the national forest (table VI-3). Large percentages of respondents said clearcutting and new construction, whether roads or buildings, and presence of more recreationists, would make their favorite sites less attractive; more than a third said the presence of more recreationists would cause them to stop visiting their favorite sites.

TABLE VI-3. FACTORS AFFECTING ATTRACTIVENESS OF FAVORITE RECREATION SITES, CHUGACH NATIONAL FOREST*

(In Percentages of Respondents)

Factor	Less Attractive	No Difference	More Attractive	Would Stop Going
Clearcuts	75%	17%	9%	11%
New buildings	69	16	16	18
New roads	58	17	25	11
More recreationists	55	19	25	36
Log storage	52	40	8	11
New logging	48	35	17	26
Mine tailings	44	40	16	11
Aircraft	42	43	16	18
Offshore oil Drilling	39	46	16	18
Ship traffic	20	47	33	11
Commercial fishing	16	61	24	9

*Respondents who selected favorite sites in the Chugach National Forest were asked to indicate the effects of various changes in their recreation sites, and whether they would stop visiting their favorite sites if the changes were to occur.

SOURCE: Alaska Public Survey, 1979.

The findings of the Alaska Public Survey are important measures of current recreational use in the Chugach region, and provide us with a baseline for determining how transfer of lands to CNI would affect recreational users.

Subsistence Lifestyle and Job Dependence

Many residents of Cordova, Tatitlek and other Prince William Sound communities fish commercially, and many others who live in those

communities and in other areas of southcentral Alaska hunt and fish for personal use in the sound. Non-Native area residents and other users who testified at a recent public hearing held by the Chugach Regional Study Group consider potential changes in land ownership as threats to their way of life.

Several recent studies provide information on subsistence among the residents of the Chugach region: a 1977 National Park Service study, a 1978 University of Alaska study and a 1980 community survey by North Pacific Rim.

The National Park Service study estimated that approximately 2,500 Cordova area residents either actively participated in subsistence activities or depended on others to share local fish and game (Nelson, 1977:6).

The University of Alaska study indicated that in Cordova no clear relationship existed between income level and the use of wild food resources. Some middle- and upper-income residents of Cordova were the most consistent users of wild resources (McNeary, 1978). The study found that at least a minimum level of capital was necessary to finance subsistence activities. Another point the study stressed was that "since whites outnumber Natives by such a large margin in this area, it is clear that the great majority of wild foods harvested are taken by non-Natives"(McNeary, 1978:41).

The study found that the area most heavily used by Cordova residents was eastern Prince William Sound (PWS). "It is probably a reasonable guess to say that 90 percent of the subsistence use of PWS by Cordova residents takes place in the area of Orca Inlet, Hawkins and Hinchinbrook Islands, and the eastern sound as far as Point Gravina" (McNeary, 1978:31). Other areas were infrequently used; Cordova residents use either planes or boats for nearly all food gathering ventures.

In the spring of 1980, the North Pacific Rim conducted subsistence surveys in Tatitlek, Valdez, and Eyak. In Tatitlek, researchers gathered information from sixteen of the seventeen existing households on 1979 food gathering activities (Stratton, 1981). In that village, 43.8 percent of households had annual incomes of less than $10,000, and more than 60 percent had incomes less than $15,000. Most residents worked seasonally, with 62.5 percent of the households dependent on fishing-related occupations. The major subsistence resources harvested at Tatitlek included salmon and harbor seals (75 percent of households); goldeneye ducks, Canada geese, and deer (50 percent of households); berries and plants (75 percent of households); and octopus, cockles, chiton, and seaweed with herring roe (25 percent of households). Respondents were asked about their use of a total of 113 different resources. One quarter of Tatitlek households said they used half of these 113 different resources, with the average household using 33 different resources in 1980.

Forty percent of resources used in Tatitlek were fish and related resources. The dominant fish resources included king, silver, red, chum, and pink salmon; halibut; fish eggs; king and tanner crab; harbor seals; and sea lions.

Nearly 70 percent of Tatitlek households said half or more of their food was subsistence caught or gathered. They also indicated that subsistence resources were more important to them today than ten years ago, because buying meat is so much more expensive now. Also, some respondents said they had moved to Tatitlek from other towns and villages where subsistence use was lower.

The North Pacific Rim also collected subsistence information in Eyak in 1980, including a sample of Native and non-Native households (Stratton, 1981). Although the sample was small for both groups, the trends can be considered important. The sample indicated that a third of Native households had annual incomes of less than $15,000, nearly two-thirds of Native households had members who worked only seasonally, and more than 70 percent of Native households relied on fishing-related employment.

The major resources harvested around Eyak included fish and shellfish, razor and butter clams, mallards, snowshoe hares and deer, and berries. Half the households sampled harvested these resources in 1980, and because there was very heavy sharing of resources among households, considerably more households used the resources than actually harvested them.

Fish and shellfish accounted for a significant part of the subsistence resource use among Cordova-Eyak households in 1980. More than three quarters of the surveyed households used king, silver, and chum salmon, smelt, and king and dungeness crab. Harbor seal was the only marine mammal used by a significant number of people (53 percent of Natives). Moose and deer were the most commonly harvested wildlife among both Native and non-Native households, with more than 50 percent of households reporting use of moose and deer.

More than 56 percent of Eyak Natives interviewed said that half or more of their total food came from wild foods. Unlike in Tatitlek, most households here indicated subsistence activity had become less important over the past ten years, but a third said they had increased subsistence use in recent years. Nearly all households reported that all types of subsistence resources were less available now than in earlier years, with greater hunting pressures, a larger local population, and reduced harvest limits. Overall in the Eyak study there did not appear to be any significant differences in subsistence use among Natives and non-Natives.

In Valdez, North Pacific Rim surveyed 60 percent (21 of 35) of the known Native households (Stratton, 1981). Income levels here were relatively high, and more than two-thirds had some household member employed full time, with only 19 percent of households having seasonally employed workers.

The survey found very limited subsistence activity among Valdez Natives in 1980. Of 113 resources surveyed, only five were harvested by at least 25 percent of Native households. These harvested resources included silver, red, chum, and pink salmon, and dolly varden. Only one in seven Native households said that half or more of household food came from subsistence resources.

We have seen in the discussion above that harvesting of subsistence resources varies considerably among Prince William Sound communities, but that subsistence use is high among many Natives and non-Natives. Residents are concerned that increased pressures and more regulations will reduce, if not halt, current subsistence activities. Given that salmon is a dominant subsistence resource in the PWS area, management practices should particularly be aimed at minimizing impacts on salmon.

Perceptions of Forest Management

In recent years the Forest Service has sought public comments on its management of CNF. Issues have been identified in a Forest Service document (1980a), a public survey (Clark and Johnson, 1981), and in public hearings held by the Chugach Lands Study Group.

The public survey asked respondents their opinions of Forest Service management (Clark and Johnson, 1981). Overall, 67 percent of the respondents felt that the Forest Service management program was good, 27 percent said fair, and 6 percent said poor. Table VI-4 shows the public's assessment of management of specific resources in CNF.

TABLE VI-4. QUALITY OF MANAGEMENT, CHUGACH NATIONAL FOREST, BY RESOURCE

(In Percentages of Respondents*)

Resource	Ratings: Good	Fair	Poor	Number Participating
Backcountry cabins	78%	17%	5%	547
Camping/picnic sites	81	18	2	754
Trails	76	21	3	604
Backcountry use	73	23	4	423
Game/fish	70	21	9	432
Logging roads	58	34	8	256

*Percentages were calculated on the basis of the number of persons visiting the Chugach National Forest who use the resource in question and who indicated such use was either very important or important to them.

SOURCE: Alaska Public Survey, 1979.

The draft Forest Service manual stresses that all recreation activities in the national forest must meet the criteria of "a demonstrated public need, as distinguished from demand. The public may 'demand' all kinds of activities, but only those which are suited for the National Forest and the role of the Forest Service and Forest area should be considered" (USDA, Forest Service, 1980b:26). Public "demand," then, is not sufficient to shape Forest Service management. Certain social functions can best be performed by public agencies and other functions can better be performed by private entities. Once

decisions are made regarding ownership patterns in the Chugach region, users and others can modify their behaviors to conform to the newly established policies. Until then, uncertainty exists, and all groups are threatened.

Analysis of Option D

Most of the selections that make up CNI's options D and C and the federal alternative are included in option D. Therefore, we discuss social effects of transfer of most of the selections under this option D analysis, and under the analyses of option C and the federal alternative we discuss only those selections that differ from those included in option D. In the discussion below, we consolidate selections falling in the same general areas; descriptions of the individual selections are included in chapter four.

Cordova and East Selections

Icy Bay and Yakataga Selections: Potential for timber, oil and gas, and commercial recreation development exists in this area. CNI selected the Icy Bay tract for its oil and gas potential, and this selection is now being conveyed to CNI. Timber harvest and oil and gas development would attract increasing numbers of people. Worker enclaves would probably be established near the development sites, with families residing in the Anchorage, Valdez, or Cordova areas.

The state currently owns the selected timber lands at Yakataga, and will harvest the timber there if the area remains under state ownership. Thus, CNI would create little different social influence in the area, except that any revenues would go to private organizations rather than to public treasuries. Because this area is far from existing communities, development here would displace few recreationists or subsistence users, but could add new recreation pressures.

East of Copper River (Bering River coal field, Carbon Mountain, Martin River timber lands, Kushtaka Lake timber lands, Bremner River mouth, Katalla, Controller Bay): All of these selections except the Carbon Mountain and Bremner River mouth areas are within the Chugach National Forest; Carbon Mountain is east of the forest, and the Bremner River mouth is in the Wrangell-St. Elias National Park and Preserve. Some hunting and fishing occurs in this area, particularly in the coastal selections like Katalla and Controller Bay, but much of the broad region is currently difficult to reach. Coal and timber are found in this region, which also has oil and gas potential. Potential for commercial recreation and real estate development also exists. Some consolidation of landownership would occur if CNI were to obtain all these selections. Depending on the intensity of any developments, new families could be attracted to the Chugach region's more urban areas. Cordova could be more heavily affected than would Anchorage, given Cordova's much smaller population and limited expansion room. Lifestyles of Cordova residents would be altered and social system conflicts increased as larger populations moved into the city.

If CNI established mines in the Bering River coal field, the corporation would probably consider harvesting timber around the Martin River, and building roads to link Cordova and the coal fields. These developments could put considerable stress on Cordova. The population could grow significantly and Cordova could become a major port for shipment of timber and coal. Also, if such a road system were constructed, it could open this previously inaccessible area to increased recreation and other uses.

Copper River

These selections along the proposed Copper River Highway, to link Cordova and Valdez, will have high recreational and real estate potential, if the road is in fact built. The Bremner and Tasnuna River areas offer good fishing and hunting and should provide good staging areas for considerable recreation; several guides currently run the Bremner, Tasnuna and Copper rivers. If the highway is not built, these areas would remain relatively isolated and the recreational pressures would be minimal.

Construction of the Copper River Highway would open the area for commercial development that could benefit both Chugach Natives, Inc., (CNI) and the general public. The major social effects of transfer of this highway frontage to CNI would be that public recreation areas along the proposed Copper River Highway would be limited; Chugach's village corporations own much of the remaining acreage along the projected route.

Small Federal Holdings

If the federal holdings in option D were transferred to CNI, we would not anticipate any significant social changes. Many of the selections are in or near communities, and in some cases private owners could possibly make better use of the areas than does the federal government.

State-Selected Lands

Acreage at five sites the State of Alaska had previously selected for establishment of marine parks is included in option D. CNI wants these lands largely for their potential for commercial recreational development. The state may be willing to give up some acreage at these sites, in exchange for certain federal lands, but the state would in any case retain enough acreage for the public marine parks. CNI's establishment of additional recreational facilities at these sites could benefit both CNI and the general public. Whether or not CNI receives these lands, the state will establish the marine parks, and the parks in themselves--with or without private recreational facilities--would probably increase recreational use in the sound. Thus, CNI's development of private recreational facilities at these sites should not substantially increase effects that would in any case attend establishment of marine parks.

14(h)(8) Selections and Overselections

All of these selections (see chapter four for complete listings) except the McKinley Lake selection are along the shores of Prince

William Sound or on islands in the sound. The McKinley Lake tract is just east of Cordova. All of the roughly 15 selections included here are within the Chugach National Forest.

Since the selection areas in Prince William Sound are numerous, scattered, and currently have relatively high dispersed recreation and subsistence use, the cumulative effects of a transfer of these lands to CNI would be substantial. Transfer of a few sites would not have nearly the effect on recreational and subsistence use patterns in the sound as would private ownership of all the selected sites. Many recreationists would be displaced, forced to substitute other locations or other recreation activities. Recreation and subsistence pressure would be considerably increased in remaining public areas of Prince William Sound. The recreation experiences of most users in nearly all locations would be affected by this increased pressure on a limited number of public recreation sites, but those who prefer uncrowded, dispersed recreation sites would be most affected by this reduction. There would also be less land open to public hunting and fishing.

Two of the most heavily used recreation areas included in this group of selections are Patton Bay on Montague Island and McKinley Lake near Cordova. The McKinley Lake selection is connected by road to Cordova, and Cordova residents hunt, fish and take part in other

recreational activities in this scenic area. Because this selection is close to Cordova and accessible by road, a significant number of users would be affected should this selection be transferred to CNI. Patton Bay on Montague Island is popular with hunters and other recreationists; the Forest Service recorded 2,600 "visitor days" of use at its five Patton Bay cabins in 1980.

Development, be it commercial recreation, timber harvest, or mining, would have a major effect on the beauty of Prince William Sound. Clearcutting, mine tailings, and increased numbers of people and construction at commercial recreation developments would all detract, to differing degrees, from scenery in this largely undeveloped area. Wildlife habitat and viewing of wildlife would also be affected.

At the same time that many users would be negatively affected, others would benefit. Private citizens might eventually have access to CNI lands through purchase or lease. CNI would probably build cabins and lodges in some areas, attracting a certain clientele to these more developed recreation areas. These more urban developments attract different kinds of, and probably more, people than who now use the areas for dispersed recreation. Tourists could be particularly attracted to these lodges, benefiting not only the lodge owners, but also charter service operators and guides, and boosting the state tourist income.

Summary of Option D Effects

The overall effects of this option on recreation and subsistence, then, would be extensive. Major development of the Prince William Sound area would occur. A large proportion of coastal lands throughout the sound would be in private ownership, thus reducing lands available for dispersed recreation. Potential developments east of the Copper River could attract large numbers of people looking for jobs. Commercial recreation development would attract more people, thus putting extra pressures on the resources.

The lifestyles of the residents of Cordova would be changed as more people moved to or visited the community. Anchorage and Valdez residents would be less affected than would Cordova residents, but increased populations would bring on broad changes in the Chugach region. Less fish and game would be available to local residents, and other Alaskans who hunt and fish in the sound, as growing populations increased pressure on the resources. Conflicts between new and established residents would likely develop. New residents--miners, loggers, and recreation developers--would probably have different values and attitudes than those of commercial fishermen and others now living in Cordova.

Balanced against potentially adverse affects on subsistence and dispersed recreation of CNI ownership of lands in option D are potential benefits: increased numbers of jobs private development could

create for local residents, and establishment of private recreational facilities that could serve larger numbers of people than are currently using the area. Although Chugach Natives would gain most, economically, from option D, they could also face considerable social effects from that option. Their lifestyle would be altered rapidly, and that rapid pace could have strong negative social consequences.

Analysis of Option C

Option C includes most of the same selection areas as option D, with some notable differences. Option C includes valuable Southeast Alaska timber lands and excludes about 44,000 acres of selections in Prince William Sound. Because options C and D both include selections east of Cordova, the same social effects discussed for that area in the analysis of option D would also occur under option C.

Southeast Alaska timber lands selected by CNI will likely be logged by the Forest Service in any case. Thus, pressures could come not so much from those opposed to logging as from local residents who would not want outside groups coming into their area. CNI and Sealaska, the Native regional corporation representing Southeast Alaska, have already had border disputes.

The most important difference between the two options is that option C includes far fewer selections in Prince William Sound. The less acreage transferred to CNI ownership in the sound, the fewer

recreational users who will be displaced to other locations or activities. Because more areas in the sound would remain in public ownership under option C, social effects would be considerably less than for option D.

Summary of Option C Effects

The overall effects of option C, then, would be similar to those of option D, except in Prince William Sound. Under option C, much less acreage in the sound would be transferred to CNI, and with more areas remaining in public ownership, fewer recreational and subsistence users would be displaced. Those who were displaced should be able to find substitute locations.

Analysis of Federal Alternative

The only two selections unique to the federal alternative are the Nelson Townsite and Snow River, discussed below. All other selections in the federal alternative are also included in CNI's options C and D and have already been discussed. (Chapter four lists and describes all selections included in each alternative.)

Nelson Townsite and Snow River

Two selections, Nelson Townsite and Snow River, are unique to the federal alternative. Nelson Townsite, 10 miles north of Cordova at the mouth of Orca Bay, was platted in 1909 and was once promoted as

the "San Francisco of the North," although the area was never developed (Janson, 1975:60). Congress passed a bill creating the townsite and providing for the incorporation of a townsite company of 2,000 acres, to be sold by the government at $2.50 per acre. The tract includes level land which could be suitable for a townsite if the area were filled and the river straightened. The bay is deep enough to serve as a coal, oil, and copper port for the region.

The area sees some recreational activity, particularly among residents of nearby Cordova, and includes bear and deer habitat. Fishing and crabbing are done in the Rude River and Orca Bay. No major negative social effects would occur if the area were to go to private ownership.

The Snow River tract is outside the study area but within the Chugach National Forest. It is accessible by car on the Seward Highway, and has potential for real estate development. Because the Snow River tract is adjacent to the highway, aesthetic values are important. With real estate development, some dispersed recreationists would be displaced, but the area could be opened up to private recreation uses.

Comparison of Status Quo Alternative with Options C and D

The hypothetical status quo alternative would have considerably less social effect than would either option C or D, because generally

areas included in this benchmark alternative are not as heavily used by recreationists, and do not have as much potential for resource development that could bring on major social changes.

The status quo alternative includes less acreage in Prince William Sound and east of the Copper River than do options C and D; thus, the social effects described for these options would be reduced under the alternative.

Of these three alternatives, option D would have the greatest negative social effects on the general public, because it includes far more prime recreation acreage in Prince William Sound than do option C or the status quo alternative. Also, both option C and D include substantial acreage with resource potential; resource development east of the Copper River could bring on major population and social system changes in Cordova and other Prince William Sound communities.

Comparison of Options C and D and No-Forest Alternative

The hypothetical no-forest alternative would have greater social effects on Prince William Sound users than would option C, but less effect than would option D. Lands in this benchmark alternative are concentrated in areas around villages and in northern Prince William Sound; many of these areas are scenic wilderness areas used by some recreationists. Option D includes a large proportion of the most heavily used recreational locations in the center of the sound.

Option C includes less acreage in the sound than do either option D or the no-forest alternative. Also, under the no-forest alternative, Cordova would not see the growth anticipated under options C and D, because this benchmark alternative includes few lands with development potential.

Comparison of Federal Alternative with Status Quo Alternative

Comparison of these two alternatives is fairly straightforward, since they include many of the same lands. On lands east of the Copper River, the social effects of either alternative would be essentially equal. The region is difficult to get to, and therefore few people currently use the area. Both these alternatives include relatively little acreage in Prince William Sound--as compared with other alternatives--but because the status-quo alternative does include the popular recreation area at Patton Bay, effects on recreational users would be greater under the status quo than under the federal alternative.

Comparison of Federal Alternative with No-Forest Alternative

The federal alternative would have fewer effects on recreation than would the no-forest option, because the federal alternative includes little acreage in Prince William Sound.

Unlike the no-forest alternative, the federal alternative includes substantial acreage near or east of the Copper River delta. If CNI developed natural resources on these lands, Cordova might see an increase in population or other social changes that would not occur under the no-forest alternative.

Summary of Comparisons

CNI's option D would have the greatest overall social effects of the five alternatives discussed; option D includes substantial acreage in Prince William Sound in areas which currently see heavy dispersed recreation and subsistence use. Those areas that would remain in public ownership would experience increasingly heavier use.

Options C and D both include areas east of the Copper River with resource development potential; if CNI developed these lands, many new residents would move into Cordova and could create social pressures. Option C would, however, create fewer social effects than would option D, because option C includes much less acreage in Prince William Sound.

The overall social effects of the hypothetical no-forest alternative would be less than those of CNI's two options, because those options include more lands with development potential and more of the prime recreational areas in the center of the sound. But because it includes many scenic and recreation areas in northern Prince William

Sound and around the three villages in the sound, the no-forest alternative would displace more recreational users than would either the status quo or federal alternatives.

The hypothetical status quo alternative and the federal alternative include many of the same lands, and would therefore create similar social effects. The majority of the lands included in these two alternatives are away from towns and from the heavily used recreation areas in Prince William Sound. Thus, these two alternatives would create the fewest social effects on users and residents of the Chugach region.

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VII. ENVIRONMENTAL ANALYSIS

This chapter reviews the environmental implications of Chugach Natives, Inc.'s receiving and developing lands included in the corporation's options C and D, as well as those included in the federal alternative, proposed by the Departments of Agriculture and Interior. We also compare environmental effects of these three proposed alternatives with likely effects of the two benchmark alternatives, the status quo and no-forest alternatives.

We limited our analysis to just those lands included in the various alternatives, but development on adjacent lands not included in the alternatives could also have effects on the tracts we analyzed. It is important to note that in some instances development of the lands in question will occur whether they remain in government ownership or are transferred to CNI. For example, the State of Alaska has for a number of years harvested timber around Yakataga. This activity is likely to continue regardless of whether portions of this area are conveyed to CNI.

We based this review on several assumptions:

1. Following land conveyance, CNI will develop recoverable resources;
2. Development options are limited to logging, mineral and hydrocarbon extraction, recreational lodges, and homesites;

3. Multiple large-scale developments would occur simultaneously;

4. CNI would exercise due care to protect the environment;

5. No new discoveries of recoverable resources will be made in the region. (Discovery and development of additional resources would have greater impacts on the environment.)

In making this review we relied heavily on our conclusions from a previous draft report, "Environmental Assessment of CNI Nominations, July 1981" (Cuccarese and Floyd, 1981), and focused specifically on the implications of large-scale development scenarios described in that report. Lesser scale developments would probably produce similar, though lower order, effects on the environment.

It is not difficult to anticipate effects of development on previously undeveloped areas. Development entails altering local environments to facilitate human activities. Modification of plant and wildlife communities is inherent in that process. It is difficult, however, to anticipate the degree of change likely to occur. The degree of environmental change associated with development is highly variable, depending in part on the nature of the activity, its relationship to other developments in the area, and the degree of care for the environment exercised by the developers.

Analysis of CNI Options C and D

Chapter four describes and lists all selections included in each alternative. Because options C and D share so many selections, we analyze the two options together, noting which selections are included in option C or D or both.

Southeast Alaska timber lands (Option C only)

This selection encompasses four separate commercial timber stands which are located near Yakutat, along Icy Strait on Chichagof Island, between Port Houghton and Windham Bay on the mainland, and on Prince of Wales Island. CNI selected all solely for their timber value. Essentially all large-scale timber harvest in Alaska in the past has been by clearcutting; therefore, we assumed that CNI would clearcut these lands. The implications of commercial timber harvest are reviewed in Appendix H; the following analysis draws heavily on assumptions presented in that appendix.

No seasonally important wildlife habitats are known or inferred in the Yakutat selection, which includes the headwaters of several salmon streams. These streams have combined escapements which average several thousand fish per year. A few moose use this tract for summer range. Timber harvest here probably would not overly influence local vertebrate populations unless erosion became a serious problem. Control of erosion could be difficult, because many streams head here, and the area typically experiences heavy precipitation.

The Icy Strait selection area on Chichagof Island includes several important salmon streams with combined average escapements approaching 100,000 fish per year. Brown bears congregate seasonally on these streams to prey on returning salmon. Topography of this selection is moderately steep, increasing the potential for erosion.

Unless stringent mitigative measures were employed during timber harvest, it is likely that silts and sediments would enter the streams, and degradation of salmon spawning habitats could follow. Should numbers of salmon decrease, carnivores and omnivores seasonally dependent on them would in turn be affected.

The Port Houghton and Windham Bay selection includes several tracts which provide seasonally important habitats for black bears, bald eagles, mountain goats, and deer. Several important salmon streams are also present, with average combined annual salmon escapement exceeding 100,000 fish. Timber harvest could destroy or alter many important terrestrial habitats here; for example, cutting of certain tracts would eliminate some traditional mountain goat winter range. As in other timber harvest areas, aquatic habitats might also be altered.

Little information is available for the relatively small selection on Prince of Wales Island. Resident vertebrates include deer, black bears, and bald eagles, but their numbers are apparently low. Because the tract is small and lacks obviously important habitats, clearcutting here would not appreciably influence the regional biota. It is important to note here that several large federally-controlled timber sales are scheduled for this area. Cutting of these large units would undoubtedly alter the biota to a far greater degree than would this small development.

Yakataga (State) timber lands (Options C and D)

CNI hopes to acquire state-owned lands around Yagataga for their valuable timber stands. We should note at the outset that while the effects of clearcutting these units would be significant, we want to place those effects in perspective. Regardless of whether CNI receives these units, the state plans to continue logging in an area that is much larger than the acreage included here. Much of the forested land in this area has already been cut, with serious consequences for the biota.

Clearcutting of this forest would destroy important overwinter habitats for bears and mountain goats. Mountain goats often rely on old-growth forests for shelter and sustenance during periods of deep snowfall, while black bears usually den at lower elevations in uneven-aged stands. Portions of the area serve as trumpeter swan nesting and migration habitat. As trumpeter swans are highly susceptible to disturbance, logging activities could influence their distribution and abundance (Hanson et al., 1971). If timber stands between natal ponds and rearing areas were cut, the swan's overland travel routes could be exposed to predators.

Clearcutting might temporarily benefit the few moose which inhabit the eastern portion of the selection area, if cleared areas revegetated in palatable browse. However, unless the areas were managed specifically for the production of moose browse, such benefits would

probably be short-lived. As the browse matured, it would become useless as food. Management for broad-leaved, palatable browse requires inhibiting conifer growth and altering stand composition--a process which would limit timber production, thus reducing the economic potential of the forest.

Tracts in this selection include the headwaters of several locally important salmon streams, which could also be influenced by timber harvest unless stringent mitigative measures were taken. Recorded escapements here are fairly low, but this may simply be a reflection of the turbidity of the streams, which makes enumeration difficult. A one-time high escapement count of 12,000 coho salmon in the Kaliakh River implies that these rivers may be more important for salmon production than is generally thought. In any case, these streams supply most of the salmon produced along this coast, and fewer salmon could eventually mean fewer brown bears and other animals which congregate on these streams during spawning runs.

In sum, if these units are clearcut, there would be a change in the kinds of wildlife present, as mountain goats, bears, and other species dependent on old-growth forest for food and shelter passed from the scene and were replaced by passerines, voles, and other species requiring early successional stages of vegetation. The area's small moose population could benefit if clearcut areas revegetated in palatable browse, but there is no guarantee that such revegetation

would occur naturally, since Sitka spruce grows rapidly in the Yakataga area. Natural regeneration is excellent here, and conifers would probably dominate the new community in short order (vide Ruth and Harris, 1979).

Icy Bay (Options C and D)

CNI chose the Icy Bay selection for its potential for oil and gas deposits. Past and present Alaska oil and gas production fields illustrate that this industry and wildlife are not necessarily incompatible. Wildlife continues to flourish on the Kenai National Wildlife Refuge, despite intensive exploration and long production and the same is true in the Cook Inlet, Prudhoe Bay, and the now-abandoned Katalla fields.

Oil and gas exploration and development does pose hazards to plant and animal life, however. Such hazards include changes in plant life as vegetation is removed for seismic lines, roads, drilling pads, and facility siting; disturbance of wildlife occupying critical overwinter or breeding ranges; chronic discharge of toxic formation waters into the aquifer; disposal of toxic drilling muds; and accidental oil spills on land and in water.

Overall implications of oil and gas industrial activities on the biota of the Icy Bay tract depend in large measure on whether recoverable deposits are discovered and developed. The exploration phase would modify some vegetation, would result in some disturbance of wildlife, could compact spawning gravels at vehicle fords, and could

introduce toxic heavy metals into the environment as drilling muds and formation waters were disposed of. These effects would most likely be transitory, however.

The environmental implications would be much more negative, should recoverable deposits of oil and gas be discovered at this specific site. This is because the selection area occupies the Malaspina Glacier outwash plain, where wildlife habitat is limited. Production facilities, workers' quarters, roads, toxic waste disposal areas, pipelines, and storage facilities would usurp already scant habitats. Some bears would likely be killed in defense of life and property. It appears doubtful that in the face of a developing industry the already-taxed habitats could continue to support both the numbers and kinds of life presently there.

Cape Yakataga (Options C and D)

This selection includes lands around the public airfield at Cape Yakataga. Since the site has long been under human influence and has little remaining significance as wildlife habitat, the environmental implications associated with conveyance of this tract appear low.

Copper River (Options C and D)

This selection is comprised of three tracts abutting village corporation selections along the as yet unconstructed Copper River Highway. Presumably, development of these lands would be limited to the roadbed and roadside establishments, since the steep topography of the

area seemingly limits development potential. Although information on this area is scant, none of these selections appear to contain habitats of particular importance for any species. Consequently, development at any, or all, of these sites would not result in significant change in the area's plant or animal life.

We limited this analysis to effects of development on the three sites in question; in all probability, however, none of these areas would see any development unless the road were constructed. Construction of the road could conceivably limit numbers of vertebrates along the route. The road probably would bisect seasonal ranges and provide travel avenues for wildlife during winter, heightening the chances for vehicle-animal collisions. A review of the past history of road construction in remote areas leads us to conclude that vehicle collisions, increased hunting, illegal shooting and various recreational pursuits could ultimately reduce vertebrate populations here.

Carbon Mountain and Bering River coal field (Options C and D)

CNI chose both selections for their coal deposits. Since the coal pockets are found at or near the surface and are often separated by substantial intrusions of rock, coal would likely be extracted by surface mining. The environmental implications of surface mining are well known and are reviewed in Appendix I. Both selections are in remote areas, and coal mining would require construction of an extensive road system to service the fields. Road access would most likely be through either the Martin or Bering River valleys. Since neither

stream could accommodate barges, coal would have to be moved overland by truck, train, conveyor belt or slurry pipeline.

Physiography of the area is structurally complex and relief dramatic. Valley floors, typically occupied by braided streams, ponds, marshes, bogs and similar wet areas, are bordered by steep mountain slopes. Construction and operation of large-scale surface mines and associated transportation networks would usurp significant portions of the limited and highly productive riparian, riverine, and lacustrine habitats in this area.

Moose and swans could lose major portions of their limited ranges in the area and thus be severely reduced in numbers, but the overall contribution of these small populations to the state's wildlife is debatable. Effects on mountain goats are more difficult to assess, as winter ranges in this area have yet to be identified. Numbers of bears would probably decline somewhat, but not enough to significantly change either numbers or population structure of bears in the area.

Considering the proposed activity, the wet valley bottoms, and the coal mining industry's history worldwide, significant discharge of silts and sediments into aquatic systems appears likely. Were this to occur, instream habitat quality would degrade. Development of a large-scale surface coal mine in this area could thus affect anadromous fish and animals dependent on these fish to a greater degree than other vertebrates.

State-Selected Lands (Options C and D)

Five small tracts in areas previously selected by the state in Prince William Sound comprise this selection.

At Shotgun Cove outside Whittier, CNI would receive title to 100 acres upland of, and adjacent to, an as yet unconstructed small boat harbor. This area is not particularly important for any land animals and development would probably have little influence on the local wildlife.

A second tract includes 200 acres on an unnamed island off the north coast of Glacier Island, near Columbia Glacier. The island, which has potential for a commercial recreational development, is not particularly important for any species although a peregrine falcon eyrie is reported to be close by. All peregrines breeding in Prince William Sound are believed to belong to a nonendangered race (Falco peregrinus peali), and displacement of this pair would not appreciably influence the population dynamics of the race. Development of a commercial recreational site at this location should not overly tax the environment, provided proper waste disposal facilities were constructed.

The Port Etches tract, approximately 225 acres, is centered on Nuchek Island. The site has been deemed suitable for commercial recreational development. Few habitats of significance are known in the area. Some deer winter habitat is present and there is a small

tufted puffin colony located at Phipps Point (Sowls et al., 1978). Because few animals would be involved development of this site would not strongly influence the population dynamics of either of these species in the region. Consequently, the environmental implications of development at this site would be low, provided adequate waste disposal facilities were constructed.

CNI has also selected about 575 acres of the coastline on Latouche Island in Horseshoe Bay. This tract, which has potential for commercial or townsite development, includes all of Chicken Island. This section of coast furnishes overwinter habitat for relatively low numbers of deer. No other sensitive habitats have been identified or inferred in the area. Considering the small scope of this proposed conveyance, probable effects on deer from development are low. Without knowing what, if any, industry will develop here, we can not comment further about the environmental effects of development in this area.

The final tract in this group centers roughly on Jack Bay and could include about 500 acres on both the north and south shorelines. CNI's specific areas of interest are not known. Since we do not know the type or extent of potential development likely here, we can not estimate its effects on the biota. Several statements bear iteration however. The Jack Bay estuarine complex provides important seasonal habitat for several species. Bears, bald eagles, and gulls concentrate on anadromous fish streams in this area during spawning runs.

Alpine areas on both sides of the bay provide habitat for mountain goats, which may also depend on old-growth forests within the selection area for winter shelter. Large mammal numbers in this area are presently low, partly in response to hunting. Increased human activity here could conceivably reduce numbers even further.

Small Federal Holdings (Options C and D)

These small federal holdings may be roughly categorized into two types: those either in or immediately adjacent to existing townsites, and those in remote areas. Examples of the former include federal holdings in Cordova, the Alaska railroad terminal and facilities at Whittier, BLM lands and Alaska Railroad terminal in Seward, and the Alaska Railroad Terminal in Valdez. The small federal holdings in townsites are either already developed or so influenced by development that they have little apparent remaining value as wildlife habitat.

The environmental implications of development in the small federal holdings in remote areas are more difficult to assess, as we have no indication of the types of development likely. Several generalizations are possible, however. Some holdings (for example, Miles Lake) do not possess habitats of obvious importance to any species. Development of tracts of this type would have little consequence for the biota. Other tracts support diverse wildlife which could be influenced by development; for example, development on Middleton Island in the Gulf of Alaska could threaten the island's large seabird colony.

14(h)(8) Selections (Options C and D)

As of this writing, CNI has yet to assign priorities to a list of selections the corporation has nominated for its entitlement under section 14(h)(8) of the settlement act. In lieu of further direction, study participants have agreed to focus on what we see as the two most valuable tracts from this list--the timber lands at Patton Bay on Montague Island and around McKinley Lake near Cordova. We have classified the remainder of tracts on CNI's list as "14(h)(8) Overselections," and analyzed them separately. In addition to their timber stands, both Patton Bay and McKinley Lake also have potential for recreational developments or remote homesites.

Historically, settlements in undeveloped areas have often resulted in significant site specific disturbance to the indigenous wildlife and plants. Effects are seldom limited to the site of development. Dramatic reductions in vertebrate populations often occur a considerable distance from the site of development. Hunting and fishing are usually responsible for this reduction, but fire, water pollution, and water diversion works also contribute to the problem. Much depends on the needs, real or perceived, of the inhabitants of new communities and the difficulties they encounter in living in the area.

Clearcutting of the forest in both areas would destroy habitats of some land animals and change habitats of others. Clearcutting could also alter water quality, unless adequate mitigation measures were employed. Numbers of species which depend on old-growth forests--

for instance, deer and bald eagles--would probably be reduced (vide Schoen and Wallmo, 1979; Schoen et al., 1979; Leopold and Bassett, 1972; Wolf, 1978; and Corr, 1974).

Effects of clearcutting would probably be more severe on the Patton Bay tract for several reasons. Areas of wildlife habitat are more limited on Montague Island than on the McKinley Lake tract, and the Patton Bay tract constitutes the largest single contiguous stand of old-growth forest on the island. Since Montague Island is the center of deer distribution and abundance in Prince William Sound (Reynolds, 1979), clearcutting of this unit could conceivably have far reaching implications for deer and other species dependent on old-growth forest for habitat. Historically, development of limited insular habitats has resulted in rapid change of the indigenous wildlife and plants.

Increased human presence on Montague Island could also compromise habitats of wilderness species such as the brown bear. Large, potentially dangerous animals simply have no place around human settlements. Regardless of administrative action designed to save habitat or limit sport hunting, conflicts would be probable and numbers of bears could ultimately decline as they were killed in defense of life and property. Other species could follow suit.

The McKinley Lake tract also furnishes important fish and wildlife habitats. Large numbers of waterfowl, including trumpeter swans,

wait out storms on the sheltered waters of McKinley Lake. Anadromous fish, principally red salmon, spawn and rear in several drainages of this selection. Brown and black bears, bald eagles, ducks, sea gulls, and others congregate seasonally at the lake to prey on dead and dying salmon. Development, whether for timber harvest or as homesites, would undoubtedly reduce the area's carrying capacity for these species.

In sum, development of these two tracts could lead to a reduction in brown bear numbers as bears were shot in defense of life and property. Clearcut logging could reduce Montague Island's carrying capacity for deer and limit bald eagle reproduction in both areas. Development could also reduce numbers of anadromous fish in both areas, but much would depend on the degree of care exercised by the developer.

Martin River timber lands (Options C and D)

Option C includes the surface estate only of the Martin River tract, while option D includes both the surface and subsurface estates. Since identified recoverable resources in this selection appear limited to commercial timber stands, the environmental implications are identical regardless of option. (Implications of timber harvest are reviewed in Appendix H.) In many respects, biotic resources of the Martin River area are similar to those previously described for the adjacent Bering River/Carbon Mountain tracts.

Destruction of habitats within this old-growth forest would affect most resident life forms. We believe that numbers of both species of bears and moose would probably decline as a consequence of development in this area. Commercially viable timber stands in this area are limited to low-lying valleys that coincide with essential seasonal habitats of moose and bears. Alteration and usurpation of these limited habitats by clearcuts, roads, yarding areas, workers' quarters, and other work-related facilities would exert a limiting influence on the biota.

Moose could temporarily benefit if cleared areas revegetated in palatable, broad-leaved browse, but there is no guarantee that this kind of revegetation would occur. Conifer regeneration in this area is thought to be rapid, and unless some areas were specifically managed for moose-browse production, shade-tolerant conifers probably would quickly replace the shade-intolerant, broad-leaved species that moose eat. As noted earlier, management for broad-leaved browse species involves limiting conifer growth and stand composition--which would reduce the timber value of the land.

Forested stands in this selection are steeply inclined, and the potential for erosion appears great. Widespread erosion would harm aquatic habitats, ultimately reducing numbers of salmon and other aquatic life. Important trumpeter swan staging habitat at Martin Lake could also be compromised, as this species is highly susceptible to disturbance.

In sum, clearing of this forest would alter habitats for many species of wildlife. Others could be affected through disturbance. If increased loads of silts and sediments were introduced into the water column, effects would reach downstream. Anticipated effects, though local, become significant when the potential for full-scale development of the Bering River coal field is considered.

Kushtaka Lake timber lands (Options C and D)

Option C includes the surface estate only of the Kushtaka Lake tract, while option D includes both surface and subsurface rights. CNI selected this small unit bordering the Bering River/Carbon Mountain tracts for its commercial timber stands. (The environmental implications of timber harvest are reviewed in Appendix H.) Harvest of this tract would eliminate the limited old-growth forest habitats in the area. Overall implications of this development would depend largely on whether the adjacent Bering River and Carbon Mountain selections were developed. The implications of timber harvest on just this small unit are slight; when viewed against the backdrop of possible high development throughout the area, the implications become more significant.

Bremner River Mouth (Options C and D)

Option C includes the surface estate only of the Bremner River tract, while option D includes the subsurface also. Identified recoverable resources within this area are few; some potential for timber harvest is present, but much depends on market conditions. Without

knowing for certain either the nature or type of development likely here, we find it difficult to assess the overall environmental implications. The mouth of the Bremner River is a nesting area for a significant number of trumpeter swans, however, and development of any kind could reduce the quality of the habitat, ultimately reducing trumpeter swan production.

Katalla (Options C and D)

CNI wants this selection primarily for its oil and gas potential. We briefly reviewed the overall implications of oil field development in the discussion of the Icy Bay selection. The Katalla selection encompasses high-quality mountain goat habitat and provides seasonal habitat essential for local populations of brown and black bears, moose, waterbirds, and anadromous fish. The following discussion of potential environmental effects assumes that significant deposits of oil and gas would be discovered and recovered.

Development of the area would probably have little direct effect on moose, mountain goats, and either species of bear. Some temporary improvement in moose habitat could occur as seismic rights-of-way, road shoulders, and other cleared areas revegetated. Such benefits would disappear as the vegetation aged and became unusable as food.

Other species probably would not be seriously affected by petroleum exploration and development activities in this area either, unless directly exposed to spilled crude. This assessment is tempered

by our imprecise understanding of the effects of chronic heavy metal pollution associated with oil field development and operation. Discharge of formation waters or leaching of toxic heavy metals from waste disposal areas could adversely affect aquatic organisms and, ultimately, their predators. Although the implications of heavy metal pollution are far from resolved, and their potential for bioaccumulation poorly understood, heavy metals are highly toxic and undoubtedly limit certain biota.

While the anticipated direct effects of development on the region's biota are probably low, the indirect effects are not. The isolation of the region and its remoteness from existing population centers argues forceably that a community to serve workers' needs would be established. Hunting and fishing pressures could become correspondingly high. Since there are relatively few moose and other large mammals in this area, it seems probable that large mammal numbers could decline with increased hunting and fishing; the region already sees many guided mountain goat hunts.

In sum, direct effects of oil and gas development in this area would probably be low. Conspicuous declines in large mammal numbers could occur, however, if year-round quarters were provided for workers and their families. These anticipated effects, while small, increase in significance when one considers the potential for full-scale development of the Bering River coal formation upstream of Katalla.

14(h)(8) Overselections (Option D only)

These 14(h)(8) overselections cover nearly 45,000 acres throughout Prince William Sound. CNI has nominated these sites for several types of development, ranging from mining to establishment of recreational facilities. A brief review of the broad effects of development of these scattered tracts is provided below.

The 14(h)(8) overselections as a group include a significant amount of deer overwinter range. Development of all of these sites would undoubtedly reduce the carrying capacity of the sound for deer. Numerous small salmon streams are also common to the various selections. Damage to any single stream or estuarine area would produce relatively insignificant localized effects, but damage to all could reduce Prince William Sound salmon production.

Recreational facility siting and the sale or lease of recreational homesites could reduce wildlife populations in the region as residents hunted and trapped for meat and furs. Although ostensibly under state regulation, such activities are largely uncontrollable in rural settings and often lead to pronounced reductions in local vertebrate numbers. All of the selected tracts either include or are immediately adjacent to estuarine areas. Within Prince William Sound, such low-lying areas are unique, providing numerous species with important seasonal habitats. Development of these sites could alter fish and wildlife populations in the sound.

In sum, development of the 14(h)(8) overselections could materially alter existing plant and wildlife communities in the region, because they center on low-lying seasonally important habitats.

Controller Bay (Option D only)

CNI selected Controller Bay for its oil and gas potential and because it is a likely location for a waterfowl hunting resort. The overall environmental implications of oil and gas development are described under the discussion of the Icy Bay selection. Predictably, effects on the biota stemming from oil and gas development would be most severe during the exploratory phase, as seismic crews repeatedly traversed the area. Such disturbance should stabilize at a lower level once production began.

Controller Bay includes important trumpeter swan breeding areas, winter habitat for moose, and breeding, rearing, and migratory habitats for millions of waterbirds. Development of any kind within the selection could degrade trumpeter swan habitat. Also, swan reproduction could decrease, were these birds exposed to chronic disturbance such as that which would accompany oil and gas development.

Moose could benefit from oil and gas exploration if cleared areas revegetated in palatable browse. There is no guarantee of this kind of revegetation, and in any case, such benefits would disappear when the browse matured and became unusable as food. Waterfowl probably would be minimally affected by placement of a waterfowl hunting lodge

in Controller Bay; the area is large and seemingly affords ample opportunity for displaced birds to rest and feed.

In sum, trumpeter swan production could decline in response to human activity in this area, and some winter moose habitat could be modified, with uncertain effects. Waterfowl should not be overly affected by construction of a commercial hunting lodge in this area.

Icy Bay Addition (Option D only)

The environmental implications of conveyance of the Icy Bay addition would parallel those described earlier for the Icy Bay selection, but since this proposed Icy Bay addition essentially encompasses all of the remaining terrestrial habitat in this area, anticipated effects to the biota would be heightened.

Summary of Implications of Options C and D

Our review of the environmental implications associated with conveyance and ultimate development of lands included in CNI's two options implies that option C would have more negative effects on the environment than would option D. Option C includes more commercial forest tracts than does option D (see Figure 1). Commercially viable old-growth stands of timber in this region of Alaska provide important seasonal habitats for numerous species. Logging of all selected tracts could alter composition of the biota in the region for the foreseeable future.

It is important to note, however, that the state-owned Yakataga lands and the Southeast Alaska selections appear destined for long-term timber production regardless of owner. When placed in this perspective, the differences between the two options diminish.

Analysis of Federal Alternative

The federal alternative includes 17 selections that are also nominated in CNI's options C and D; the environmental implications of development of these selections are discussed in our analysis of those options and will not be repeated here. (Lists of tracts included in each alternative appear in chapter four.) The only two selections unique to the federal alternative are the Nelson Townsite and Snow River tracts, discussed below.

Nelson Townsite

Opportunities for development at this site appear limited to townsite developments, commercial tourist lodges and recreational homesites. The tract provides seasonal habitat for bald eagles, deer, black bears, and anadromous fish.

The environmental implications of development of this site are difficult to assess, since we do not know the extent of planned development. This tract is centered on the Rude River estuary, however, and includes productive riverine and riparian habitats of local importance. Development of any type could reduce local vertebrate populations by destroying or altering those habitats.

Environmental effects might not be limited to the site of development. A review of the history of ecological change following development of remote sites shows that reductions in vertebrate populations in adjacent areas are also likely. Hunting and fishing are usually the principal causes of such reductions, but fire, water pollution, and water diversion works also contribute to the problem.

Snow River

Located within easy driving distance from Seward, this site seems to offer broad potential for development as either a recreational wayside and campground or as a gravel source for construction. The site straddles both the highway and railbed, enhancing its attractiveness as a commercial site.

Moose, black bears, and beavers are the most conspicuous wildlife, but numbers of individuals are low. Development of this site would destroy terrestrial habitats and could compromise in-stream habitats in the Snow River, unless stringent protective measures were employed. Considering the few animals involved, the relatively small size of the tract, and the seeming abundance of similar habitats immediately adjacent to the site, the consequences of development of this tract are probably low.

Summary of Implications of the Federal Alternative

The overall environmental implications of the federal alternative are moderately high because it includes several relatively extensive tracts which have potential for hydrocarbon extraction and timber harvest. Economically viable lands in this remote mountainous region are restricted to low-lying valleys and coastal plains. These same areas often provide seasonal habitats essential for local populations of fish and wildlife. Development of all these important low-lying tracts would undoubtedly lead to a change in the biotic character of the region. The anticipated effects to the environment from development of this alternative are of a much lower order than those associated with options C and D, principally because the federal alternative includes far fewer acres of commercial timber lands (Figure 1).

Comparison of CNI Options C and D with the No-Forest and Status Quo Alternatives

Options C and D have far greater potential for altering the biological character of the Chugach region than do either the no-forest or status quo alternatives, our benchmark alternatives.

As noted earlier in this report, CNI included lands in options C and D solely for their economic potential. (See Figure 1.) Most such tracts selected coincide with habitats of paramount importance to the region's vertebrate populations. We believe that alteration and des-

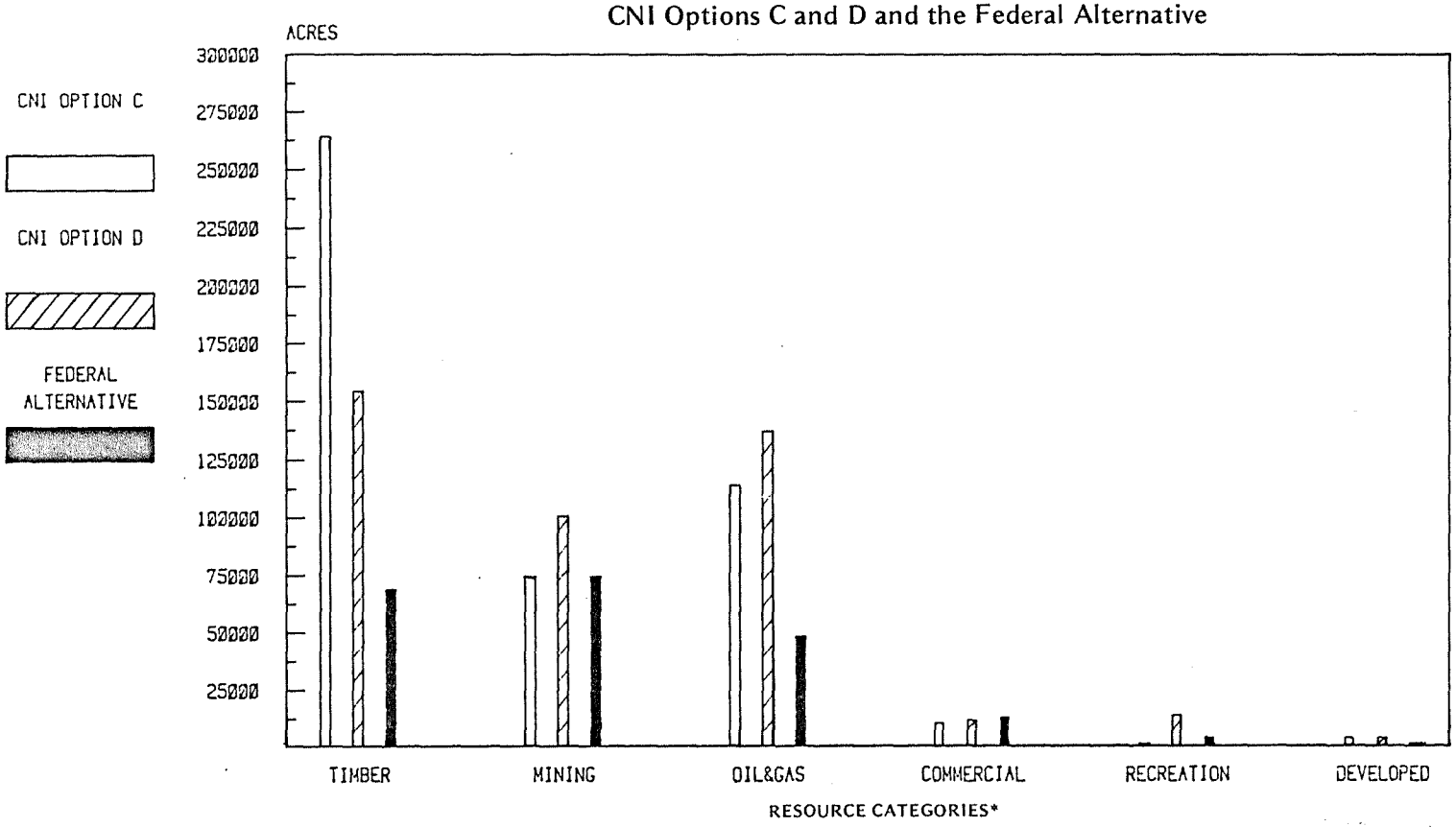
truction of habitats concomitant with development of these lands would lead to area-wide population reductions among many vertebrates, including deer, bears, and anadromous fish.

On the other hand, the hypothetical status quo and no-forest alternatives, respectively, limit available lands to areas currently withdrawn for CNI selection, and to areas which would have been open to CNI had the settlement act placed no restrictions on selections from within the Chugach National Forest. The lands that make up the benchmark alternatives generally afford few opportunities for development, and with little development on these lands, the environmental effects would be correspondingly few.

Comparison of the No-Forest and Status Quo Alternatives with the Federal Alternative

The federal alternative has far greater potential for altering the biological character of the region than do either the no-forest or status quo alternatives, because unlike either of these two benchmark alternatives, the federal alternative includes tracts solely for their economic potential. As discussed previously, economically viable lands in the Chugach region coincide with low-lying valleys and coastal plains which provide important habitats, the significance of which cannot be overstressed. Development of all selected areas would alter the ecological character of the region.

Figure 1. Comparison of Selected Resource Acreages, CNI Options C and D and the Federal Alternative



*This figure is intended as a rough measure of maximum numbers of acres that could potentially be affected by various kinds of resource development under the three alternatives; we arrived at these comparisons simply by totalling acreages in all the selections which CNI or the federal government cited as having specific resource potential. The mining category includes selections made for coal or copper potential; the commercial category includes areas selected for establishment of lodges, marinas, or other types of commercial recreation facilities; the developed category includes selections in or near townsites where development has already taken place.

This is clearly not the case under either the no-forest or status quo alternatives, since lands available for selection under either of these hypothetical alternatives afford few apparent opportunities for development.

Summary of Comparisons

CNI's options C and D have far greater potential for altering the composition of the region's biota than do any of the other alternatives, because these options include economically viable lands that generally coincide with the region's most productive fish and wildlife habitats. The federal alternative could also affect the regional status of some organisms, but the overall effects would be much lower since this alternative includes far fewer acres of commercially viable lands than do CNI's options. Figure 1 graphically illustrates proportions of potentially valuable resource lands included in the three proposed alternatives. Transfer of lands in the benchmark alternatives would have little implication for the environment, since few exploitable resources are included in these alternatives.

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VIII. MANAGEMENT ANALYSIS

This chapter reviews the management implications, should Chugach Natives, Inc. receive and develop lands included in the corporation's options C or D, or in the federal alternative proposed by the Departments of Interior and Agriculture. We also compare the management effects of conveyance of lands in these three proposed alternatives with effects of conveyance of lands in our two benchmark alternatives, the status quo and no-forest alternatives.

Most lands in the Chugach region are presently in federal reservations. Major exceptions include state-owned lands around Yakataga along the northern Gulf of Alaska. Generally, reserved lands under consideration for conveyance to CNI are identified with specific public values and purposes. Transfer of those lands to private ownership would remove them from public control, reduce public benefits, and possibly stimulate change in adjacent public land management.

Our analysis of management implications of transfer to CNI of selections from the three alternatives is divided into several parts. First, to place in perspective possible private development of various selections, we briefly discuss the kinds of management--e.g., management for habitat protection--now open to federal and state planners on the various public lands under consideration for transfer to CNI. Then we look at potential management conflicts and other problems, should CNI--or the federal and state governments if these remain

public lands--undertake various kinds of development on the lands in question. Finally, we assess how transfer of the selected lands to CNI would meet management goals outlined in the Alaska Lands Act, and how such land transfers would affect CNI and public management agencies. Having looked at management implications of transfer to CNI of selections included in three proposed alternatives, we then compare the broad management implications of each of the three alternatives, and assess those management effects against implications of our two benchmark alternatives.

Analysis of Alternatives

Chapter four describes and lists all selections included in the various alternatives; options C and D include most of the same selections, and the federal alternative includes, with modifications, some of the selections in options C and D.

Land Management Potentials

Wilderness: Areas with the highest potential for wilderness management in the Chugach region are found within the Copper River-Bering Glacier area. Selections in this area include the Bering River coal field, Carbon Mountain, Copper River, Martin River, Kushtaka Lake and Bremner River mouth. All these selections are included in options C and D, and some are in the federal alternative. Although subject to minor resource development in the past, these lands are now essentially wilderness, remote and

scenic sections of the Chugach National Forest. Not presently included in any formal national wilderness or wilderness study area, these selections nonetheless could be managed as such. Small state-selected tracts in the national forest in Prince William Sound, included in all options, also contribute to the overall wilderness aspect of the Chugach region.

Yakatat and Port Houghton, Southeast Alaska timber lands included in CNI's option C, are adjacent to designated wilderness areas. These timber lands are essentially wilderness now, but the federal government has no plans to preserve that status.

Critical fish and wildlife habitat: The McKinley Lake-Copper River-Bering Glacier region provides critical habitat for several resident and migratory species of wildlife. Anadromous fish streams of this land complex, in aggregate, produce more than 100,000 fish annually. Coastal lakes and outwash wetlands of this area, in particular the Controller Bay selection in option D, are critical nesting sites for the dusky Canada goose and the trumpeter swan. Millions of other migratory birds annually use these areas also. Resident mammals include moose, brown and black bears, beavers and mountain goats, and the habitat in this region is critical to these local animal populations.

The Yakataga and Yakatat areas along the northern Gulf of Alaska include numerous important though small anadromous fish streams, winter range for mountain goats, year-around range for moose and black and brown bears, and some habitat for migrating birds. Substantial state-owned acreage around Yakataga is included in all three proposed alternatives.

Selections within Prince William Sound include important coastal habitats, and while no such habitats are federally designated as "critical habitats," all these lands are important to the fisheries and animal life of the sound and could be managed for habitat protection. All three proposed alternatives include some acreage in Prince William Sound, but CNI's option D includes far more acreage in the sound than do option C and the federal alternative.

Various tracts included in the Southeast Alaska timber lands selection in option C also include important habitats. The Icy Strait unit includes important anadromous fish streams and brown bears concentrate here during salmon runs. Also part of this unit are the Neka River lowlands that flow into the sensitive estuarine area of Neka Bay. The Houghton Bay tracts include important fish streams in the Chuck River and Hobart Bay drainages; the Forest Service rates these areas as having low sensitivity to disturbances, however. The Big Salt Lake unit includes the upper drainages of a stream that produces many anadromous fish.

Resource development on public lands: The most likely development under continued public ownership in the Chugach region is timber harvest through sales contract. Logging has taken place in the past on state lands in the Yakataga region, and on some sections of the Chugach National Forest and in the Tongass National Forest in Southeast Alaska. These areas and some sections of the McKinley Lake-Bering Glacier region are suitable for sustained timber management.

Some potential exists for various kinds of mineral development on selections included in the three proposed alternatives: coal mining in the Bering River area, oil and gas development in the Bering River and Icy Bay areas, and hard rock mineral operations at a few locations. All of these potential developments are of uncertain economic viability, and if the federal government decided to open these lands to development, it would do so through private leases.

Potential for road construction within these selections is essentially limited to completion of the Copper River Highway linking Cordova and Valdez, and an access road system in the Copper River-Bering Glacier region, possibly connecting into the logging road network west of Icy Bay.

Areas in Prince William Sound could be developed as public anchorages and campgrounds, or could be leased or otherwise transfer-

red to private enterprise for development of commercial recreational facilities.

Potential Management Conflicts

Potential conflicts between various land uses in the Chugach region could occur to varying degrees under either public or private ownership. Public agencies, under management mandates to consider all resources and monitored by various interest groups, may concern themselves with a wider range of resource values than would private owners. Any resource development that took place on public lands in the Chugach region would probably be carried out by private industry under government leases or permits, and with public oversight. CNI would likely manage any lands it received directly and efficiently for profit, with more emphasis on single-use management.

Critical habitat/resource development: Timber harvest induces radical ecological change and could seriously compromise sensitive habitats included in various selections. Uneven-aged, mature forest provides a myriad of habitats and supports a diverse array of vertebrates. Clearcutting produces a different ecosystem. Revegetated clearcuts are often monotypic, even-aged, and unsupportive of diverse life forms. Elimination of old-growth stands in logged areas will inhibit uses of winter range for mountain goats, deer, and moose. There is potential for damage to salmon spawning streams from siltation and stream debris and increased runoff.

Any coal mining in the Bering River and Carbon Mountain selections would likely be surface mining. Such surface mining is potentially hazardous to fish streams and groundwater, and would require environmental protection measures. Oil and gas development presents the usual hazards of oil field and exploratory areas, including possible oil spills and construction of pipelines that can block wildlife movements. Development may destroy or modify habitats and effectively limit management options for affected species.

Recreation/resource development: Little conflict is apparent between private and government goals for recreational development in the Chugach region. There is relatively high recreational potential throughout the selections in options C and D and, to a lesser extent, in the federal alternative. Some of the parcels in all three alternatives were selected specifically for recreational development. The state has selected tracts in Prince William Sound for development of marine parks, and the state may be willing to give up to CNI acreage at some of these sites for establishment of private recreational facilities to accompany the public parks. Whether the state is willing to give up some of these lands depends on what lands the federal government offers in exchange. Whether or not CNI obtains any acreage at these state-selected sites, the sites will see recreational development.

Selections along the planned Copper River Highway, which are included in all three proposed alternatives, would essentially transfer all highway lands to private ownership, since CNI's village corporations own most of the remaining lands along the proposed route. The transfer would also put suitable wayside and campground locations in the hands of private owners, thus relieving public agencies of the responsibility to provide and maintain such facilities.

The McKinley Lake selection, included in CNI's options C and D, appears to have high potential for public recreation, and would probably be developed for this purpose under either private or public ownership.

With varied resources and terrain, the Copper River-Bering Glacier selections have high recreational potential, but are now relatively inaccessible. Increased public recreational use of these areas could be expected if a road were constructed from the Copper River Highway into the Martin River and Katalla areas. Such a road would, however, be a prelude to timber harvest and coal mining, or any other economic development in the Copper River-Bering Glacier region. While timber clearcuts and strip mines for coal certainly do nothing to enhance recreational values, careful planning might accommodate these potentially conflicting uses.

The state lands at Yakataga appear destined for sustained timber production and harvest regardless of owner. We see little conflict between recreational use and timber harvest here, as the area is remote and access difficult. Public use of this area is presently slight. Recreational use of beaches in the vicinity of Yakataga will probably change little under any type of development, provided that the area is left open to public use. Development of recreational facilities by the private sector would eliminate government need to do so and could facilitate public management goals.

There is potential for conflict between recreational use and resource development in locations in the Icy Cape and Port Houghton units of the Southeast Alaska timber lands included in CNI's option C; timber harvest there could adversely affect sport fishing and scenic values.

Other Management Problems: Selection of the small federal holdings presents some apparent management conflicts. Some, like the Alaska Railroad lands and the Yakataga airstrip, are now used by public agencies to provide public services. Transfer of these installations would impose on CNI the responsibility for maintenance and operation of these public services.

Development of any resources in the Copper River-Bering Glacier area would require simultaneous development of access routes--for example, a road system from the Copper River Highway through

this area to port facilities in the Katalla region. Timber harvest would change the recreational opportunities, as well as some wildlife habitat in the region. Coal mining and road construction could adversely affect streams and ground waters that support anadromous fish runs and migratory bird habitat. Human occupancy could drive out wildlife such as wintering moose or nesting swans. CNI's selection of only valuable resource lands from this region would leave to public management scattered lands with low value and inadequate public access.

Anadromous fish streams cross many selections in the Copper River-Bering Glacier area, and transfer of the lands to CNI would shift the burden for protection of these areas to CNI. These streams provide fish that are harvested in public waters; the responsibility for riparian protection and control would go with the land.

Realization of ANILCA Management Goals

Consolidate land ownership: Transfer to CNI of selections in any of the three proposed alternatives would further fragment both public and private ownership and increase complexity of boundaries.

Facilitate management: Generally, inholdings that introduce conflicting uses complicate management on federal conservation reserves such as the Chugach National Forest. On the other hand, management may be improved by transfer to CNI of areas that require private development to achieve highest and best use, such

as sites where lodges or marinas are needed or where there are concentrated mineral deposits. Where public wildlife resources such as waterfowl areas, anadromous fish streams, or big game wintering areas will be encompassed by private inholdings, both public and private management will become more complex.

Private management of extensive forest holdings is more likely to be single-use (sustained timber production) while public management would tend toward multiple use. Private management for profit can be highly efficient, and in certain types of forest lands this single-use management may be the preferred management. Other forest lands, with multiple values such as wildlife habitat and recreational potential, would be best served under public management. Much of the timber land in the Chugach National Forest and around Yakataga has multiple values, and it is unlikely that transfers to CNI will facilitate multiple-use management.

Access Considerations

In all three alternatives many selections are in isolated coastal areas where access is by water or air only. Development in the Copper River-Bering Glacier and Yakataga areas would require extensive road construction. The latter area already possesses a fairly complex road system which would have to be expanded. Port and airfield facilities also would be needed in the Copper River-Bering Glacier area. Public easements across CNI lands would have to be negotiated. Small selections in the cities of Seward, Whittier, and Cordova and the Snow River selection on the Seward Highway are easily accessible.

Implications for Management Agencies

Alaska Department of Fish and Game: Under all the alternatives, lands would be transferred from public to private hands. Private control of habitat and access would complicate state fish and wildlife management. Private ownership in effect presents a veto option over fish and wildlife management and harvest regulations. Continuation of public wildlife programs on CNI lands would depend on extended negotiations with private owners.

Alaska Department of Natural Resources: Options C and D and the federal alternative provide that the Yakataga state lands and small state-selected tracts in Prince William Sound (five selections in options C and D and four in the federal alternative) would be transferred from ADNR management to CNI ownership. Such transfers of state lands to CNI would take place only if the state in turn received federal lands it wants. Transfer of small Prince William Sound tracts would relieve ADNR of the need to arrange for commercial recreational development.

Forest Service: Private inholdings (extensive under options C and D and of moderate extent under the federal alternative) would be established in the Chugach National Forest; these inholdings would require revisions and adjustments in management planning by the Forest Service.

National Park Service: Selections near Yakataga included in all three proposed alternatives adjoin or are near the Wrangell-St. Elias National Park and Preserve. The Bremner River mouth selection, included in options C and D, lies within the preserve. If CNI received these lands, the Park Service might negotiate with CNI for development of park access facilities.

Bureau of Land Management: Under all three proposed options, the BLM would relinquish control over the Carbon Mountain area and small sites in Cordova, Whittier, Seward, and at Cape Yakataga.

Other agencies: Options C and D include small federal holdings now managed by various federal agencies, including the Alaska Railroad, the Federal Aviation Administration, and the Corps of Engineers.

Chugach Natives, Inc.: Under all three proposed options, CNI would acquire extensive and diverse lands suitable for community use and economic development, as well as the responsibility for management of all resources, some of which have public value and are used on adjacent public lands.

Summary of Management Implications of Options C and D and the Federal Alternative

Options C and D and the federal alternative are generally made up of valuable lands scattered throughout the Chugach region. Lands in-

cluded in options C and D have a wide range of public values and single-use management on these lands--management solely for timber harvest, for example--could conflict with some of those values. Options C and D also include a number of selections in or adjacent to the Chugach National Forest and other federal reserves. Transfer of these lands would have important management implications for a number of public agencies, and would not advance ANILCA public management goals of consolidating land ownership and facilitating management. If high-value tracts in the national forest were transferred to CNI, the Forest Service would retain management of isolated tracts of less valuable land, possibly at higher cost and for reduced public benefits.

Options C and D would offer the most economic benefits to CNI, largely because both include valuable timber lands in the Chugach National Forest and around Yakataga. Option C is the most valuable because it not only includes Chugach National Forest lands and state-owned lands at Yakataga, but also valuable timber lands from the Tongass National Forest in Southeast Alaska. Because it includes these timber lands in Southeast Alaska, option C would also create the greatest conflicts with public management.

Transfer to CNI of certain small tracts scheduled for development by public agencies for public use facilities would relieve government of the need to establish and manage these sites. This benefit, while not insubstantial, would not offset the management problems inherent with the fragmented, widely separated selections common to options C and D.

As compared with management effects of options C and D, the federal alternative would minimize impacts on federal agencies and on the general public. Because lands mainly outside the Chugach National Forest were specifically selected for this alternative, affects on the Forest Service would be minimal. Public recreation would also be largely unaffected if CNI received lands in the federal alternative, since most of these lands are not widely used; exceptions include selections in Prince William Sound that are popular recreation sites. Although still generally of high value, the federal alternative would be much less valuable to CNI than would options C and D, largely because the alternative includes much less commercial timber acreage than do the two options.

Comparison of Options C and D and the Federal Alternative with the No-Forest and Status Quo Alternatives

Lands in the benchmark status quo alternative are all in the Chugach region. The alternative does not include state lands but does include tracts in the Chugach National Forest, the Wrangell-St. Elias National Park and Preserve, and BLM public domain lands, as well as the public airfield site at Yakataga. In general, selections in the status quo alternative are widely scattered and of relatively low resource value. Because there is little potential for resource development on these lands, the hypothetical status quo alternative would produce relatively little resource management conflict, less than would either of CNI's two options or the federal alternative.

The hypothetical no-forest alternative includes both high and low value lands in several areas around Prince William Sound. Together with village corporation lands, selections in this benchmark alternative would create blocks of Native-owned lands in northeastern and southwestern Prince William Sound. The no-forest alternative would present a greater conflict with public management of lands for recreation and wilderness than would options C and D, because it includes more coastal lands in Prince William Sound and extensive tracts in the Nellie Juan College Fiord wilderness study area. The no-forest alternative would conflict less with fish and game management, because it includes less upland game range and fewer anadromous fish streams than do CNI's two options. There would be less of a conflict with public management of high value timber lands under the no-forest alternative than under the three proposed alternatives, since the no-forest alternative includes less timber land.

Summary of Comparisons

In summary, CNI's options C and D, because they are made up of valuable, scattered selections with a wide range of public values, would create greater management conflicts and problems than would either the federal alternative or the two benchmark alternatives. Option C in particular would create significant management conflicts, because it includes not only lands in the Chugach region but also in the Tongass National Forest in Southeast Alaska.

The federal alternative, although it has a number of selections in common with options C and D, includes much less acreage from the Chugach National Forest than do those two options, and thus would create fewer public management problems. The status quo and no-forest alternatives would generally present little management conflict, because unlike the three proposed alternatives, these benchmark alternatives contain little land with potential for development. The no-forest alternative would, however, conflict with public management for wilderness and recreation, since the hypothetical alternative includes substantial wilderness and recreation acreage in northern Prince William Sound.

Appendix A. Excerpts, Alaska National Interest Lands Conservation Act and Alaska Native Claims Settlement Act

Section 1430, Alaska Lands Act

CHUGACH REGION STUDY

SEC. 1430. (a) PARTICIPANTS; PURPOSES. The Secretary of the Interior, the Secretary of Agriculture, and the Alaska Land Use Council, in conjunction with Chugach Natives, Incorporated, and the State of Alaska, if the State chooses to participate, are directed to study the land ownership and use patterns in the Chugach region. The objectives of the study are: to identify lands, pursuant to guidelines contained in section 1302(h) of this Act, and in section 22(f) of the Settlement Act, as amended, which can be made available for conveyance to Chugach Natives, Incorporated; for the purpose of consolidation of ownership patterns in the Chugach region; to improve the boundaries of and identify new conservation system units; to obtain a fair and just land settlement for the Chugach people; and realization of the intent, purpose and promise of the Alaska Native Claims Settlement Act by the Chugach Natives, Incorporated, in satisfaction of its regional land entitlement pursuant to section 12(c) of the Alaska Native Claims Settlement Act, to consider monetary payment in lieu of land and to consider all other options which the participants in the study consider to be appropriate to achieve the objectives set forth above.

(b) LANDS. Lands identified to meet the study objectives outlined in subsection (a) shall be, to the maximum extent possible, lands of like kind and character to those traditionally used and occupied by the Chugach people and shall be, to the maximum extent possible, coastal accessible, and economically viable. The inclusion of lands within the areas designated as conservation system units or for wilderness study by this Act within the Chugach region shall not preclude the identification of those lands to meet the study objectives outlined in subsection (a).

Section 1302(h), Alaska Lands Act

(h) EXCHANGE AUTHORITY. Notwithstanding any other provision of law, in acquiring lands for the purposes of this Act, the Secretary is authorized to exchange lands (including lands within conservation system units and within the National Forest System) or interests therein (including Native selection rights) with the corporations organized by the Native Groups, Village Corporations, Regional Corporations, and the Urban Corporations, and other municipalities and corporations or individuals, the State (acting free of the restrictions of section 6(i) of the Alaska Statehood Act), or any Federal agency. Exchanges shall be on the basis of equal value, and either party to the exchange may pay or accept cash in order to equalize the value of the property exchanged, except that if the parties agree to an exchange and the Secretary determines it is in the public interest, such exchanges may be made for other than equal value.

Section 22(f), Alaska Native Claims Settlement Act

(f) The Secretary, the Secretary of Defense, the Secretary of Agriculture, and the State of Alaska are authorized to exchange lands or interests therein, including Native selection rights with the corporations organized by the Native groups, Village Corporations, Regional Corporations, and the corporations organized by Natives residing in Juneau, Sitka, Kodiak, and Kenai, all as defined in this Act, and other municipalities and corporations or individuals, the State (acting free of the restrictions of section 6(i) of the Alaska Statehood Act), or any Federal agency for the purpose of effecting land consolidations or to facilitate the management or development of the land, or for other public purposes. Exchanges shall be on the basis of equal value, and either party to the exchange may pay or accept cash in order to equalize the value of the property exchanged: Provided, that when the parties agree to an exchange and the appropriate Secretary determines it is in the public interest, such exchanges may be made for other than equal value.

Appendix B. Summaries of Land Exchange Cases

By Linda Leask and Thomas A. Morehouse, ISER

Introduction

This paper summarizes six land or selection rights exchange cases involving Native corporations: Cook Inlet, Sealaska, Admiralty Island, Koniag, Arctic Slope, and Doyon. Congress approved these exchanges in amendments to the Alaska Native Claims Settlement Act in 1976 (P.L. 94-204) and in the 1980 Alaska National Interest Lands Conservation Act (P.L. 96-487).

The value of these case summaries is that they show the variety and range of specific options available for exchanging lands or otherwise adjusting original entitlements granted to Native corporations under ANCSA. These cases include the following exchange or adjustment elements:

1. State lands (Cook Inlet, Doyon)
2. Out-of-region lands (Cook Inlet)
3. Borough lands (Koniag)
4. National wildlife refuge lands (Cook Inlet, Arctic Slope, Doyon)
5. National forest lands (Sealaska, Admiralty, Koniag)
6. National park lands (dual withdrawal) (Arctic Slope)
7. Federal surplus property (Cook Inlet)

8. Equal value timber exchange (Admiralty Island)
9. Joint regional-village timber ownership (Koniag)
10. "Acre-equivalent" formula based on economic value of federal surplus lands (Cook Inlet)
11. Subsurface rights only (Cook Inlet, Arctic Slope)
12. Restricted surface rights (Admiralty Island)
13. Federal regulation of resource development (Arctic Slope, Koniag, Doyan)
14. Public access agreements (Arctic Slope, Koniag)
15. Wildlife protection easement (Arctic Slope)

Cook Inlet Land Exchange

In 1975, after several years of negotiations, the federal government, the State of Alaska, and Cook Inlet Region, Inc. agreed on where that Native regional corporation and several of its village corporations would receive lands they were entitled to under the Alaska Native Claims Settlement Act. This agreement was approved by Congress in 1976 amendments to the Alaska Native Claims Settlement Act, section 12 (P.L. 92-204).

The complex three-way agreement marked the first time the State of Alaska had negotiated to make state lands available to a Native corporation, and also the first time--and only time, to date--that a regional corporation has agreed to take part of its lands outside its

own region. Existing federal withdrawals and lands the state either owned or had selected covered most of the low-lying areas in Cook Inlet when the settlement act was passed, and the region's corporations had since 1972 protested that lands made available to them were neither similar to those they had historically used nor economically viable.

By mid-1981, some provisions of the 1975 agreement had yet to be carried out, and in fact some were still subject to negotiation and revision. Therefore, the final form of Cook Inlet's land settlement is not precisely known. Generally, however, under the agreement:

1. Cook Inlet Region, Inc. agreed to accept approximately one million acres--some of which included only subsurface rights--to fully satisfy its land entitlements under sections 12(c) and 14(h)(8) of the settlement act. Under that act, the corporation would have been entitled to about 1.5 million acres of 12(c) lands, and some additional 14(h)(8) lands. The specific acreages cited in the agreement were:

   a. 10,040 acres, including both surface and subsurface rights, from the Kenai National Wildlife Refuge; once conveyed, this acreage was to become private land, not subject to refuge regulations--except for some river and lake frontage, which was subject to some development restrictions.

   b. 220,000 acres of oil, gas, and coal rights within the Kenai Wildlife Refuge; 82,500 acres of these subsurface rights were to fully satisfy the corporation's 14(h)(8) entitlement. This acreage was to remain a part of the wildlife refuge, and any exploration for or development of petroleum or coal deposits was to be accompanied by a surface protection plan approved by the U.S. Fish and Wildlife Service.

c. About 46,000 acres of subsurface rights only in the Talkeetna Mountains.

d. 684,000 acres outside Cook Inlet Region entirely; these out-of-region lands were to be selected primarily from the five regions neighboring Cook Inlet, and these regions had some control over which lands Cook Inlet could select. The corporation could also select lands in regions other than the five neighboring ones, but for such a selection had to obtain approval of the State of Alaska, the Interior Department, and any affected regional or village corporation. This out-of-region acreage could, however, be reduced in two ways:

   i. In the state-federal-Cook Inlet agreement, there was an additional provision, calling for the federal government to establish a pool of 138,000 acres of federal surplus property in Alaska; any such surplus property deeded to the regional corporation would be deducted from the 684,000 acres cited above. Because such surplus federal property very often has improvements substantially increasing its value, the agreement established an "acre-equivalent" formula for determining how lands from this pool would be calculated in the corporation's entitlement: for each $500 of assessed value of the property, the Interior Department would subtract one acre from the 684,000 acres cited above. If, for example, the corporation obtained one-half acre of federal surplus property assessed at $10,000, 20 acres would be deducted from the 684,000 acres.

   ii. Another means by which the 684,000 acre out-of-region entitlement could be reduced was developed in a separate agreement the Interior Department, Cook Inlet Region, Inc., and its village corporations reached in 1976. Concurrent with and complicating the land negotiations was a dispute between Interior and Cook Inlet's corporations over eligibility of two regional villages for benefits under the settlement act. While this eligibility question was being adjudicated, the Interior Department and Cook Inlet's regional and village corporations agreed that certain village deficiency lands would be conveyed to the regional corporation to hold in trust until the village acre entitlement was finally determined. These deficiency lands were primarily in the Talkeetna Mountains and around Tuxedni Bay on the west side of Cook Inlet. Under that agreement, Cook Inlet regional corporation won approval to select some of these village deficiency lands, in lieu of some of its out-of-region acreage.

2. The State of Alaska agreed to deed back to the United States, for subsequent conveyance to Cook Inlet regional corporation, about 500,000 acres in the Beluga area on the west side of Cook Inlet and in the Kenai area of the Kenai Peninsula. The regional corporation in turn was to convey surface rights on this acreage to its village corporations but retain subsurface rights; the Beluga area is believed to have substantial coal deposits, and the Kenai area is a known oil and gas province. The state had some control over which specific tracts the corporation selected in these two general areas.

3. The federal government agreed, in exchange for the state's relinquishment of the 500,000 acres cited above, to deed to the State of Alaska about one million acres, largely in the Nushagak and Koksetna River drainages of the Bristol Bay area, at Kamishak Bay on the southwestern tip of Cook Inlet, and along the Talkeetna Mountains. This acreage was not to be counted against the state's land entitlement under the statehood act, and had formerly been largely closed to state selection because it had been withdrawn by the federal government for possible inclusion in the nation's park system. The state also won the right to select as many as 275,000 additional acres in the Koksetna River area and in the Talkeetna Mountains; this acreage was to be charged against the state's entitlement under the statehood act. Lands to be deeded to the state in this exchange were considered largely park and recreation lands.

4. The federal government agreed to deed to the state, at some point in the future, about 6,000 acres from within several federal installations in the Municipality of Anchorage; these tracts had become important public recreation areas and had formerly been closed to state selection.

5. Village corporations of Cook Inlet agreed to relinquish selection rights in the Lake Clark area, in exchange for surface rights to lands the state was giving up in the Beluga and Kenai areas; the state agreed not to select these relinquished lands, which the Interior Department wanted for establishment of a new national park.

As of mid-1981, the status of this very complex agreement was:

1. The Interior Department had conveyed to Cook Inlet Region, Inc. about 552,000 acres in the Cook Inlet area. Most of this land, about 500,000 acres, was the land which the State of Alaska had deeded back to the federal government for conveyance to the corporation and its village corporations.

2. The Interior Department had conveyed to Cook Inlet regional corporation about 82,000 acres of oil, gas, and coal rights in the Kenai National Wildlife Refuge; 220,000 acres of such subsurface rights were granted the corporation under the agreement.

3. The U.S. Fish and Wildlife Service (FWS) and Cook Inlet Region, Inc. were negotiating again over acreage the corporation will receive within the Kenai refuge; the Fish and Wildlife Service hopes to win an agreement that would reduce the acreage to which the corporation will receive subsurface rights in the refuge; in exchange for such a reduction, FWS would exempt the corporation from the surface-protection requirements contained in the 1976 agreement.

4. Cook Inlet Region, Inc. has not yet completed its out-of-region selections and has until 1983 to do so.

5. The only out-of-region lands that have thus far been conveyed to the corporation are federal surplus properties, from the pool of such properties that was to be established; 186 acres of federal surplus properties outside Cook Inlet region have been conveyed to the corporation, and 63 acres within the region. Under the "acre-equivalent" formula contained in the exchange agreement, these 240 actual acres translate into 6,500 acre-equivalents; thus, 6,500 acres will be deducted from the 684,000 out-of-region acres Cook Inlet was to receive. As noted earlier, this surplus property pool was to have contained 138,000 acres. For a number of reasons, the federal government has been unable to place that many surplus acres in the pool, and the 1980 Alaska Lands Act added another provision to the 1976 agreement: Cook Inlet Region was authorized to obtain federal surplus property anywhere in the

United States. The federal treasury department is now establishing an account for the corporation to use in bidding on such federal properties, and any acreage the corporation acquires this way will be charged, under the acre-equivalent formula, against its 684,000 acre out-of-region entitlement.

6. Under the separate 1976 agreement among Cook Inlet regional and village corporations and the Department of the Interior, the regional corporation had by mid-1981 selected about 88,000 acres of village deficiency lands described earlier; this acreage will also be deducted from the corporation's out-of-region lands.

Sealaska 14(h)(8) Lands

Sealaska Corporation, the Native regional corporation for Southeast Alaska, in 1976 won congressional approval (amendments to the Alaska Native Claims Settlement Act, section 10, P.L. 92-204) to select its 200,000 acre 14(h)(8) lands entitlement from the Tongass National Forest, which covers about 16 million acres in the southeast region.

Because the Tlingit-Haida Indians had been awarded a cash settlement of their land claims by the Court of Claims before the settlement act was passed, the regional and village corporations of Southeast Alaska received few of the 40 million acres Congress appropriated for

all Alaska Natives. Aside from subsurface rights on village corporation lands, Sealaska Corporation was entitled to receive lands only under section 14(h)(8) of the act, which called for certain "unreserved and unappropriated" public lands to be allocated among the regional corporations.

Sealaska argued before Congress that the only lands outside the Tongass Forest in its region were mountains and glaciers without the timber the corporation needed to produce revenues for its stockholders. The corporation asked for, and ultimately got, an amendment to the settlement act allowing it to select its 200,000 acres of 14(h)(8) lands in areas of the Tongass Forest that had been withdrawn for, but not selected by, village corporations. The only restriction that Congress placed on this amendment was that Sealaska was barred from selecting lands that had been withdrawn for the village of Angoon, on Admiralty Island. (Admiralty Island was, at that time, a subject of strong controversy between those who wanted to have it placed in federal protective status and those who wanted it to remain open for logging.)

Admiralty Island Land Exchange

Section 506 of the Alaska National Interest Lands Conservation Act, P.L. 96-487, ("Alaska Lands Act") resolves what had been a well-publicized dispute among several Native corporations and environmental

organizations over Native land selections on Admiralty Island in Southeast Alaska.

Before the lands act was passed, the Secretary of the Interior had withdrawn lands on Admiralty Island for three Native corporations: the village corporation for Angoon, the only village on the island, and the urban corporations representing Natives of Juneau and Sitka. Each of these corporations was entitled to 23,040 acres under the Alaska Natives Claims Settlement Act. Although Admiralty Island was part of the Tongass National Forest and had been the scene of several logging operations in the past, much of the one-million-acre island was wilderness at the time the settlement act was passed. The Sierra Club and other groups sought to have the entire island declared a national monument, and the village of Angoon agreed.

To keep the island essentially as it was, the corporation representing Angoon was willing to give up rights to timber on Admiralty for such rights elsewhere, and asked Congress to bar Juneau and Sitka corporations from the island and provide them instead with lands of "equal value" elsewhere in the national forest. The Juneau and Sitka corporations, on the other hand, maintained that, for a number of reasons, lands of equal value off Admiralty might not be available, and that because the Interior Secretary had in fact withdrawn Admiralty lands for the Juneau and Sitka corporations, those corporations had legal rights to those lands.

After years of negotiations between the departments of Interior and Agriculture, the three village and urban corporations, Sealaska Corporation, and environmental groups, the issue of land ownership and use on Admiralty Island was resolved by the Alaska Lands Act:

1. 921,000 acres of the island were declared a national monument, to be managed by the U.S. Forest Service.

2. Goldbelt, Inc., the corporation representing Juneau Natives, agreed to give up its approximately 20,000 acres of selections on Admiralty Island in exchange for approximately 27,000 acres on Berners Bay and Douglas Island near Juneau.* The corporation in addition retained rights to about 3,500 acres in the same approximate area; this 3,500 acres had been part of Goldbelt's original selections, made at the same time it selected the 20,000 acres on Admiralty. Thus, from an entitlement of 23,040 acres under the settlement act, the corporation negotiated a settlement of about 30,000 acres. The terms of this exchange were laid out in an April 1979 agreement among Goldbelt, Inc., Sealaska Corporation and the Department of Interior and Agriculture; the lands act simply ratified the agreement.

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*The state in 1978 filed selections on some of these lands, but the Interior Department rejected these selections on the grounds that Goldbelt, Inc. had selection rights.

3. Shee Atika, Inc., representing Sitka Natives, did not agree to move off Admiralty Island, and will receive about 23,000 acres on northern Admiralty Island. The corporation had originally asked the Interior Department for lands nearer the village of Angoon--although the corporation kept lands on Admiralty Island, it did not receive its first choice lands.

4. Kootznoowoo, Inc., the village corporation representing Angoon, will receive the following under terms of the exchange:

    a. Rights to timber on 21,000 acres on Prince of Wales Island.

    b. Restricted surface rights to a strip of coastline, 660 feet wide, along Kootznoowoo Inlet, where Angoon is located; the corporation received no timber rights along this coastline, and must allow public access. (The Burea of Land Management has yet to determine acreage included in this grant.)

    c. Surface rights to approximately 9,000 acres around Angoon. (Whether Angoon will receive full surface rights, including rights to timber, on this acreage around the village has not yet been determined by the BLM.)

5. Sealaska Corporation, the regional corporation for Southeast Alaska, will receive the following:

a. Subsurface rights to lands granted the Sitka corporation on northern Admiralty Island.

b. Subsurface rights to 23,040 acres of the roughly 30,000 acres the Juneau corporation will receive.

c. Subsurface rights to lands selected by Angoon corporation on Prince of Wales Island.

d. Subsurface rights to the acreage granted to Angoon around the village.

e. The regional corporation will not receive subsurface rights to the coastal area granted the Angoon corporation.

Some lands granted in the exchange have not yet been surveyed, and precise final acreages are not known in some cases; some conveyances have been made under the exchange, and the Solicitor's Office of the Interior Department is examining, for the BLM, questions about acreages and rights granted to Angoon corporation under the exchange.

Koniag Land Exchange

The Koniag land exchange, section 1427 of the Alaska Lands Act, resolves two long-standing disputes between the Native regional and village corporations in the Kodiak area and the Department of the Interior. One dispute had been over lands the department had made available to the Native corporation in the region that includes Kodiak and Afognak Islands and part of the Alaska Peninsula. Because existing federal withdrawals and approved state land selections covered much of both islands when the Alaska Native Claims Settlement Act was passed, the Interior Department had opened lands on the Alaska Peninsula for Koniag and several of its village corporations. The corporations said this peninsula land was not similar to lands they had

used historically, and that it had no known economic value. The second dispute had involved seven area villages which Koniag regional corporation had maintained were eligible for benefits under the settlement act, and which the Interior Department had held were not.

This land exchange settled both disputes by recognizing the villages in question as eligible for limited benefits, and by awarding Koniag Region, Inc. and its village corporations--including those that had been in dispute--joint ownership of about 280,000 acres of timber lands on Afognak Island in exchange for the corporations' relinquishment of about 340,000 acres on the Alaska Peninsula, for addition to the nation's wildlife refuge system.

Before the land exchange was approved, the following situation existed:

1. About 330,000 of Afognak Island's total 460,000 acres were included in the Chugach National Forest. The State of Alaska and the Kodiak Island Borough owned or had claims to approximately 15,000 to 20,000 acres on Afognak.

2. Two Native village corporations and the special corporation representing Natives in the city of Kodiak had surface rights to about 127,000 acres on Afognak; Koniag Region, Inc. held subsurface rights to that acreage.

3. Village corporations on Kodiak Island held surface rights to some acreage selected from within the Kodiak National Wildlife Refuge; the regional corporation was barred from receiving corresponding subsurface rights in the refuge, and held "in lieu" subsurface rights to about 350,000 acres on the Alaska Peninsula.

4. In addition to the 350,000 acres of subsurface rights Koniag corporation held on the Alaska Peninsula, the regional corporation and its village corporations had surface and subsurface rights to 340,000 more acres on the peninsula. These 340,000 acres included three kinds of land entitlements under the settlement act:

   a. About 50,000 acres represented the regional corporation's surface and subsurface entitlement under section 14(h)(8) of the act;

   b. About 200,000 acres were "deficiency" lands held by five village corporations which had not been able to select their full entitlements on Kodiak and Afognak Islands; the regional corporation held subsurface rights on this acreage.

   c. Roughly 100,000 acres were lands village corporations were entitled to under section 12(b) of the settlement act; section 12(b) says that if any acreage remains after all village corporations have received their initial land entitlements from the 22 million acres allotted for village selection, that remaining acreage is to be divided among the regional corporations for re-allocation to their village corporations. The regional corporations retain subsurface rights on these 12(b) lands.

Given this existing situation, the legislated Koniag land exchange approved several changes:

1. The federal government recognized the disputed villages as eligible for limited benefits. Three disputed villages on Kodiak Island each received rights to a single square mile--640 acres--outside the Kodiak wildlife refuge. The other disputed villages received no separate land entitlement, but did win part ownership of acreage on Afognak Island, as detailed below. Had these disputed villages won an administrative or legal recognition of full rights under the settlement act, they could theoretically have been entitled to several hundred thousand acres of land.

2. Koniag, Inc. and its village corporations agreed to give up surface rights to 340,000 acres on the Alaska Peninsula, in exchange for joint surface rights to about 280,000 acres of timber land on Afognak Island--acreage that had formerly been part of the Chugach National Forest. (Ownership of the surface of this Afognak acreage was divided among the regional and village corporations because all the corporations had given up some surface rights on the Alaska Peninsula--the regional corporation gave up its section 14(h)(8) surface rights, and each of the village corporations gave up surface rights on either deficiency or section 12(b) lands.)

3. Koniag, Inc. agreed to relinquish its subsurface rights to the above 340,000 acres, in exchange for subsurface rights to the 280,000 acres on Afognak.

4. About 50,000 acres on Afognak--the balance of the federal land remaining on the island--was transferred from the Chugach National Forest to the Kodiak National Wildlife Refuge.

5. The state retained rights to several thousand acres on Afognak, and the Kodiak Borough agreed to trade some of its acreage on Afognak to the Native corporations in exchange for Native-owned acreage the borough wanted on Kodiak Island.

6. The Native corporations receiving title to Afognak lands agreed to leave most of those lands open for public hunting; the state's only elk herd is on the island.

7. The 340,000 acres relinquished by the Native corporations on the Alaska Peninsula became part of the new Alaska Peninsula National Wildlife Refuge.

8. On the remaining 350,000 acres to which Koniag regional corporation had held subsurface rights on the Alaska Peninsula, the corporation retained only rights to oil and gas. This acreage to which the corporation retained petroleum rights also falls within the new wildlife refuge, and any petroleum exploration there must meet environmental protection standards for wildlife refuges as contained in the Code of Federal Regulations.

By mid-1981, the provisions of the Koniag land exchange had yet to be carried out.

Arctic Slope Regional Corporation Land Exchange

Section 1431 of the Alaska Lands Act ratifies an exchange agreement signed by Arctic Slope Regional Corporation and the Department of the Interior in 1979. The agreement includes a number of exchanges between the Native corporation and the Interior Department, but the most important exchange provisions are (1) Arctic Slope Corporation won lands at Karupa Lake which the corporation believes have oil and gas potential; these lands would otherwise have been included in the Gates of the Arctic National Park; (2) Arctic Slope corporation will have the option of obtaining subsurface rights on village corporation lands within the National Petroleum Reserve and the Arctic National Wildlife Refuge, should the federal government open those reserves to commercial petroleum development within the next 40 years.

Negotiations between the Interior Department and Arctic Slope corporation were largely spurred by controversy over certain lands at Karupa Lake. In the early 1970s, these lands had been both withdrawn by the Interior Department for possible creation of a national park and selected by Arctic Slope corporation. Section 17(d) of the Alaska Native Claims Settlement Act allowed such dual withdrawals, and stipulated that if Congress had failed to declare the lands in question part of the national park system by 1978, the lands were to become available to the Native corporation which had selected them. Arctic Slope corporation particularly wanted this Karupa Lake acreage because of its oil and gas potential. Congress failed to declare the Karupa

Lake area a national park by 1978, but the Interior Department and the President then made special executive withdrawals of the lands in question, preventing Arctic Slope corporation from receiving them. Summarized below is the Karupa Lake exchange agreement and other provisions of the 1979 Interior Department-Arctic Slope agreement:

1. Arctic Slope Regional Corporation agreed to relinquish any selection rights it held, or may have hoped to gain, on about 210,000 acres in the John River-Karupa Lake area.

2. Arctic Slope corporation agreed to deed back to the United States 114,000 acres the corporation owned south of Chandler Lake near Anaktuvuk Pass; these lands were to become part of the Gates of the Arctic National Park.

3. In exchange for the 114,000 acres given up by the regional corporation, the Interior Department agreed to convey to the corporation 124,000 acres, with 32,000 of those acres including subsurface rights only--73,000 acres near Anaktuvuk Pass; 19,000 acres at Karupa Lake; and 32,000 acres of subsurface rights only near Itkillik Lake. The Karupa Lake acreage borders the Gates of the Arctic National Park, and the regional corporation is required to allow public access across these lands and to prepare plans of operation for approval by the Secretary of the Interior before undertaking any petroleum exploration or development. The corporation's surface access to its subsurface rights near

Itkillik Lake will be subject to applicable federal and state regulation.

4. The Arctic Slope corporation agreed to grant the Interior Department conservation easements for protection of Arctic peregrine falcons on the corporation's lands along the Colville River.

5. The Interior Department agreed to convey to Arctic Slope corporation certain lands north of the Gates of the Arctic National Park; these lands, like those at Karupa Lake, had been both withdrawn by the Interior Department and selected by the regional corporation under section 17(d) of the settlement act; the corporation would have been eligible to receive these lands in 1978 had the President not made them part of a special executive withdrawal that year.

6. The Interior Department agreed to allow Kaktovik village corporation to select its full 92,000-acre surface entitlement within the Arctic National Wildlife Refuge; under terms of the settlement act, the corporation had been limited to selecting 69,000 acres within the refuge. Kaktovik corporation agreed to give up 23,000 acres it had previously selected outside the refuge.

7. Arctic Slope Regional corporation won the right to exchange its "in lieu" subsurface rights on lands outside the National Petro-

leum Reserve and the Arctic National Wildlife Refuge for subsurface rights on village lands within those two reserves, should the federal government open those reserves to commercial petroleum development within the next 40 years. Such development would have to take place within 75 miles of village corporation lands to open the way for the exchange, and the regional corporation would have to give up equal subsurface acreage outside the reserves.

Doyon Regional Corporation Land Exchange

Sections 1419-1422 of the Alaska Lands Act authorize a three-way land exchange between Doyon, Ltd., the State of Alaska, and the Interior Department. The exchange is intended to eliminate Doyon holdings in two national reserves; to allow the state and Doyon to obtain lands formerly closed to their selection; and to consolidate land ownership in Interior Alaska.

Under the exchange, Doyon corporation agreed to give up about 218,000 acres of selection rights to lands the federal government wanted to include within the Kanuti National Wildlife Refuge and the Yukon-Charley National Preserve and 48,000 acres the state wanted in the Lower Yukon River area. In exchange for this relinquishment, Doyon will receive about 256,000 acres elsewhere, including 94,000 acres of state lands and 160,000 acres which the Interior Department had previously withdrawn under section 17(d) of the settlement act.

Doyon had previously gone to court, maintaining that its selections should take priority over 17(d) withdrawals; under this agreement, Doyon agreed to drop the lawsuit in exchange for conveyance of some of the disputed lands.

In exchange for the 94,000 acres the state gave up for Doyon, the state will receive the 48,000 acres from Doyon--noted above--and 46,000 acres which the federal government had previously withdrawn from state selection under section 17(d) of the settlement act.

Finally, Doyon also won the right to select up to 23,040 acres from the Yukon Flats National Wildlife Refuge, and rights to explore for minerals before making its selection; such exploration, particularly in the Hodzana River area, will be subject to Interior Department regulation.

Appendix C. Estimation of Timber Values

By

Matthew Berman, ISER

This paper discusses estimates of the current market value of standing timber on the various selection areas included in the three proposed and two benchmark land settlement alternatives we analyzed. The estimates of value consider only the current inventory of sawtimber. Discounted values of future harvests of immature and second-growth stands are, in all cases, small compared to values of stands which can be harvested within the next two decades.

Estimates of acres and volume of operable standing timber are based on working inventories used by the public agencies which currently manage the affected lands. Information on state lands in the Cape Yakataga area is derived from the inventory organized by township used by the Division of Forest, Land, and Water Management, and modified by the results of an aerial survey undertaken by the state during August 1981. Acreage and volume estimates for the Tongass National Forest selection proposals were derived from data developed for the Tongass Land Management Plan, as discussed in a memo from W. H. Wilson to Walt Sheridan, dated June 26, 1981.

Timber volume and acreage data for selection areas within the Chugach National Forest were obtained from the Chugach National Forest

inventory using the following method. Forest Service stand map overlays were used to identify individual timber stands and portions of stands lying within proposed selection unit boundaries. Inoperable stands were screened out with the harvest operability codes associated with each stand. Operable stands included those which could be logged with tractor, A-frame, high-lead, and skyline methods. The condition class codes for each operable timber stand provided estimates of the total volume in the unit.

The basic approach to estimating the current market value of timber land is an application of multiple regression analysis of 80 independent timber sales on the Tongass and Chugach National Forests from 1970 through 1980. Net stumpage values, adjusted for inflation and currency fluctuations, are estimated to vary as a function of information generally available from inventory data. A statistical analysis found the independent variables having a significant impact on stumpage prices were the Producers Price Index for forest products (representing the impact of trend and cyclical forces affecting the industry), miles of temporary roads per MBF (dependent on volume per acre), an index of log prices, size of the sale, and the percentage of volume composed of higher-value Sitka Spruce and Alaska Yellow Cedar. This approach is parallel to that of Mehrkens and Covel[1] but extends it by attempting to estimate the effect of

[1]Joseph Mehrkens and George Covel, "Economic Suitability for Timber Production, Prince William Sound-Copper River Area," U.S. Forest Service, Juneau, Alaska. May 1981.

differences in characteristics of timber stands observable from inventory data on what buyers have actually been willing to pay for timber in the region.

The estimated timber values reflect prices which were actually bid for the right to harvest similar tracts of timber over a period of approximately five years. Timber purchasers' harvest schedules and discount rates were implicit in their bids for the right to harvest timber over a period of approximately five years. However, in applying these prices to large areas of timber, such as are included in the proposed land settlement alternatives, it is necessary to assume that the entire area of timber could be harvested within a period of approximately five years without depressing the market price of timber. We discuss the validity of this assumption at the end of this appendix.

Assumptions

The analysis of timber values employs the following specific assumptions:

1. Species composition in the Tongass National Forest selections is similar to the region averages.

2. Timber acres and volumes in the Cape Yakataga state inventory represent operable lands. (This is not explicit in the supporting materials, but the entire volume was included in the state forester's allowable cut computation.)

3. Average volume per acre in the Chugach National Forest parcels is the same as that found for the RARE-II survey (23 MBF/acre). The weighted average volume using the stand condition codes was around 18 MBF/acre, so the volume on all stands was increased by 5 MBF/acre for this analysis.

4. Accessibility codes for the Chugach National Forest were used for determining road access costs for the Chugach parcels. Tongass National Forest lands were all assumed to have access code 1 (0.2 miles of access road per million board feet of timber) while Cape Yakataga road lengths were derived by projecting experience with prior sales in that area.

5. Data for log prices, producers price index, and currency exchange rates were taken from Mehrkens and Covel.

6. All prices, including the price differential for spruce, are quoted in 1980 price levels. This is deemed more representative of long-run conditions than the temporarily depressed 1981 price levels.

7. A primary processing differential was added to reflect the difference between stumpage values on lands sold with the primary processing requirement and those on private lands without this restriction. This differential was computed from cost summaries and price data contained in the Forest Service Region 10 Appraisal Handbook, updated March 1981.

Regression Results

The regression equations estimated from the reports on 80 independent timber sales in the Tongass and Chugach National Forests held between January 1970 and the end of 1980 are shown in Table C-1. Equation (1) estimates net stumpage values as a function of a cost index for the forest products industry (PPI), the price of logs in 1980 dollars (RPLOGS), a dummy variable for sales in the Chugach National Forest (CHUG), the percent of volume represented by Alaska Yellow Cedar (AYC), the size of the sale (VOLUME), and the estimated miles of temporary roads required per thousand board feet to be harvested (TEMPMI/ VOLUME).

Equation (2) shows how miles of temporary logging roads depend on acres to be harvested. Equation (3) shows how the cost in 1980 dollars of permanent access roads (ROADCOST) depends on the number of miles of road. Equations (2) and (3) were also estimated adding a trend term as an independent variable, but the trend coefficient was not significant. Equation (1) represents the best statistical relationship that could be fitted to the pattern of stumpage prices. However, equations (2) and (3) are necessary to estimate values for TEMPMI and ROADCOST since values for these independent variables are not known from timber inventory data available to forecast stumpage values for proposed timber land selections.

Estimates of the stumpage values of individual parcels followed a three-step procedure. First, estimates for operable commercial timber acres and volumes and miles of access road were obtained from timber inventory data as described in the text. Secondly, equations (2) and (3) provided estimated values for temporary road miles and access road costs, given the timber acreage and access road miles. Finally, estimates of stumpage values were derived by applying equation (1). Total value of timber for a land selection is, of course, the estimated stumpage times the estimated volume from the inventory.

TABLE C-1. REGRESSION COEFFICIENTS FOR ESTIMATES OF TIMBER VALUES

(figures in parentheses represent t statistics)

Equation	(1)	(2)	(3)
	Dependent Variables		
Independent Variables	STUMPAGE	TEMPMI	ROADCOST
Constant	31.14 (1.24)	-0.4743 (-0.68)	-824.3 (-0.04)
PPI	-46.46 (-5.85)		
RPLOGS	0.2256 (4.57)		
CHUG	43.76 (1.86)		
AYC	6.791 (4.99)		
VOLUME	0.000623 (2.94)		
TEMPMI/VOLUME	-75916 (-3.19)		
ACRES		0.00700 (4.26)	
ROADMI			135027 (17.76)
R^2	.65	.48	.80
Degrees of Freedom	73	78	79

TABLE C-1. REGRESSION COEFFICIENTS FOR ESTIMATES OF TIMBER VALUES (continued)

Estimation method: Equations (2), (3): ordinary least squares
Equation (1): weighted least squares, weighted by volume

where STUMPAGE = statistical high bid for stumpage in $/MBF

TEMPMI = miles of temporary roads

ROADCOST = cost of specified roads

PPI = ratio of producers price index for forest products in observation year divided by the value of the index in 1980

RPLOGS = average price of export logs, $/MBF, adjusted for currency fluctuations, times PPI

CHUG = dummy variable for sales in the Chugach National Forest

AYC = percent of volume represented by Alaska Yellow Cedar

VOLUME = volume to be harvested, in MBF

ACRES = acres to be harvested

ROADMI = miles of specified roads

In applying equation (1), the method assumed there was no Alaska Yellow Cedar in the parcel* and that, where otherwise not known, the percent of Sitka Spruce for the Tongass National Forest and the Chugach National Forest selections were equal to the averages for the sample of timber sales in those forests. Where estimates of the percent of spruce were known, as in the Cape Yakataga area and in certain stands in the Chugach National Forest inventory designated as pure spruce, the stumpage for these stands was adjusted from the Chugach National Forest base by the formula $300 (% spruce - 60/100). Three hundred dollars was the approximate price differential between spruce and hemlock cants in 1980.

Since estimates of stumpage prices were in 1980 dollars, the value of the PPI variable in equation (1) was set at 1.0. Since the timber sale sample did not contain data for timber sales above 50,000 MBF, there was no information on which to base an assumption of economies of scale beyond that point. The volume term for equation (1) was set at 50,000 MBF for stands or parcels with a timber volume higher than that. In addition, the stumpage forecasts added two terms to equation (1) to reflect differences between costs and values of timber harvests in the national forest sample and those on private lands.

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*Alaska Yellow Cedar is probably present in small quantities in some of the Tongass National Forest selections. However, the price differential for Alaskan Yellow Cedar on national forest lands is due primarily to the absence of a primary manufacturing requirement for this species. The bias in stumpage prices by excluding an adjustment for Alaska Cedar is largely eliminated by the inclusion of a primary processing adjustment, discussed below.

Sale administration costs (not charged to timber purchasers by the national forests), estimated at $6.00 per MBF for private lands, were subtracted from stumpage.* Stumpage price estimates were also adjusted to account for the difference between the value of logs that may be exported without processing and the value of logs with the forest service primary processing requirement. The primary processing adjustment is basically the difference between the value of a thousand board feet in cants and chips and a thousand board feet in logs for export, less the cost of manufacturing the logs and chips. Using prices and costs based on the industry average cost summaries contained in the U.S. Forest Service Region 10 Appraisal Handbook for March 1981, the primary processing differential in dollars per MBF is estimated as

PRIMARY = - 61 (% spruce/100) + 146 (1 - % spruce/100).

Timber Value Estimates

Estimates of operable timber acreage, volume, and value are presented by selection area in table C-2. The southeast Alaska selection area contains approximately 1.7 billion board feet of timber (Scribner rule), worth approximately $160 million. The state-owned Yakataga selection area proposed in the CNI options contains approximately 1.1 billion board feet worth approximately $100 million. The volume and value are approximately 10 percent higher on the larger Yakataga selection area proposed in the federal alternative.

*Mehrkens and Covel, op. cit., cited this figure initially in the draft version of the paper but raised it to $12 in the final version to account for the impact of section 22(k) of ANCSA. Such an increase is not supportable, however, given the manner in which the Bureau of Land Management has implemented the law.

TABLE C-2. ESTIMATES OF TIMBER VALUES BY SELECTION AREA

Selection Area	Commercial Forest Area (Acres)	Est. Volume (MMBF) Scribner Rule	Est. Timber Value w/o Primary Processing Requirement ($ million 1980 Prices)
Southeast Alaska Timber Lands: Total	61375	1682	159.6
Yakutat	15305	413	39.0
Icy Strait	24310	726	70.0
Port Houghton	17090	386	35.2
Big Salt Lake	4670	157	15.4
Yakataga (State) Timber			
Federal Alternative	53156	1195	109.0
CNI Options	50449	1112	100.1
Bering River Coal Field	9865	213.1	17.9
State-Selected Lands			
Shotgun Cove	165	3.5	0.2
14(h)(8) Selections			
Patton Bay	6059	200.3	32.1
McKinley Lake	7343	134.0	20.1
14(h)(8) Overselections			
Whalen Bay	1390	24.6	1.2
Constantine Creek	1222	38.3	3.9
St. Matthews Bay	773	18.2	1.7
Latouche Island	665	13.9	1.2
Macleod Harbor	1223	25.7	2.3
Stockdale Harbor	278	4.2	0.2
Louis Bay	341	6.4	0.4
Northeast Arm, Mummy Bay	92	1.9	0.1
Iron Mountain	1010	20.4	1.1
Martin River Timber Lands	11283	300.1	33.3
Kushtaka Lake Timber Lands	4462	98.6	4.9
Katalla	5323	126.1	4.9

TABLE C-2. ESTIMATES OF TIMBER VALUES BY SELECTION AREA
(Continued)

Selection Area	Commercial Forest Area (Acres)	Est. Volume (MMBF) Scribner Rule	Est. Timber Value w/o Primary Processing Requirement ($ million 1980 Prices)
Eyak Selections	1253	28.7	2.0
Tatitlek Selections	1099	24.3	0.8
Chenega Selections	2166	36.3	1.9
Deficiency Area Selections	7372	177.2	12.3

The various selection areas within the Chugach National Forest have widely ranging operable timber volumes and values. The timber value of the Bering River coal field selection is approximately 18 million dollars for around 200 MMBF. The Katalla selection area includes 126 MMBF worth only about $5 million due to the occurrence of commercial stands in isolated, relatively inaccessible areas.

The Martin River selection area contains about 300 MMBF estimated to be worth $33 million. The Kushtaka Lake selection area includes an additional 99 MMBF. Considered by itself, the inaccessibility of this parcel results in a timber value estimated at only $5 million. The value of development of the Kushtaka area, however, would be more than double this amount if the Martin River parcel were also conveyed, allowing access road costs to be shared.

The Patton Bay and McKinley Lake 14h(8) selections have a value of approximately $65 million. The $30 million estimated for the value of the Patton Bay selection may overstate the actual value, however, due to the difficulty of transfer of logs from the exposed outer coastline.

Aggregation Effects

We estimated current market values for timber separately for each selection area without attempting to estimate the impact of development of one parcel on the value of timber in another. Two separate affects could work to either increase or decrease the combined current market value of the selection areas in the three proposed and two benchmark land settlements. First, harvest costs could be reduced if adjacent parcels were harvested together, which might increase the value of adjacent selection areas in the Chugach National Forest east of the Copper River. The second effect relates to the effect on timber prices of the harvest within a short period of time of large areas of timber. As discussed above, in aggregating timber values over large areas, it is necessary to assume that the total timber volume could be harvested within approximately five years without depressing the price of timber.

In order to examine the validity of this assumption for the three alternative land settlements and the two benchmark alternatives, we compared the size of the total timber market with the volume of timber which would need to be harvested annually over a five-year period for

each alternative. Data on the size of the total timber market of which Alaskan harvests are a part are presented in table C-3. The minimum size of this market is the volume of softwood log exports from the Pacific Coast region. However, the market to some extent includes total timber harvests from this region, as even a small decline in export prices would result in some diversion of export timber to domestic markets.

TABLE C-3. AVERAGE ANNUAL HARVEST AND EXPORT OF FOREST PRODUCTS FROM THE PACIFIC COAST REGION, 1969-1979 (Billion Board Feet)[1]

	Alaska	British Columbia	Washington	Oregon	California	Region Total
Softwood Log[2] exports	0.05	0.1	1.9	0.5	0.1	2.7
Softwood Lumber[2] exports	0.3	1.5	0.2	0.3	0.1	2.4
Total Softwood lumber and log exports[2]	0.4	1.6	2.1	0.8	0.2	5.1
Total timber harvest	0.6[3]	13.0	6.8[4]	8.5[5]	4.7	33.6

Sources: Florence K. Ruderman, Production, Prices, Employment and Trade in Northwest Forest Industries, Third Quarter, 1980, USDA, Forest Service, Pacific Northwest Forest and Range Experiment Station, 1981; and _____, Production, Prices, Employment and Trade in Northwest Forest Industries, Second Quarter, 1980, USDA, Forest Service, PNW Forest and Range Experiment Station, 1980.

[1]Scribner rule, except British Columbia log scale for British Columbia figures.
[2]Excludes exports from U.S. and Canada to each other.
[3]Public lands only.
[4]Average, 1969-1978.
[5]Average, 1969-1977.

Table C-4 compares the annual harvests which would be required if total timber volume were to be harvested over a five-year period with different measures of the total market size, for the three land settlement alternatives and the two benchmark alternatives. For CNI option C, annual harvests would amount to 29 percent of annual softwood log exports from the Pacific Coast region, 15 percent of annual softwood log and lumber exports, and 2 percent of annual total timber harvests. As these figures are not insignificant, it appears that the harvest of the total timber volume of CNI option C over a five-year period would depress the market price to some extent. Thus, the sum of the timber values for the individual selection areas may overstate the total value of the timber in CNI option C. The extent to which the value might be overstated is uncertain. The timber land owner has a choice of harvesting over a period longer than five years, reducing the depressing effect on price, but requiring the discounting of more distant returns. However, to the extent that the real price of timber is rising, the extent to which more distant returns must be discounted is reduced. The land owner's optional harvest schedule will depend on the rate of discount, which may vary among owners.

In contrast, the total timber volume on the status quo alternative is much lower. This timber could probably be harvested over a five-year period without significantly depressing the price of timber. Thus, the timber value obtained by aggregating over individual selection areas probably does not overstate the value of timber on this alternative.

TABLE C-4. ANNUAL HARVEST VOLUME OVER FIVE-YEAR PERIOD*
AS SHARE OF DIFFERENT MEASURES OF TOTAL MARKET SIZE (PERCENT)

Alternative	Share of Average Annual Softwood Log Exports (2.7 billion board feet)	Share of Average Annual Softwood Log & Lumber Exports (5.1 billion board feet)	Share of Total Timber Harvests (33.6 billion board feet)
CNI option C (3.8 billion board feet)	28.7	15.2	2.3
CNI option D (2.3 billion board feet)	17.3	9.2	1.4
Federal Alternative (1.4 billion board feet)	10.5	5.5	0.8
No-Forest Alternative (0.6 billion board feet)	4.5	2.4	0.4
Status Quo Alternative (0.3 billion board feet)	2.5	1.3	0.2

*Annual harvests required if total volume is harvested over a five-year period.

The other land settlement alternatives contain volumes of timber intermediate between those of CNI option C and the status quo alternative. In general, the greater the total volume of timber, the more the aggregation of the timber values of individual selection areas is likely to result in an overstatement of total timber values.

Appendix D: Assessment of Mineral Values

By

Matthew Berman, ISER

The value of the subsurface estate of a given undeveloped parcel of land is always highly uncertain and in many cases entirely speculative. The Chugach Region is somewhat atypical for Alaska in that it has been relatively well-explored for valuable minerals and has a known history of commercial production of subsurface resources. Aside from scattered small-scale placer gold mining, however, commercial mining is nonexistant in the Chugach region at the present time. Exploration continues, but at a relatively low level compared to activity in other regions of the state.

The approach used here to estimate potential mineral values is based on the known mining history of the Chugach region. It starts with the definition of a typical commercial operation drawn from historical experience and known geologic potential for future new discoveries. Given the definition of the type of mine considered appropriate, given geologic information and local production history, the next step is to develop three scenarios intended to bound the probability that geologic and economic conditions permit such an operation to take place in a given area.

The low scenario projects the existing low levels of activity in the minerals sector to continue at roughly their current levels. This scenario includes no significant new discoveries of commercially viable deposits. Prices for important minerals are projected to rise little, if at all, faster than the rate of inflation, so that few known deposits can be brought into production profitably.

The high scenario projects significant new discoveries from geologically promising areas, coupled in some cases with rapidly rising real prices of mineral resources. In this scenario, the local geologic potential rather than economic factors as at present limits the scale and value of mining activity. The high scenario thus envisions a return to the conditions prevailing during the first few decades of the Twentieth Century when the Chugach region produced all of Alaska's coal and oil and contained significant commercial copper and gold production.

The most-likely or mid-range scenario considers the mineral potential to be based on known or inferred resources and current industry exploration interest. World prices for minerals are expected to rise slightly faster than the rate of inflation, which will have a modestly beneficial impact on economic feasibility as compared to current conditions. The location and value of mineral deposits are expected to follow the historical pattern, adjusted for the projected economic climate. At best, however, one can probably estimate only an order of magnitude as the most likely value of minerals on a particular parcel of land.

Analysis

The mineral potential of lands proposed for selection in the Chugach region may be divided into three categories. Locatable minerals historically important in the region are gold and copper. Of leasable minerals, coal and petroleum are both present in the region. Common variety minerals such as sand and gravel are abundant throughout the region and are not considered here to be an important factor in determining the value of mineral resources of specific parcels.

Estimated gold, copper, coal and petroleum mineral values are summarized by selection area in Table D-1. Calculation of these values is discussed below. No attempt was made to consider the potential mineral value of the Southeast Alaska timber lands.

Table D-1: Summary of Mineral Values by Selection Area

(Millions of Dollars)

Selection Area	Resource	Low	Medium	High
Yakataga timberlands	Gold	0.0	0.0	0.3
Icy Bay	Oil	0.1	0.7	6.1
Carbon Mountain	Coal	0.0	2.0	10.0
Bering River Coal Field	Coal	0.0	10.0	60.0
Latouche Island	Copper	0.0	0.3	2.0
Iron Mountain	Copper	0.0	0.3	2.0
Katalla	Oil	0.2	1.4	12.2
Tatitlek Selections	Copper	0.0	0.3	2.0
Chenega Selections	Copper	0.0	0.3	2.0

Gold

The typical gold mine in the region is a small-scale placer mine employing two to five men for a mining season that may last from three to six months. Some deep mining of gold has occurred in the past in the Prince William Sound district but is not foreseen as important in the future. Profitability of most placer mines is low, and mining often takes place intermittently in a delicate balance between gold prices and mining costs.

Given the extensive exploration and production activity, most gold deposits with a high potential for profit have probably been mined or claimed already. Some geologists have talked about the potential for intertidal or subsea mining in Prince William Sound, but these resources are not included in any of the land settlement alternatives. Due to the marginal nature of gold mining, CNI apparently did not make any land selections with the gold resource in mind.

Of all the proposed selection areas, the beach sands in the Cape Yakataga area have the greatest potential for CNI to acquire commercial gold resources. Records show that approximately 15,000 ounces of gold have been dredged from beach sands between the Duktoth River and Cape Yakataga during the past 85 years.[1] In the high scenario,

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[1] Edward H. Cobb, "Summary of References to Mineral Occurrences (other than Mineral Fuels and Construction Materials) in the Bering Glacier, Icy Bay, Middleton Island, and Yakutat Quadrangles, Alaska." U. S. Department of the Interior, Geological Survey. Open-File Report 79-1246, 1979.

Chugach Natives could lease an operation mining 200 ounces of gold per year for 20 years at a 20 percent royalty. With gold selling at $500 per ounce and a discount rate of two percent above the rate of inflation, such an enterprise would be worth about $300,000. In the most-likely and low scenarios, the net present value of gold mining opportunities for Chugach Natives, Inc., is probably negligible for all its proposed selection parcels.

Copper

Copper was mined in the Chugach region at Ellamar, near Tatitlek, and on Latouche Island during the first part of the century. Any new mine is expected to be of a similar type, a deep-mining operation from a deposit containing between 100 and 200 million pounds of copper in a relatively high-grade ore.[2] The closest comparable operation for which any information exists about capital and operating costs is the Greens Creek deposit on Admiralty Island near Juneau. A study by SRI International estimated that the Greens Creek Mine, a somewhat larger operation, mining ore with a somewhat lower value per ton, would require a capital investment of $15 million in 1978 dollars.[3] Assuming

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[2] Edward H. Cobb, "Summary of References to Mineral Occurrences (other than Mineral Fuels and Construction Materials) in the Valdez Quadrangle, Alaska." U.S. Department of Interior, Geological Survey. Open-File Report 79-1241, 1979. Edward H. Cobb and Russell G. Tysdal, "Summaries of Data and Lists of References to Metallic and Selected Nonmetallic Mineral Deposits in the Blying Sound and Seward Quadrangles, Alaska." U.S. Geological Survey. Open-File Report 80-621, 1980.

[3] Impact of the Withdrawal of Alaskan Federal Lands, SRI International, Menlo Park, California, March 1978.

a 20 percent return on a $20 million investment in 1981 prices, discounted at 15 percent for twenty years, the present discounted value of such a mine is approximately $6 million.

Four selection areas are recognized as favorable for discovery of such copper deposits. These are the Latouche Island and Iron Mountain 14(h)(8) overselections, the no-forest alternative Tatitlek selection area near Ellamar, and the Chenega selection area on Knight Island. For the high scenario, one may assume a 30 percent probability that such a mine would be discovered. For the most likely scenario, there is probably only about a 5 percent probability that such a mine would be discovered on each of these areas. This is because these areas have been intensively explored in the past and are overlain with numerous mining claims that would not be transferred to CNI with the land parcels. These pre-existing claims probably mark the most promising deposits likely to be found in the area.

Thus, one can say that the value of these selection areas for potential copper mining is somewhere between zero, for the low scenario, and $2 million, on the high side. The most likely estimate is on the order of magnitude of $300,000 for each area.

Coal

The Bering River coal field selection area, containing over 48,000 acres, was recently estimated to contain over 3 billion tons of

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[4] Alaska Economic Report, June 29, 1981, page 2.

bituminous coal of up to 15,000 BTU per pound.[4] The Bering River field was mined sporadically in the first part of the century and has been the subject of a great deal of speculation and folklore. Due to the complex geology of the area, resulting in folded and faulted coal beds of greatly varying thickness and unpredictable length, any large-scale mining operation would be risky without intensive exploration.

If mining were to take place on a significant scale for export, as under the high scenario, one might envision a 5,000-ton-per-day strip mine smaller than that proposed for the Beluga fields, but about twice the size of the current mine at Healy. At a relatively high mine-mouth price of $30 per ton and a 5 percent royalty, the present discounted value at a discount rate 2 percent above the rate of inflation for a thirty-year lease is about $60 million.

Most geologists feel that large-scale commercial development of the field is unlikely. A more realistic smaller operation, similar in size to the Healy strip mine, would, under the most-likely scenario, have perhaps a one in three chance of succeeding. This would give an expected lease value of around $10 million for the most-likely case. Such a value is not much larger than the combined cost of building the necessary access roads and exploration expenses. As is also the case for timber resources in this area, the conveyance of the Martin River timber parcel, which could pay for access roads, is probably necessary for the economic viability of the Bering River coal fields.

The Carbon Mountain tract, to the east of the Bering River coal field, is a nearly 26,000-acre parcel containing an anthracite coal deposit. Despite the recognized high quality of coal in this area, information on the size and value of the resources is so speculative that no intelligent guess can be made of its value. The isolation and rugged terrain of this region would limit the economic viability of a coal operation even with abundant high-quality resources. However, low, medium, and high values of zero, $2 million, and $10 million--roughly one-fifth the values assigned to the Bering River coal field--were assigned to this tract for illustrative purposes.

Oil

Although industry interest in the potential petroleum resources in the Gulf of Alaska region was once strong, disappointing drilling results both onshore and offshore have led to waning exploration activity. Although 150,000 barrels were produced from Katalla prior to 1933 and several oil seeps are present in the general area, state geologists believe it highly unlikely that any significant fields will be found. The market price of a lease retaining a 20 percent royalty for lands with a relatively low potential for oil discovery would be comparable to that of recent state leases in the Copper River area and some in the Cook Inlet area which sold from $2 to $5 per acre. Taking $3 per acre as a benchmark for the Katalla and Icy Bay selection proposals, the 20 percent royalty lease might bring $200,000 for the entire Katalla area and $100,000 for the Icy Bay area.

Virtually no information exists about the location and size of potential oil-bearing structures in these two areas. If oil were found, however, the absence of infrastructure and the remoteness of the parcels would require that deposits be large in order to be economically viable. An order of magnitude estimate for the size of a field that might be found under favorable conditions and would be large enough to exploit would be 100 million barrels of recoverable reserves. The 20 percent royalty share of such a field would be worth around $600 million in present discounted value.

Although there is always some chance that such a field could be discovered either in the Katalla or Icy Bay selection areas, geologists for the State of Alaska rate such a probability as extremely low. Even under an optimistic high scenario, the chance would still be less than three percent that a major field would be discovered in either parcel. Adding the expected value of royalties to the lease payment, the value of subsurface rights to the Katalla and Icy Bay selection areas under the high scenario might be $12.2 million and $6.1 million, respectively.

Under the low scenario, there will be no royalties collected, so the total value is just $200,000 for the Katalla and one-half that for the Icy Bay selection. A realistic assumption for the most-likely case is only a 10 percent probability of discovering as much oil as is considered in the high scenario. Under this assumption, the expected value of royalties for the two parcels is $1.2 million for Katalla and

$600 thousand for Icy Cape. Adding the value of the lease prices, the total expected petroleum value of the two parcels in the most-likely scenario is $1.4 million and $0.7 million, respectively.

Appendix E: Summary of Chugach Region Mines with a Known History of Production

By

Teresa Dignan, ISER

To identify mines in the Chugach region that have a known history of production we reviewed USGS-compiled summaries for the following quadrangles: Blying Sound, Seward, Bering Glacier, Middleton Island, Icy Bay, Yakutat, Cordova, Valdez, Seldovia, and Anchorage. The review focused on the Prince William Sound mining district but also included the mining districts of Hope, Anchorage, Seward, Homer, Nelchina, and Yakataga.

The review is summarized in the accompanying tables. The mine names are given according to the convention established in the summaries: "Proper names of mines . . . are given if such names appear in the reports cited. If a deposit does not have such a name, but is near a named geographic feature, the name of the feature is shown in parentheses in lieu of a proper name. All placer mines . . . are considered under the name of the stream on which they are located. If a part of a proper name is not always used in references, that part of the name is shown in parentheses" (Cobb, 1979, 1980).

If dates that mining occurred were not clear from the authors' summaries, we inferred possible dates from the list of sources the

authors supplied for each mine description. This approach applies to almost all the dates given for mines in the Blying Sound and Seward quadrangles. For all the other quadrangles most of the dates are as the authors of the summaries determined from their research.

If the minerals mined commercially were explicitly stated in the summary, these minerals were listed. If the authors mentioned only "ore" then those mineral commodities present in the ore were listed.

References

Cobb, Edward H. and Russell G. Tysdal. Summaries of Data on and Lists of References to Metallic and Selected Nonmetallic Mineral Deposits in the Blying Sound and Seward Quadrangles, Alaska. U.S. Department of the Interior, Geological Survey. Open-File Report 80-621. 1980.

Cobb, Edward H. Summary of References to Mineral Occurrences (Other than Mineral Fuels and Construction Materials) in the Anchorage Quadrangle, Alaska. U.S. Department of the Interior, Geological Survey. Open-File Report 79-1095. 1979.

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_____. Summary of References to Mineral Occurrences (Other than Mineral Fuels and Construction Materials) in the Cordova Quadrangle, Alaska. U.S. Department of the Interior, Geological Survey. Open-File Report 79-973. 1979.

_____. Summary of References to Mineral Occurrences (Other than Mineral Fuels and Construction Materials) in the Seldovia Quadrangle, Alaska. U.S. Department of the Interior, Geological Survey. Open-File Report 80-87. 1979.

_____. Summary of References to Mineral Occurrences (Other than Mineral Fuels and Construction Materials) in the Valdez Quadrangle, Alaska. U.S. Department of the Interior, Geological Survey. Open-File Report 79-1242. 1979.

BERING GLACIER, ICY BAY, MIDDLETON ISLAND,
AND YAKUTAT QUADRANGLES, ALASKA

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
(White R.)	MF-373, loc. 4 Yakataga Dist.	Bering Glacier 60°04'-60°05'N, 142°08'-142°12'W	Gold	Unknown and probably small	1908-1916	7
			Silver	Unknown and probably small		
(Yakataga)	MF-373, loc. 5 Yakataga Dist.	Bering Glacier 60°01'-60°04'N, 142°02'-142°21'W	Gold	15,000-16,000 oz.	1897-present	8-10
(Middleton I.)	MF-380, loc. 1 Pr.Wm.Sd. Dist.	Middleton Island 59°24'N, 146°22'W	Gold	385 oz.	Early 1900s	16

Source: Cobb, Edward H. "Summary of References to Mineral Occurrences (other than Mineral Fuels and Construction Materials) in the Bering Glacier, Icy Bay, Middleton Island, and Yakutat Quadrangles, Alaska." United States Department of the Interior, Geological Survey. Open-File Report 79-1246, 1979.

SELDOVIA QUADRANGLE

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
Alaska Hills (Mines Corp)	MF-397, loc. 20 Homer Dist.	Seldovia 59°34'N-150°38'W	Gold	>1,935 fine oz. thru 1931; no data on later production.	1924-1928 1933-1939	5
(Anchor Point)	MF-397, loc. 31 Homer Dist.	Seldovia 59°45'-59°46'N, 151°52'W	Gold	Amt. unknown; small-scale operations	1889-1911 Intermittent	8
(Claim Point)	MF-397, loc. 1 Homer Dist.	Seldovia 59°12'N, 151°49'W	Chromite	c 2000 tons	1917-1918	11-13
			[Total resource above low tide level estimated to be 260,000 tons averaging 17.8% Cr_2O_3 content that could be concentrated to about 75,000 tons with 45% Cr_2O_3--1978 source.]			
Glass & Heinfer	MF-397, loc. 19 Homer Dist.	Seldovia 59°33'N, 150°41'W	Gold, lead, silver, zinc	Amt. unknown; "some ore mined"	Dev. wk. beg. 1924; 1932-34 wk. couldn't justify a mill; 1934-65 idle; 1967 mill installed; [no info. past 1967]	15
Goyne	MF-397, loc. 26 Homer Dist.	Seldovia 59°31'N, 150°30'W	Gold	3½ tons of ore returned 4.10 oz. gold and	1931-1934? Unsuccessful wk. after WWII	16-17
			Silver	1.72 oz. silver; no other production reported.		
Nukalaska Mining Co.	MF-397, loc. 17 Homer Dist.	Seldovia 59°31'N, 150°40'W	Gold	About $35,000 worth of gold produced 1934-40.	1934 or 35 - 1940	26

SELDOVIA QUADRANGLE (continued)

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
(Red Mtn.)	MF-397, locs. 4-13 Homer Dist.	Seldovia 59°21'-59°23'N 151°28'-151°32'W	Chromite, cobalt, nickel	21,650 tons of ore with 40-46% Cr_2O_3	1942-44; c 1954	28-31
			[Total resource of deposits estimated to be 67,500 tons of shipping ore and 112,250 tons of concentrating ore; total chromite content 118,500 tons.]			
Rosness & Larson	MF-397, loc. 22 Homer Dist.	Seldovia 59°34'N, 150°35'W	Gold	Small amount probably $15,000 worth	1931-1933	33
Sonny Fox	MF-397, loc. 28 Homer Dist.	Seldovia 59°32'N, 150°28"W	Gold	About $70,000 worth (at values for years mined)	1926-1940	38

Source: Cobb, Edward H. "Summary of References to Mineral Occurrences (other than Mineral Fuels and Construction Materials) in the Seldovia Quadrangle, Alaska." United States Department of the Interior, Geological Survey. Open-File Report 80-87, 1979.

ANCHORAGE QUADRANGLE

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
Agostino [some confusion betw. this mine and the Jewel Mine)	MF-409, loc. 53 Anchorage Dist.	Anchorage 61°03'N, 149°07'W	Gold Silver (maybe)	Amt. unknown; probably small. Silver alloyed with gold (75 pts. silver, 25 pts. gold)	1909-1939 w/interruptions	5
Bahrenberg	MF-409, loc. 52 Anchorage Dist.	Anchorage 61°03'N, 149°06'W	Gold, lead, zinc	7 tons ore shipped	Concluded from refs. between 1915-1933	12
(Barry Arm)	MF-409, loc. 55 Pr.Wm.Sd. Dist.	Anchorage 61°05'-61°06'N, 148°06'-148°09'W	Antimony, gold (?)	1,000 lbs. of stibnite ore taken out before 1910	Prior to 1910	14
(Bird Cr.)	-- Anchorage Dist.	Anchorage 61°03'N, 149°17'W (app.)	Gold	Production very small	1898-1938	16
(Crow Cr.)	MF-409 locs. 115,116 Anchorage Dist.	Anchorage 61°00'-61°02'N, 149°05'-149°06'W	Gold	Amt. unknown; [much written up, but nothing on production]	1898 to WWII	28
Gunnysack [may have become part of Jewel]	MF-409, loc. 53 Anchorage Dist.	Anchorage 61°03'N, 149°06'W	Gold	Maybe a little production	1928	54
Jewel (1)	MF-409, loc 53 Anchorage Dist.	Anchorage 61°03'N, 149°06'W	Copper, gold lead, silver, molybdenum	Amt. unknown probably small	1921-1939 sporadic	67

ANCHORAGE QUADRANGLE (continued)

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
(Metal Cr.)	MF-409, locs. 95-109 Anchorage Dist.	Anchorage 61°26'-61°37'N, 148°20'-148°32'W	Gold	Amt. unknown; probably worth no more than few thousand $	1906-present, intermittent	104-5
			Platinum	Amt. unknown; production just reported		
Mitchell & Meyers	MF-409, loc. 57 Pr.Wm.Sd. Dist.	Anchorage 61°01'N, 148°11'W	Gold, lead	Very little development	c 1914	108
(Peters Cr., tributary Knik Arm)	MF-409, loc. 50 Anchorage Dist.	Anchorage 61°14'N, 149°05'W (app)	Chromite (?) copper, gold, lead, jade (?)	Amt. unknown; some ore may have been mined but not shipped in 1917	(1917)	121
(Poorman Cr.)	MF-409, loc. 90 Nelchina Dist.	Anchorage 62°00'N, 147°17'W	Gold	Amt. unknown; "a little placer gold production"	1914	124
(Rainbow Cr.)	-- Anchorage Dist.	Anchorage 61°00'N, 149°38'W	Gold	Inference that mining before 1906 and some activity in 1937-1938	1906, 1937-38	130

Source: Cobb, Edward H. "Summary of References to Mineral Occurrences (other than Mineral Fuels and Construction Materials) in the Anchorage Quadrangle, Alaska." United States Department of Interior, Geological Survey. Open-File Report 79-1095, 1979.

VALDEZ QUADRANGLE

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
Alice (Mines Ltd.)	MF-438, loc. 13 Pr.Wm.Sd. Dist.	Valdez 61°08'N, 146°36'W	Copper, gold, lead, silver, zinc	Small ore shipments in 1912 and 1916	1912 & 1916	9
Big Four (Mineral Cr.)	MF-438, loc. 22 Pr.Wm.Sd. Dist.	Valdez 61°13'N 146°23'W	Gold, lead, zinc	Unknown but small amt. of ore mined	1911-1939 sporadic	17
(Boulder Cr.)	MF-438, loc. 85 Nelchina Dist.	Valdez 61°20'N, (approx) 145°21'W (approx)	Gold	"Has been placer mining on Boulder Cr."; amt. unknown	1913, 1926 (?)	23
Cameron-Johnson (Gold Mining Co.)	MF-438, locs. 3, 4 Pr.Wm.Sd. Dist.	Valdez 61°12'N, 146°38'-146°40'W	Gold	Amt. unknown	1912-1921; attempt to reopen 1935	27
Cliff (Port Valdez)	MF-438, loc. 18 Pr.Wm.Sd. Dist.	Valdez 61°07'N, 146°33'W	Gold	Amt. unknown; annual prod. for many yrs. worth several hundred thousand $	1910-1940 w/interruptions	30
Cube (Mines Co.)	MF-438, loc. 17 Pr.Wm.Sd. Dist.	Valdez 61°08'N, 146°33'W	Gold	Mill operated part of 1917; no data on amt. gold produced	1914-1917	34
Devinney & Dolan	-- Pr.Wm.Sd. Dist.	Valdez NE¼ SW¼ SW¼ quadrangle	Gold	Some production in 1930; no other data	1930	36
Eagle	MF-438, loc. 44 Nelchina Dist.	Valdez 61°19'N, 145°24'W	Gold	<1,000 oz.	1917, 1918	39

VALDEZ QUADRANGLE (continued)

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
Ethel (Mining Co.)	MF-438, loc. 30 Pr.Wm.Sd. Dist.	Valdez 61°13'N, 146°16'W	Gold	Little prod. before 1915; no good data available	1910-1928 Exploration or development work	44
(Fall Cr.)	MF-438, loc. 87 Nelchina Dist.	Valdez 61°22'-61°25'N, 145°07'-145°09'W	Gold	A little placer gold	1898-99, 1910, 1916	45
(Fourth of July Cr.)	MF-438, loc. 88 Nelchina Dist.	Valdez 61°14'N, 145°13'W	Gold	A little placer gold recovered during prospecting & development	1929-30	50
(Gold Cr.)	MF-238, loc. 75 Pr.Wm.Sd. Dist.	Valdez 61°08'N 146°28'W	Gold	Production undoubtedly small	1905-1915 (?)	53
Gold King	MF-438, loc. 2 Pr.Wm.Sd. Dist.	Valdez 61°12'N, 146°44'W	Gold (copper ?)	Amt. unknown; mine consisted of 2,000 ft. or more of workings	1911-1924 prob. not continuously	55
Hercules	MF-438, loc. 23 Pr.Wm.Sd. Dist.	Valdez 61°13'N, 146°21'W	Gold	Prob. some gold prod. in 1916	1912-1916	60
(Hurtle Cr.)	-- Nelchina Dist.	Valdez 61°22'-61°23'N, 145°26'-145°27'W	Gold	A little placer mining; not very productive	1913-1952 (?) [rough est. from dates of sources]	62

VALDEZ QUADRANGLE (continued)

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
Little Giant	MF-438, loc. 29 Pr.Wm.Sd. Dist.	Valdez 61°13'N, 146°17'W	Gold	Unknown; undoubtedly small amount	1913-1939 not continuous	73
(Lowe R.)	MF-438, locs. 80, 81 Pr.Wm.Sd. Dist.	Valdez SE¼ SW¼ quad.	Gold	Amt. unknown; minor prod.	Course gold before 1900; placer mining before 1915.	75
			Copper (?)	--	--	
Mayfield	MF-438, loc. 7 Pr.Wm.Sd. Dist.	Valdez 61°10'N, 146°49'W	Gold	Amt. unknown; production reported in 1936 and 1938	1911-1938 intermittent	79
			Copper (?)	--	--	
Midas (Copper Co.)	MF-438, loc. 40 Pr.Wm.Sd. Dist.	Valdez 61°01'N, 146°16'W	Copper	>1,000,000 lbs.	1911 or 1912-1919	83-85
			Gold (?)	--	--	
Millionaire	MF-438, loc. 23 Pr.Wm.Sd. Dist.	Valdez 61°13'N, 146°21'W	Gold	Small amt. in 1937 (and possibly some other years)		86
(Mineral Cr.)	MF-438, locs. 76, 77 Pr.Wm.Sd. Dist.	Valdez 61°09'-61°12'N, 146°19'-146°22'W	Gold	Amt. unknown; undoubtedly small amount	1894-1914 sporadic	87
Minnie	MF-438, loc. 4 Pr.Wm.Sd. Dist.	Valdez 61°12'N, 146°38'W	Gold, lead	4 tons ore	1913	89
Monte Carlo	MF-438, loc. 24 Pr.Wm.Sd. Dist.	Valdez 61°14'N, 146°20'W	Gold, lead	4 tons ore	1913	90

VALDEZ QUADRANGLE (continued)

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
Mountain King (Mining Co.)	MF-438, loc. 29 Pr.Wm.Sd. Dist.	Valdez 61°13'N, 146°17'W	Copper, gold, lead, zinc	120 tons of ore in 1914	1913-1915	92
National	MF-438, loc. 6 Pr.Wm.Sd. Dist.	Valdez 61°09'N, (approx) 146°50'W (approx)	Gold	Little mortared out during assessment (1915)	1915	98
Opal	MF-438, loc. 54 Nelchina Dist.	Valdez 61°32'N, 144°39'W (app)	Gold, lead silver, zinc	Probably been recent minor production	1977 [date of source]	102
(Quartz Cr.)	MF-438 locs. 50, 89 Nelchina Dist.	Valdez 61°25'-61°30'N, 145°21'-145°24'W	Gold	Loc.50: gold undoubtedly present, but no data on amt.	1898-99 Limited later activity; c 1918	111
				Loc.89: placer gold mined in 1898-99 (50-60 oz.)		
Ramsay-Rutherford (Gold Mining Company)	MF-438, loc. 36 Pr.Wm.Sd. Dist.	Valdez 61°12'N, 146°06'W	Gold	Amt. unknown; one of major gold mines of district (e.g., 1915, 2nd largest producer in dist.; 1916-1917, 1 of 2 largest producers in dist.; 1924, largest gold producer in dist.)	1914-1935 some interruptions	115-16

VALDEZ QUADRANGLE (continued)

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
Rose	MF-438, loc. 29 Pr.Wm.Sd. Dist.	Valdez 61°113'N, 146°17'W	Copper (?), gold, lead	Amt. unknown; minor prod.	1914, 1934, 1935 (?) [confusion re when mining occurred and where]	118
Rose Johnson	MF-438, loc. 34 Pr.Wm.Sd. Dist.	Valdez 61°11'N 146°10'W	Copper, gold lead, zinc(?)	Amt., if any, unknown	1914	119
Rough & Tough	MF-438, loc. 1 Pr.Wm.Sd. Dist.	Valdez 61°12'N, 146°47'W	Gold, silver	Amt. unknown; minor production	1935-1937	121
Seacoast (Mining Co.)	MF-438, loc. 14 Pr.Wm.Sd. Dist.	Valdez 61°09'N 146°35'W	Copper, gold, lead, zinc	Only production recorded is small test shipment c 1914	1913-1916	122
Sealy-Davis (Mining Co.)	MF-438, loc. 15 Pr.Wm.Sd. Dist.	Valdez 61°08'N 146°34'W	Copper, gold, lead, zinc	Two ore shipments reported	1911-1915	123
Silver Gem	MF-438, loc. 11 Pr.Wm.Sd. Dist.	Valdez 61°08'N, 146°37'W	Antimony, gold, lead, silver, zinc	Amt. unknown; ore shipments to custom mill in Valdez reported	1912 (?)	126
Slide	-- Pr.Wm.Sd. Dist.	Valdez 61°16'N, 146°18'W (?)	Gold	Small shipment of ore in 1917	1917	127
Star [see Rose]	MF-438, loc. 29 Pr.Wm.Sd. Dist.	Valdez 61°13'N, 146°17'W	Gold	Amt. unknown; prod. reported in 1934-35	1934-1935	133
Thompson-Ford (Mining Co.)	MF-438, loc. 19 Pr.Wm.Sd. Dist.	Valdez 61°09'N, 146°32'W	Copper, gold, lead, zinc	Amt. unknown; ore shipment reported 1913	1911-1916	140

VALDEZ QUADRANGLE (continued)

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
Tuscarora	-- Pr.Wm.Sd. Dist.	Valdez 61°12'N, 146°38'W (approx)	Gold	A little Prod. reported 1921, 1923-25	1921, 1923-25	144
Valdez (Mining Co.)	MF-438, loc. 33 Pr.Wm.Sd. Dist.	Valdez 61°12'N, 146°12'W	Gold	Amt. unknown; some gold produced incidental to development	1911-1920	146
Wetzler	MF-438, loc. 49 Nelchina Dist.	Valdez 61°23'N, 145°27'W	Copper, gold, lead, zinc	3 tons of ore shipped in 1914	1914 [assessment work as recent as 1971]	148

Source: Cobb, Edward H. "Summary of References to Mineral Occurrences (other than Mineral Fuels and Construction Materials) in the Valdez Quadrangle, Alaska." United States Department of Interior, Geological Survey. Open-File Report 79-1241, 1979.

BLYING SOUND AND SEWARD QUADRANGLES

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
Consolidated	MF-880A, loc.150 Pr.Wm.Sd. Dist.	Seward 60°59'N, 147°54'W	Gold	Less than 769 fine oz.	1914	59
George & McFarland	MF-880A, loc.130 Pr.Wm.Sd. Dist.	Seward 60°57'N, 148°18'W	Gold	Less than 769 fine oz.	c 1914	85
Gold(en) Eagle	MF-880A, loc.160 Pr.Wm.Sd. Dist.	Seward 60°58'N, 148°00'W	Gold	Less than 769 fine oz.	c 1914-1917	88
Golden Wonder No. 1	MF-880A, loc.156 Pr.Wm.Sd. Dist.	Seward 60°58'N, 147°58'W	Gold	Less than 769 fine oz.	c 1914, 1915	90
Granite (Gold Mining Co.)	MF-880A, loc.120 Pr.Wm.Sd. Dist.	Seward 60°58'N, 148°13'W	Gold	More than 7,692 fine oz.	c 1914-1941; 1954 (?); 1967 (?)	95
Herman(n) (& Eaton)	MF-880A, loc.129 Pr.Wm.Sd. Dist.	Seward 60°57'N, 148°21'W	Gold	769-7,692 fine oz.	c 1913-1941	102
Jonesy	MF-880A, loc.222 Pr.Wm.Sd. Dist.	Seward 60°20'N, 147°45'W	Copper	Possibly few thousand tons shipped	c 1908-1918; 1950 (?); 1965 (?)	122
Kavanaugh & Boon	MF-880A, loc.167 Pr.Wm.Sd. Dist.	Seward 60°53'N, 148°07'W	Copper (?) [gold & lead are listed as possible others]	A little ore reported to have been shipped in 1911, 1912, or 1913	1911, 1912, or 1913	123
(Latouche)	MF-880A, locs. 254-256 Pr.Wm.Sd. Dist.	Seward 60°03'N, 147°45'W	Copper	150 million pounds	c 1900-1938 1946-1978	137-8

BLYING SOUND AND SEWARD QUADRANGLES (continued)

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
Monarch	MF-880A, loc.217 Pr.Wm.Sd. Dist.	Seward 60°21'N, 147°47'W	Copper	Some ore may have been shipped	c 1908-1918; 1950 (?); 1965 (?)	161
Moore	MF-880A, loc.232 Pr.Wm.Sd. Dist.	Seward 60°17'N, 147°49'W	Copper	Small Shipment of ore in 1917	1917	162
Nugget	MF-880A, loc.155 Pr.Wm.Sd. Dist.	Seward 60°59'N, 147°57'W	Gold	<769 fine oz.	c 1913-1918	173
Pandora	MF-880A, loc.210 Pr.Wm.Sd. Dist.	Seward 60°21'N, 147°42'W	Copper	Possibly few thousand tons of ore shipped	c 1909-1919; 1950 (?); 1965 (?)	176
Patten Cooperating Co.	-- Pr.Wm.Sd. Dist.	--	Copper (?)	Some ore shipped in 1917	1917	178
Portage Bay Mining Co.	MF-880A, loc.138 Pr.Wm.Sd. Dist.	Seward 60°52'N, 148°32'W	Gold	Between 769 & 7,692 fine oz.	c 1937-1943	183
(Resurrection R.)	MF-880B, loc. 27 Seward Dist.	Seward 60°16'N, 149°41'W	Gold	"A little"	1924	195
Reynolds Ak. Development Company	MF-880A, locs. 258, 259 Pr.Wm.Sd. Dist.	Seward 60°01'N, 147°55'W	Copper ore	"A few shipments . . . rumored . . ."	c 1906-21 1950-67 (?)	196
Sweepstake (Mining Co.) (Avery R.)	MF-880A, loc.148 Pr.Wm.Sd. Dist.	Seward 61°00'N, 147°55'W	Gold	Less than 769 fine oz.	c 1914-1915	229

BLYING SOUND AND SEWARD QUADRANGLES (continued)

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
(Resurrection River)	MF-880B, loc.27 Seward Dist.	Seward 60°16'N, 149°41'W	Gold	A little mined	1924	195
Ronan (and James)	MF-880A, loc.52 Hope District	Seward 60°37'N, 149°34'W	Gold	769 fine oz.	c 1917-1919; 1933 (?) 1967 (?)	199
(Silvertip Cr.)	MF-466, loc.146 Hope District	Seward 60°44'N, 149°21'W	Gold	"a little"	c 1906-1915; 1967 (?)	210
(Sixmile Cr.) (R.)	MF-880B, loc.13 Hope District	Seward 60°47'-60°53'N, 149°25'-149°26'W	Gold	>7,692 fine oz.	c 1898-1941; 1967 (?) 1973 (?)	213
Skeen-Lechner (Mining Co.)	MF-880A, loc.71 Hope District	Seward 60°26'N, 149°17'W	Gold	Between 769 & 7,692 fine oz.	c 1910-1918; 1967 (?)	214
(Stetson Cr.)	MF-880B, loc.24 Hope District	Seward 60°27'N, 149°51'W	Gold	c 769 fine oz.	c 1900-1919	226
Strong	MF-880A, loc. 1 Anchorage Dist.	Seward 61°00'N, 149°30'W	Gold	"a little ore" shipped about 1920	1920	227
Sunshine	MF-880A, loc.21 Hope District	Seward 60°48'N, 149°33'W	Gold	<769 fine oz.	c 1933; 1967 (?)	228

Source: Cobb, Edward H. and Russell G. Tysdal. Summaries of Data and Lists of References to Metallic and Selected Nonmetallic Mineral Deposits in the Blying Sound and Seward Quadrangles, Alaska. United States Geological Survey. Open-File Report 80-621, 1980.

BLYING SOUND AND SEWARD QUADRANGLES (continued)

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
Thomas-Culross (Mining Co.)	MF-880A, loc.169 Pr.Wm.Sd. Dist.	Seward 60°44'N, 148°11'W	Gold	Less than 769 fine oz.	c 1914-1929; 1941 (?) 1954 (?)	235
Tomboy	MF-880A, loc.134 Pr.Wm.Sd. Dist.	Seward 60°53'N, 148°23'W	Gold	Less than 769 fine oz.	c 1914-1919	238

BLYING SOUND AND SEWARD QUADRANGLES (continued)

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
Alaska Oracle (Mining Co.)	MF-880A, loc.51 Hope District	Seward 60°37'N, 149°33'W	Gold	Less than 769 fine oz.	c 1933-1942; 1967 (?)	24
(Bear Cr.)	MF-880B, loc.10 Hope District	Seward 60°53'-60°55'N, 149°33'-149°36'W	Gold	More than 7,692 fine oz.	c 1898-1941; 1952 (?) 1968 (?) 1973 (?)	31
(Bird Point)	MF-880A, loc.2 Anchorage Dist.	Seward 60°56'N, 149°22'W	Gold (?) copper (?) lead (?)	"was production before 1950" (dark copy)	c 1913-16; 1967 (?)	38
(Canyon Cr.)	MF-880B, loc.16 Hope District	Seward 60°40'-60°47'N, 149°25'-149°28'W	Gold	More than 7,692 fine oz.	c 1898-1941; 1968 (?) 1973 (?)	47-48
Case	MF-880A, loc. 66 Hope District	Seward 60°30'N, 149°19'W	Gold	Between 769 & 7,692 fine oz.	c 1915-1924; 1933-1939; 1967	50
(Cooper Cr.)	MF-880B, loc. 25 Hope District	Seward 60°27'-60°29'N, 149°50'-149°53'W	Gold	c 769 fine oz.	c 1900-1919; 1933 (?) 1968 (?)	61
(Crow Cr.)	MF-466, loc.133 Anchorage Dist.	Seward 61°00'N 149°04'-149°05'W	Gold	More than 7,692 fine oz.	c 1900-1941; 1968 (?) 1973 (?)	66-7
(East Fork)	MF-880B, loc.14 Hope District	Seward 60°47'N 149°24'-149°25'W	Gold	Between 769 & 7,692 fine oz.	c 1906-1915	76
East Point (Mining Co.)	MF-880A, loc.74 Hope District	Seward 60°26'N 149°11'W	Gold	Between 769 & 7,692 fine oz.	1947	77

BLYING SOUND AND SEWARD QUADRANGLES (continued)

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
(Fresno Cr.)	MF-880A, loc.39 Hope District	Seward 60°41'N, 149°32'W	Gold	<769 fine oz.	c 1915; 1933 (?)	83
Gilpatrick (Sprague & Byers)	MF-880A, loc.54 Hope District	Seward 60°37'N, 149°34'W	Gold	Between 769 & 7,692 fine oz.	c 1910-1919; 1933-1941; 1967 (?)	86
Gold Stamp (Mining Co.)	MF-880A, loc.10 Hope District	Seward 60°53'N, 149°32'W	Gold	<769 fine oz.	c 1905-1915; 1933	93
(Gulch Cr.)	MF-880B, loc.15 Hope District	Seward 60°47'N, 149°22'-149°24'W	Gold	c 7,692 fine oz.	c 1906-1919	99
Independence	MF-880A, loc.44 Hope District	Seward 60°40'N, 149°33'W	Gold	<769 fine oz.	c 1915; 1933 (?) 1967 (?)	111
(Indian Cr.)	MF-880B, loc.1 Anchorage Dist.	Seward 61°00'N, 149°30'W	Gold	<1,000 fine oz.	c 1916; 1939	113
Johnson	MF-880A, loc.50 Hope District	Seward 60°37'N, 149°34'W	Gold	<769 fine oz.	c 1915; 1933 (?)	120
Kenai-Alaska (Gold Co.)	MF-880A, loc.70 Hope District	Seward 60°27'N, 149°18'W	Gold	Between 796 & 7,692 fine oz.	c 1909-1919; 1937-39; 1967	124
(Kenai R.)	MF-880B, loc.26 Hope District	Seward 60°29'N, 149°53'-149°55'W	Gold	<769 fine oz.	c 1900-1916; 1941; 1968; 1973	125
Kenai Star	MF-880A, loc.15 Hope District	Seward 60°50'N, 149°31'W	Gold	<769 fine oz.	c 1913-1925; 1933; 1967	126
Lucky Strike (Palmer Cr.)	MF-880A, loc.25 Hope District	Seward 60°46'N, 149°33'W	Gold	Between 769 & 7,692 fine oz.	c 1915-1941; 1967; 1968	145

BLYING SOUND AND SEWARD QUADRANGLES (continued)

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
(Lynx Cr.)	MF-880B, loc.20 Hope District	Seward 60°42'-60°43'N, 149°18'W	Gold	c 7,692 fine oz.	c 1906-1939; 1973 (?)	148
McMillan	MF-880A, loc.57 Hope District	Seward 60°36'N, 149°34'W	Gold	<769 fine oz.	c 1913-1919; 1933 (?) 1967 (?)	155
(Mills Co.)	MF-880B, loc.18 OF77-169A, p.65, loc. 189 Hope District	Seward 60°39'N, 149°25'-149°28'W	Gold	Well over 7,692 fine oz	c 1898-1941; 1968 (?) 1973 (?)	159
Nearhouse (and Smith)	MF-880A, loc.12 Hope District	Seward 60°52'N, 149°31'W	Gold	<769 fine oz.	c 1933-1941; 1967 (?)	167
(Palmer Cr.)	MF-880B, loc.13 Hope District	Seward 60°51'N, 149°37'-149°38'W	Gold	c 769 fine oz. May have been somewhat more	c 1905-1915; 1924; 1933-41; 1952; 1968	175
(Peterson Cr.)	MF-880A, loc. 3 MF-880B, loc. 6 Anchorage Dist.	Seward 60°54'N, 149°00'-149°02'W	Gold	<800 oz	c 1916; 1967 (?)	179
Primrose (Mining Co.)	MF-880A, loc.81 Hope District	Seward 60°20'N, 149°25'W	Gold	Between 769 & 7,692 fine oz.	c 1913-1919; 1937-38; 1967 (?)	186
(Quartz Cr., trib. Kenai Lake)	MF-880A, locs. 59, 60 MF-880B, loc.23 Hope District	Seward 60°32'-60°33'N, 149°35'-149°39'W	Gold	<769 fine oz.	c 1910-1916; 1933	187
(Resurrection Cr.)	MF-880B, loc.11 Hope District	Seward 60°50'-60°55'N, 149°38'W	Gold	>7,692 fine oz.	c 1898-1941; 1968 (?) 1973 (?)	193-94

CORDOVA QUADRANGLE

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
Alaska Commercial Co.	MF-392, loc.14 Pr.Wm.Sd. Dist.	Cordova 60°51'N, 146°32'W	Copper	70 tons of ore shipped in 1905	1905; most recent activity in 1915	5
(Bligh I.)	MF-392, loc. 2 Pr.Wm.Sd. Dist.	Cordova 60°53'N, 146°45'W	Gold	About 121 oz/ton reported to have been worked out in early 1900s; shaft caved and nothing visible in 1912		10
Dickey Copper Co.	MF-392, loc. 20 Pr.Wm.Sd. Dist.	Cordova 60°46'N, 146°25'W	Copper (?)	Several hundred tons of ore shipped; amt. unknown	1914-1917	17
Ellamar (Mining Co.)	MF-392, loc. 4 Pr.Wm.Sd. Dist.	Cordova 60°54'N, 146°42'W	Copper	100 million lbs.	1900-1920	19-22
			Gold byproduct			
			Silver byproduct			
Fidalgo (Mining Co.)	MF-392, loc.21 Pr.Wm.Sd. Dist.	Cordova 60°48'N, 146°18'W	Copper	Total unknown; >few hundred tons	1913-1919	24-25
			Gold byproduct			
Fielder & Hemple	MF-392, loc. 7 Pr.Wm.Sd. Dist	Cordova 60°53'N, 146°37'W	Copper	Unknown; "some ore ready for shipment, 1908"	early 1900s	26
Glacial Is. Commercial Co.	(not given) Pr.Wm.Sd. Dist.	Cordova (?) NW¼ NW¼ quad (?)	Copper	Unknown; "some ore shipments will be made in 1911"	1911	29

CORDOVA QUADRANGLE (continued)

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
Landlock(ed) Bay Copper Mining Co.	MF-392, loc.15 Pr.Wm.Sd. Dist.	Cordova 60°51'N, 146°33'W	Copper	928 tons of 4% copper ore; 74,200 pounds	1903-1916	37
McKinley Lake Mining Co.	MF-392, loc.29 Pr.Wm.Sd. Dist.	Cordova 60°28'N, 145°12'W	Gold	Amt. unknown	Source dated 1913; says small mill operated for number of years	41
Montezuma	MF-392, loc.13 Pr.Wm.Sd. Dist.	Cordova 60°51'-60°52'N, 146°33'-146°34W	Copper	Small amt. in 1916	1916	44
Reynolds-Ak. Develop. Co. (Boulder Bay)	MF-392, loc. 7 Pr.Wm.Sd. Dist.	Cordova 60°53'N, 146°37'W	Copper	Several hundred tons of ore	1908	47
Schlosser	MF-392, loc.19 Pr.Wm.Sd. Dist.	Cordova 60°46'N, 146°25'W	Copper	16,000 tons of ore averaging 10% copper	1913-1920	51-52
Standard (Copper Mines Co.)	MF-392, loc.13 Pr.Wm.Sd. Dist.	Cordova 60°52'N, 146°34'-146°35'W	Copper	1,100 tons of ore that contained 32,000 lbs.	1906-1911	53-54
			Gold	36 oz. 5.8 oz. } not all gold & silver were reported		
Steinmetz	MF-392, loc.14 Pr.Wm.Sd. Dist.	Cordova 60°51'N, 146°32'W	Copper	6 tons of ore containing 6% copper shipped before 1913	1913	56

CORDOVA QUADRANGLE (continued)

Mine Name	Map Location	Coordinates	Mineral Mined Commercially	Cumulative Quantity Mined	Dates Mining Occurred	Page No. of Source
Threeman (Mining Co.) (Main Mine)	MF-392, loc.14 Pr.Wm.Sd. Dist.	Cordova 60°51'N, 146°32'-146°33'W	Copper	6,000 tons of ore containing 1,214,000 lbs.	1904-1915	58-60
			Gold	More than 115 oz.		
			Silver	More than 1,508 oz.		

Source: Cobb, Edward H. "Summary of References to Mineral Occurrences (other than Mineral Fuels and Construction Materials) in the Cordova Quadrangle, Alaska." United States Department of Interior, Geological Survey. Open-File Report 79-973, 1979.

Appendix F: Assessment of Real Estate Values

By

Gunnar Knapp, ISER

In addition to timber and mineral values, some lands of the Chugach region may command significant value as commercial, residential, or recreational real estate. This appendix will discuss the methodology used to estimate real estate values.

Approach

Average land values in any given area are determined by demand and supply. Demand is affected by the total number of people who wish to own land, the kinds of properties they wish to own, and their incomes, which affect the amount they are willing to pay to own land. In general, for a given land base, the higher the demand (the higher the population and income levels of a region), the higher will be average land values. The greater land supply--the total area of private land--the lower will be land prices. While average land prices are determined by demand and supply, values of individual parcels of land within a given region vary dramatically depending upon factors such as location, topography, and accessibility.

The value of land does not necessarily reflect current population, total land area, and property characteristics. It may instead reflect speculators' assessments of what these factors will be in the

future. For instance, speculators may bid up the price of an inaccessible parcel of land in a region in which there is little demand, if they anticipate that a road will be built near the property or that demand will increase in the future.

Usually, property values are assessed by comparisons with prices of similar parcels which were sold in recent market transactions. However, there were several difficulties in applying this approach:

1. For many of the lands under consideration, there have not been sales of similar lands which could be studied for comparison.

2. The conveyance of a large area of public land to private ownership may have important effects upon land markets in the Chugach region. Past market transactions may convey little information about the prices which might prevail following a land settlement. By itself, a large increase in the area (supply) of private land would tend to reduce land prices. However, if the land settlement leads to an expectation of expanded recreational development in the region, with improvement of transportation facilities, demand for land might increase, causing prices to rise.

3. Land prices vary depending on the size of the transaction. Smaller parcels usually command higher prices per acre. The parcels sizes in which CNI land might be sold were not known.

Given these difficulties, real estate values were assigned as follows. First, topographical maps were used to estimate the area of "usable land"--reasonably flat, low-lying dry land--within each selection area. Other lands, such as mountains, glaciers, and wetlands, were not thought to command significant real estate value. Usable land was further categorized as "waterfront land" (within one-quarter mile of a river, lake, or salt water), "roadfront land" (within one-quarter mile of an existing road), or "other usable land."

Second, available data was reviewed on past land sales which might shed information on land values within the Chugach region. One source of data was a report for the Alaska Department of Natural Resources appraising the value of recreational real estate in the Kachemak Bay area. Property values in this area ranged from $1,000 to $20,000 per acre, depending on location, access, and waterfront. This study also reported on the value of a 1979 land transaction on the south side of the Port Fidalgo Bay, between Valdez and Cordova, in which 130 acres of waterfront land were sold for $1,388 per acre. (Franklin M. King, Jr., "Market Value Appraisal of Various Lands to be Exchanged by the State of Alaska and the Seldovia Native Corporation," prepared for State of Alaska, Department of Natural Resources, Division of Forest, Land, and Water Management, February 2, 1981, p. 67.) In addition, data were provided by a real estate appraiser who has worked extensively in the Prince William Sound area. This appraiser reported price ranges for waterfront properties in Prince William Sound based on the size of the sale, as shown in Table F-1.

Table F-1. Price Ranges for Waterfront Properties in Prince William Sound

Acreage	Price
1 Acre to 5 Acres	$12,000/Acre to $15,000/Acre
5 Acres to 10 Acres	$ 2,000/Acre to $ 4,000/Acre
10 Acres to 20 Acres	$ 1,250/Acre to $ 2,500/Acre
20 Acres to 160 Acres	$ 1,000/Acre to $ 1,800/Acre
Over 160 Acres	$ 500/Acre to $ 1,000/Acre

Larger residential properties outside the Cordova city limits were reported as selling for $10,000-to-$15,000 per acre for nonwaterfront property and for $15,000-to-$20,000 per acre for waterfront property.

No data were available on land prices for lands similar to those constituting a large share of the lands under consideration, such as harvested timberlands in the Yakataga area, lands along the proposed Copper River Highway route, or lands in the Martin River area. However, it is doubtful whether land prices for isolated sales in those areas would have shed much light upon the total value of the large selection areas under consideration.

Based on the limited data available, "medium" or most-likely estimates of price per acre were assigned to lands within each selection area. One-half and twice the medium value estimates were chosen as "low" and "high" value estimates, respectively.

The price assignments for selected categories of land are shown in Table F-2. In general, price assignments were considerably lower than the maximum value per acre which a small parcel might command. For instance, although individual one-to-five acre waterfront lots command a value between $12,000 and $13,000 per acre in Prince William Sound, water properties were assigned a value of $2,000 per acre. This was because it is unlikely that large areas of land could be divided up into such small lots and still command these prices.

Selection areas might be sold in a variety of parcels sizes, with larger parcels commanding much lower values per acre.

Table F-2. "Medium" Price Assignments for Selected Categories of "Usable" Land

Waterfront Land	Price ($ per acre)
Small properties on which development is likely	2000
Larger properties, less likely to be developed extensively	1000
Remote properties, properties harvested for timber	500
Roadfront Land	
Copper River Highway near Cordova	4000
Planned Copper River Highway route	2000
Other Land	
Near roadfront land	400
Near waterfront land	200
Remote properties; properties harvested for timber	100

Recreational values were assumed to be considerably reduced by timber harvest. On selection areas where timber values were high, low real estate values were assigned. Although some timber might not be harvested on these properties, resulting in higher real estate values, the timber value would be accordingly reduced.

It was not possible within the framework of this study to make a detailed estimate of the value of certain small federal holdings included in the CNI options. Small improved properties, such as railroad and harbor facilities in Whittier and Seward, may be very valuable and require detailed appraisal to obtain meaningful estimates. For illustrative purposes it was assumed that 1000 acres of "other" small federal properties worth $10,000 per acre would be conveyed in CNI options C and D.

Usable area, assigned prices, and total value are summarized for each selection area in Table F-3.

Table F-3. Calculation of Real Estate Values

Selection Area	Total Area Acres	Usable Area (Acres) Roadside	Waterfront	Other	Total	"Medium" Price Per Acre (Dollars) Roadside	Waterfront	Other	Total Value (Million Dollars)
Southeast Alaska timber lands	112,385				61,375[a]				0.0[b]
Yakataga (State) timber lands									
Federal Alternative	100,000		4,400	21,600	26,000		500*	100*	4.4
CNI Options	63,776		3,800	16,200	20,000		500*	100*	3.5
In-Region Prior Withdrawals									
Icy Bay	47,750		1,900	10,100	12,000		500	100	2.0
Cape Yakataga	1,078		200	600	800		4,000	4,000	3.2
Copper River Highway	9,212	800		2,500	3,300	2,000		400	2.6
Carbon Mountain	25,757		200	300	500		500	100	0.1
Bering River coal field	48,657		200	3,800	4,000		500*	100*	0.5
State Selected Lands									
Shotgun Cove	100		100		100		20,000		2.0
Glacier Island	200		200		200		2,000		0.4
Port Etches	225		225		225		2,000		0.5
Horseshoe Bay	1,230		350	680	1,030		2,000	400	1.0
Jack Bay	1,095		700	300	1,000		2,000	400	1.5
Small Federal Holdings									
Whittier BLM land	333	333			333		20,000		6.7
Seward BLM land	0.5	0.5			0.5		50,000		0.1
Cordova (Federal Reserve)	1.3	1.3			1.3		130,000		0.2
Cordova (Lutheran Homesite)	2.5	2.5			2.5		130,000		0.3
Miles Lake	685	685			685		2,000		1.4
Other Small Federal Holdings	1,000	1,000			1,000		10,000		10.0

Table F-3. Calculation of Real Estate Values
(Continued)

Selection Area	Total Area	Usable Area (Acres)				"Medium" Price Per Acre (Dollars)			Total Value (Million Dollars)
		Roadside	Waterfront	Other	Total	Roadside	Waterfront	Other	
Nelson Townsite	2,000		250	250	500		1,000	200	0.3
Snow River	960	960			960		3,000		2.9
Eyak Selections	104,000			3,700	3,700			100[d]	0.6
Tatitlek Selections	55,800		200	1,600	1,800		1,000	200[e]	0.5
Chenega Selections	107,200		2,950	1,600	4,550		1,000	200	3.3
Deficiency Area Selections	75,400		13,800	5,200	19,000		1,000	200	14.8
White River	6,500			200	200			100	c
Duktoth River	19,000			4,500	4,500			100*	0.5
Kaliakh River	29,000			3,000	3,000			100	0.3
Copper River Valley	165,500	1,600		4,800	6,400	2,000		270	4.5
Tasnuna River Valley	31,500	1,000		900	1,900	2,000		400	2.4

*Assumes timber or mineral development

[a]Usable area was assumed to be the same as operable commercial forest area.

[b]Value was assumed to be solely for timber growing with any real estate value requiring an equal reduction in timber value.

[c]Less than 0.05.

[d]A price of $400 per acre was assumed for T14S,R2W. A price of $200 per acre was assumed for T15S,R1W.

[e]A price of $100 per acre was assumed for T9S,R9W and T10S,R6W.

Table F-3. Calculation of Real Estate Values
(Continued)

Selection Area	Total Area	Usable Area (Acres) Roadside	Waterfront	Other	Total	"Medium" Price Per Acre (Dollars) Roadside	Waterfront	Other	Total Value (Million Dollars)
14(h)(8) Selections: Total									
Patton Bay	19,354		2,100	12,100	14,200		500*	100*	2.3
McKinley Lake	14,608	700	900	6,900	8,500	4,000	4,000	400	9.2
14(h)(8) Overselections									
Whalen Bay	2,709		150	1,100	1,250		500*	100*	0.2
Constantine Creek	3,683		50	1,300	1,350		500*	100*	0.2
St. Matthews Bay	1,585		300	400	700		500*	100*	0.2
Latouche Island	13,367		1,050	3,000	4,050		1,000	200	1.7
Cordova Airport	98	98				10,000			1.0
Copper River Highway	1,405	750			750	4,000			3.0
Gibbon Anchorage	1,607		650	950	1,600		1,000	200	0.8
Hook Point, Hinchinbrook Island	1,105		400	500	900		1,000	200	0.5
Macleod Harbor	2,927		650	1,300	1,950		500*	100*	0.5
Stockdale Harbor	1,195		600	500	1,100		1,000	200	0.7
Bettles Island	240		240		240		2,000		0.5
Louis Bay	685		285	400	685		1,000	200	0.4
Northeast Arm, Mummy Bay	287		200		200		1,000	200	0.2
Iron Mountain	13,564		600	400	1,000		500*	100*	0.3
Martin River timber lands	26,580	300		22,700	23,000	2,000		100*	2.9
Kushtaka Lake timber lands	8,751		400	5,100	5,500		500*	100*	0.7
Bremner River mouth	13,549		600	4,400	5,000		1,000	200	1.5
Katalla	66,405		2,000	6,000	8,000		500*	100*	1.6
Controller Bay	10,174		600		600		2,000		1.2
Icy Bay Addition	12,868		300	2,900	3,200		500	100	0.4

Appendix G. Estimation of Timber Harvest Effects

By

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This appendix discusses the methodology which we used in the estimation of timber harvest effects for the three land settlement alternatives and the two benchmark alternatives. We divided the various selection areas into seven groups which, in various combinations, make up the different alternatives. For each of these groups of selection areas, we made low, medium, and high estimates of total timber harvests and cant mill processing over each of the next three decades, under public and CNI ownership. The differences between the estimates for public and CNI ownership over the first decade form the basis for the estimated changes in volume harvested and processed presented in table V-9 of Chapter five. The medium-effect scenario presented in table V-9 assumed the medium harvests estimated in this appendix. The low-effect scenario assumed the high estimates for harvests under public ownership and the low estimates for harvests under private ownership, while the high-effect scenario reversed these assumptions.

We assumed three sources of differences in timber harvesting and processing between public owners and CNI. These were differences in

the total volume of timber which might eventually be harvested (available volume), differences in the rate of harvest of this timber over time, and differences in the allocation of this harvest between direct export, cant mills, and pulp mills. These assumptions are summarized in table G-1.

For all groups of selection areas, we assumed that CNI and the state would eventually harvest all timber volume. In contrast, we assumed that for some groups of selection areas, the Forest Service would harvest less than the full timber volume.

For all lands in the Chugach National Forest, we assumed for the medium case that the Forest Service would harvest 10 percent of available volume for each of the next three decades. (We assumed 5 and 15 percent for the low and high cases, respectively.) These harvests would not necessarily take place on the actual selection areas, but retention of these areas in the national forest would result in corresponding increases in total harvests from the national forest. For the Southeast Alaska selection area, we assumed for the medium case that the Forest Service would annually harvest 11 million board feet, as implied in a study of employment impacts of Chugach land selections in Southeast Alaska done for CNI by Reed Collins, Inc. We assumed harvests of 50 percent and 150 percent of this level, respectively, for the low and high cases.

Table G-1: Assumptions for Calculations of Timber Harvests, by Decade Under Public and Private Ownership

Selection Area	Ownership	Scenario	Share of Total Vol. Available for Harvest	Share of Available Volume Harvested By Decade			Allocation of Harvest (Share)		
				1	2	3	Cant Mills	Pulp Mills	Export
14(h)(8) Selections	CNI	L	1.0	-	-	-	0	0	1
		M	1.0	-	-	-	0	0	1
		H	1.0	-	-	-	0	0	1
	National Forest	L	0.6	.05	.05	.05	1	0	0
		M	0.8	.10	.10	.10	1	0	0
		H	1.0	.15	.15	.15	1	0	0
14(h)(8) Overselections	CNI	L	1.0	.17	.17	.17	0	0	1
		M	1.0	.33	.33	.33	0	0	1
		H	1.0	.67	.38	.00	0	0	1
	National Forest	L	0.6	.05	.05	.05	1	0	0
		M	0.8	.10	.10	.10	1	0	0
		H	1.0	.15	.15	.15	1	0	0
Martin River Kushtaka Katalla	CNI	L	1.0	.17	.17	.17	0	0	1
		M	1.0	.33	.33	.33	0	0	1
		H	1.0	.66	.33	.00	0	0	1
	National Forest	L	0.8	.05	.05	.05	1	0	0
		M	0.9	.10	.10	.10	1	0	0
		H	1.0	.15	.15	.15	1	0	0
Bering River Coal Field	CNI	L	1.0	.17	.17	.17	0	0	1
		M	1.0	.33	.33	.33	0	0	1
		H	1.0	.67	.33	.00	0	0	1
	National Forest	L	0.8	.05	.05	.05	1	0	0
		M	0.9	.10	.10	.10	1	0	0
		H	1.0	.15	.15	.15	1	0	0
No-Forest Alternative Selection Areas	CNI	L	1.0	.17	.17	.17	0	0	1
		M	1.0	.33	.33	.33	0	0	1
		H	1.0	.67	.33	.00	0	0	1
	National Forest	L	0.8	.05	.05	.05	1	0	0
		M	0.9	.10	.10	.10	1	0	0
		H	1.0	.15	.15	.15	1	0	0
Yakataga Timberlands	CNI	L	1.0	-	-	-	0	0	1
		M	1.0	-	-	-	0	0	1
		H	1.0	-	-	-	0	0	1
	State	L	1.0	-	-	-	0	0	1
		M	1.0	-	-	-	1	0	0
		H	1.0	-	-	-	1	0	0
Southeast Alaska Timberlands	CNI	L	1.0	.17	.17	.17	0	0	1
		M	1.0	.33	.33	.33	0	.25	.75
		H	1.0	.67	.33	.00	0	.5	.5
	National Forest	L	1.0	-	-	-	.5	.5	0
		M	1.0	-	-	-	.5	.5	0
		H	1.0	-	-	-	.5	.5	0

With the exception of Patton Bay and Cape Yakataga, we assumed rates of harvest by CNI of 17, 33, and 67 percent of available volume per decade for the low, medium, and high cases, respectively (implying 60-, 30-, and 15-year periods, respectively, for the time needed to harvest the entire volume). The high assumption would result in the removal of all timber volume by the middle of the second decade with a corresponding decline in harvests.

For the Patton Bay 14(h)(8) selection, under the medium case, we assumed a CNI harvest during the first decade of 15 million board feet per year. Under the low case, timber would be harvested at half this rate, and under the high case, all of the Patton Bay timber would be harvested within the first decade. We obtained total 14(h)(8) harvest assumptions by combining these Patton Bay assumptions with standard CNI harvest assumptions for McKinley Lake. For the Yakataga selection area, we assumed medium annual harvests of 25 million board feet and 10 million board feet under CNI and state ownership, respectively. These assumptions were based on current harvest rates and state estimates of future harvest levels under state ownership. We assumed half and twice these volumes for the low and high cases, respectively.

For all Chugach region lands, we assumed that all CNI harvests would be exported and all Forest Service or state harvests would be processed by cant mills (with the exception of the low case for state harvests). For the Southeast Alaska timber lands, we assumed that some timber volume would be allocated to pulp mills under both public and CNI ownership.

Table G-2 presents the total harvest and cant mill processing estimates resulting from our assumptions. The total volume figures used are those presented in Appendix C.

We recognize that these harvest and cant mill processing estimates are based on numerous assumptions which might reasonably be changed. However, we feel that the procedure used represents a valid approach for obtaining initial estimates of the magnitude of the effects of the different land settlements upon timber harvests and cant mill processing. Tables G-1 and G-2 present the information necessary for examining the effects of changing various assumptions.

Table G-2: Calculations of Timber Harvests, by Decade Under Public and Private Ownership

Selection Area	Ownership	Scenario	Total Volume	Volume Available For Harvest	Volume Harvested By Decade 1	2	3	Cant Mill Processing By Decade 1	2	3
14(h)(8) Selections	CNI	L	334.3	334.3	97.3	97.3	72.6	0.0	0.0	0.0
		M		334.3	194.7	95.0	44.7	0.0	0.0	0.0
		H		334.3	289.7	44.7	0.0	0.0	0.0	0.0
	National Forest	L	334.3	200.6	10.0	10.0	10.0	10.0	10.0	10.0
		M		267.4	26.7	26.7	26.7	26.7	26.7	26.7
		H		334.3	50.1	50.1	50.1	50.1	50.1	50.1
14(h)(8) Overselections	CNI	L	153.6	153.6	25.6	25.6	25.6	0.0	0.0	0.0
		M		153.6	51.2	51.2	51.2	0.0	0.0	0.0
		H		153.6	102.4	51.2	0.0	0.0	0.0	0.0
	National Forest	L	153.6	92.2	4.6	4.6	4.6	4.6	4.6	4.6
		M		122.9	12.3	12.3	12.3	12.3	12.3	12.3
		H		153.6	23.0	23.0	23.0	23.0	23.0	23.0
Martin River Kushtaka Katalla	CNI	L	524.8	524.8	87.5	87.5	87.5	0.0	0.0	0.0
		M		524.8	174.9	174.9	174.9	0.0	0.0	0.0
		H		524.8	349.9	174.4	0.0	0.0	0.0	0.0
	National Forest	L	524.8	419.8	21.0	21.0	21.0	21.0	21.0	21.0
		M		472.3	47.2	47.2	47.2	47.2	47.2	47.2
		H		524.8	78.7	78.7	78.7	78.7	78.7	78.7
Bering River Coal Field	CNI	L	213.1	213.1	35.5	35.5	35.5	0.0	0.0	0.0
		M		213.1	71.0	71.0	71.0	0.0	0.0	0.0
		H		213.1	142.1	71.0	0.0	0.0	0.0	0.0
	National Forest	L	213.1	170.5	8.5	8.5	8.5	8.5	8.5	8.5
		M		191.8	19.2	19.2	19.2	19.2	19.2	19.2
		H		213.1	32.0	32.0	32.0	32.0	32.0	32.0
No-Forest Alternative Selection Areas	CNI	L	266.5	266.5	44.4	44.4	44.4	0.0	0.0	0.0
		M		266.5	88.8	88.8	88.8	0.0	0.0	0.0
		H		266.5	177.7	88.8	0.0	0.0	0.0	0.0
	National Forest	L	266.5	213.2	10.7	10.7	10.7	10.7	10.7	10.7
		M		239.9	24.0	24.0	24.0	24.0	24.0	24.0
		H		266.5	40.0	40.0	40.0	40.0	40.0	40.0
Yakataga Timberlands	CNI	L	1112.0	1112.0	125.0	125.0	125.0	0.0	0.0	0.0
		M		1112.0	250.0	250.0	250.0	0.0	0.0	0.0
		H		1112.0	500.0	500.0	500.0	0.0	0.0	0.0
	State	L	1112.0	1112.0	50.0	50.0	50.0	0.0	0.0	0.0
		M		1112.0	100.0	100.0	100.0	100.0	100.0	100.0
		H		1112.0	200.0	200.0	200.0	200.0	200.0	200.0
Southeast Alaska Timberlands	CNI	L	1682.0	1682.0	280.3	280.3	280.3	0.0	0.0	0.0
		M		1682.0	560.7	560.7	560.7	0.0	0.0	0.0
		H		1682.0	1121.3	560.7	0.0	0.0	0.0	0.0
	National Forest	L	1682.0	1682.0	55.0	55.0	55.0	27.5	27.5	27.5
		M		1682.0	110.0	110.0	110.0	55.0	55.0	55.0
		H		1682.0	165.0	165.0	165.0	82.5	82.5	82.5

Appendix H. The Environmental Effects of Timber Harvest

by Sal V. Cuccarese and Margaret S. Floyd, AEIDC

From an ecological perspective, the harvest of timber can have complex and far-reaching implications for the biota since wildlife habitats are a function of the structure, form, and quality of the vegetation. Many trends revealed by evaluation of logging operations can be applied to any development which may result in the removal of the crown cover and the disruption of the soil mantle.

Fundamental to any discussion of the effects of development on vegetation is the issue of soil disturbance. Most sites where vegetation has been present for very long have an organic or duff layer built up on top of the mineral soil layers. This organic layer, which provides most of the nutrients available to plants (Sheehy, 1975; Brady, 1974),* is generally composed of leaves and other plant parts in various stages of decay. The availability of nutrients is governed by the health of the decomposing fauna which breaks down the plant matter (Spurr and Barnes, 1980).

Besides adding nutrients, the organic layer helps to protect the mineral soils from erosion caused by the impact of rain droplets and small surface riverlets (Ruth and Harris, 1979). Although this type of erosion may not seem significant, great volumes of soil can be moved in this way.

*All references cited in this appendix are listed at the end of Appendix I.

Clearcutting often exposes mineral soils which have a tendency toward mass wasting when saturated with water. Under normal conditions intertwining root systems help to prevent slides and slumps (Swanston, 1974). As root systems decay following clearcutting the potential for mass wasting increases. Obviously, slides can usurp much valuable land. Reoccurring slide areas are often essentially devoid of vegetation or are kept in a perpetual subclimax seral community (Swanston, 1974). Erosional processes not only affect the immediate area but often degrade aquatic habitats as the products of erosion enter streams and rivers. This can have a detrimental effect on fisheries, wildlife, and drinking supplies (Sheehy, 1975). The potential for erosion is determined by the type of soil, the landform (slope), vegetation, and climatic conditions (Swanston, 1974). The evaluation of erosion, therefore, is site-specific and generalizations about large areas of land mean little.

Removal of the forest overstory (crown cover) can have profound effects on the remaining flora and the fauna. Any canopy break, whether from natural or man-induced causes, stimulates a change in the plant community structure by allowing increased light penetration. Understory shrubs which were previously inhibited by low light conditions proliferate in the increased light. A warming of the organic soil layer follows which can stimulate biological action, thereby speeding the release of nutrients. These two factors together can greatly increase growth of understory plants (Spurr and Barns, 1980). Under natural circumstances, an uneven-aged forest stand will have

many holes in its canopy. These holes are created as trees die from disease, pests, or blowdown (Harris, 1979). Standing dead timber or snags can be important for cavity-nesting birds such as woodpeckers (Kessler, 1979). Another important effect of the removal of the forest canopy is its effect on the depth of the accumulated snowpack. Without the canopy to intercept most of the snow, the accumulation can be several feet deeper than in the surrounding forest. Many larger vertebrates, notably mountain goats and deer, are severely restricted by deep snow and seek refuge in old-growth forest (Schoen and Wallmo, 1979).

The differential between the shrubs and the tall forest canopy creates an "edge." Edges have long been recognized as areas of increased species diversity among both the flora and fauna (Leopold, 1933; Smith, 1974). In an unaltered, uneven-aged forest, the edge effect is multiplied by many small openings, whereas in a clearcut the total edge created may actually be less than existed before. Clearcutting induces radical ecological change by substituting relatively simple associations for complex ones.

Removal of large areas of trees can have a funnelling effect on local winds. Unless this factor is taken into account in the design of the cutting units, windthrow may occur, resulting in uprooting, stem breakage, and crown and root damage. Leave strips along coastlines and streams must be carefully designed to provide wind firm boundaries. The design of wind firm boundaries is not an easy task,

and even the best silvicultural techniques cannot totally eliminate wind damage (Ruth and Harris, 1979).

Following any major disturbance to the environment, whether it is due to logging, mining, or natural disaster such as land slides or blowdown, the vegetation of the area begins to adjust to the new situation. This series of changes on previously vegetated ground is referred to as secondary succession. There are numerous factors which greatly influence the rate of revegetation, as well as the types of seral stages that will occur. One of the most influential factors in secondary succession is the severity of soil disturbance (Harris and Farr, 1974). If the organic soils are removed and mineral soils are exposed, revegetation will probably be very slow. Disturbed mineral soils favor pioneering species such as alder (Alnus sp.) and salmonberry (Rubus spectabilis). Alder has been shown to support nitrogen-fixing bacteria within nodules on its roots. These bacteria convert free nitrogen, which plants are not able to utilize, into more available forms (Smith, 1974). These shrubs also produce a great deal of leaf litter which aids in the reestablishment of organic soils. In this way, the invasion of a site by alder and other shrub species can enhance the productivity of a highly disturbed site (Harris and Farr, 1974).

However, when alders and other shrubs become established on a site, they can greatly inhibit the regeneration of conifer species. The fast growing and opportunistic shrubs can effectively block the

necessary light from slower growing conifers. The length of time that shrubs will dominate is dependent on many characteristics of the site such as the number of residual conifers, the density of the shrub crown cover, the favorability of climatic conditions, and seed sources. Depending on conditions, it may take 40 years for shrubs to be shaded out by conifers (Harris and Farr, 1974).

On sites where the soil is less disturbed, residual plants will play a more important role in the revegetation of an area. Some plants readily regenerate from their roots even if the above ground parts have been destroyed. Shrubs may still inhibit conifer growth on these lesser disturbed sites, but residual seedlings and a more favorable seed bed would generally benefit the conifer species and shorten the period of shrub domination.

Although there are many silvicultural methods available, clearcutting is standard practice throughout the Pacific Northwest and Alaska. Unlike in the Pacific Northwest, it is not standard practice to clear logging debris in southcentral and southeast Alaska. This is primarily a function of the low fire danger throughout most of the region. Logging debris, when left in place, can help to protect the soil from erosion and can, in the long term, increase the organic component of the soil. It can, however, form a barrier to the movement of large vertebrates and may impede natural reforestation by providing a barrier between the seed source and seed bed (Ruth and Harris, 1979). Logging debris can also shade seedlings and provide a brooding area for insect pests.

Natural reforestation is another standard practice in Alaska. In southeast Alaska, natural regeneration is generally good, and this method is obviously less expensive than planting (Ruth and Harris, 1979). However, a program of intense management including plantings, fertilization, and control of competing vegetation may increase the harvest and shorten the rotation period.

These management practices have inherent problems similar in scope to those associated with natural regeneration. Even-aged stands result regardless of technique. Although stand densities may be less in a planted stand than in one which has been allowed to naturally re-vegetate, much depends on management goals. Application of fertilizers and defoliants, though beneficial for targeted trees, can adversely influence other terrestrial and aquatic organisms. The management decision of which technique to employ is best determined on a site-by-site basis.

Appendix I. The Environmental Effects of Surface Mining

by Sal V. Cuccarese and Margaret S. Floyd, AEIDC

The physical effects of surface mining often include changes in topography, alteration of drainage basins, and degradation of soils as topsoils are buried or lost (Spaulding and Ogden, 1968). The effects of surface mines often extend beyond the pits themselves. Great quantities of overburden are generated during strip mining operations. Overburden is often used as fill and dumped in ravines, gullies, or other low-lying areas (National Academy of Sciences, 1980). Regardless of where overburden is dumped, that site is also lost as habitat, since underlying vegetation and the topsoil that supports it is buried.

Overburden piles often exhibit high porosity and frequently produce mud slides which extend the area of physical usurpation of habitat. Should pyrite be present in the overburden and coal seams it will react to produce sulphuric acid and iron sulfate (Spaulding and Ogden, 1968; National Academy of Sciences, 1980). When dissolved in water, iron sulphate hydrolizes to form more sulphuric acid. Acid water can dissolve and hold more minerals in solution than can neutral water (Clarke, 1974). As a result, metals such as aluminum and arsenic are often found in deleterious quantities in acid mine water.

Surface waters often bear the brunt of strip mining activities (National Academy of Sciences, 1980; Spalding and Ogend, 1968). Unlike terrestrial effects, which are limited to the mine site and adjacent areas, aquatic effects often reach far beyond the work area.

Water passing over and through exposed mineral soils at mine workings, spoil banks and mine roads leaches out minerals which may adversely affect the biota (Clarke, 1974; National Academy of Sciences, 1980). Typically, runoff carries copious quantities of silts and sediments into fluviatile and lacustrine environments.

Heavy loads of silt and sediment limit primary production, impede respiration by aquatic organisms, and adversely affect developing eggs and embryos. Primary production is limited as the transparency of water lessens with increasing turbidity. Dissolved oxygen levels may fall as free oxygen bonds to reactive minerals leached from mine works. Silt and sediment also have a negative mechanical effect upon the naked respiratory organs of aquatic vertebrates and invertebrates. Silts and sediments settling out of the water column may fill in interstitial gravel spaces, suffocating developing eggs and embryos of aquatic organisms.

Subsurface water quality may also be adversely affected as surface water, collected in surface pits, percolates downward through fractures and auger holes into subterranean strata, introducing heavy metals and acids into the aquifer (National Academy of Sciences, 1980). The effects of this type of chronic contamination may be particularly long lived and wide-reaching. Many years may be required after corrective measures have been applied for the aquifer to rid itself of contaminants.

The land that remains following surface mining is usually incapable of supporting higher forms of life without extensive rehabilitation (National Academy of Sciences, 1975; Spaulding and Ogden, 1968). If left alone, it may take millenia before soils are regenerated through weathering. Without productive soils, most native North American vascular flora simply cannot live.

Exposed mineral soils in southcentral Alaska typically revegetate with dense, monotypic stands of alder (Alnus spp). Alder may successfully colonize such areas thanks to its symbiotic relationship with certain nitrogen-fixing bacteria. Alder stands often have closed canopies which preclude development of an understory. Stand density is often so high as to form an effective barrier to large mammals. As a general rule, monotypic stands are unsupportive of a diverse fauna (cf Kesseler, 1979; Komarek, 1964; Karr and Roth, 1971; MacArthur, Recher, and Cody, 1966; Cody, 1981).

Terrestrial habitats may be indirectly affected by surface mines also. During sensitive seasons, many species of wildlife are intolerant of human activities. For example, trumpeter swans are notoriously intolerant of human intrusion during the breeding season and are quick to abandon their nests if disturbed (Hansen et al., 1971). Other effects are more subtle. Surface mining often produces miles of contiguous highwalls which may form effective barriers to terrestrial vertebrate migration, precluding their use of critical seasonal range.

However, with proper reclamation after surface mining, fish and wildlife habitats can be enhanced (Spaulding and Ogden, 1968). Naturally occurring pure vegetation stands could be broken up during the mining of coal creating edges and voids where monotypes previously existed. With aggressive reclamation, preferred food and cover plants can become established in these openings to benefit a wide variety of wildlife. A mixed grass and shrub cover type can support many more species of animals and larger populations than a monotypic forest. Many factors would affect the degree of revegetation success achieved. Recovery would ultimately depend on whether enough arable soils remain.

Although the techniques for reclaiming strip mined lands in Alaska have not been fully investigated, indications are that such reclamation is entirely feasible. The only major mine in Alaska, the Usibelli Mine in Healy, has initiated a reclamation program that appears to be quite successful. It should be noted that reclaimation techniques in Alaska may vary from those that are successful in other areas of the country (Rao and Wolff, 1975).

Faunal recolonization of strip-mined areas would occur following rehabilitation and stabilization of the area. Colonization rates would ultimately depend on the species involved and their respective population levels adjacent to the area. Since the reclaimed substrates would differ somewhat in composition from the original, these

substrates should act as new islands to be colonized. Predictably, patterns of recolonization would parallel equilibrium postulates first proposed by MacArthur and Wilson (1967).

Patterns of recolonization by herbivores are more complex than those of carnivorous species. Profound species-specific differences in mobility and range utilization exist among herbivores. This specialization within and between types has led in part to their preponderance in numbers and kinds. The following discussion illustrates some of the divergent patterns of recolonization likely in reclaimed areas.

Gore (1979) examined the patterns of recolonization of benthic macroinvertebrates in a reclaimed coal strip-mined river channel. Colonization occurred primarily through downstream drift of aquatic insects and algal mats. The author concluded that the agents responsible for observed patterns of recolonization were differential drift rates and distances travelled for both aquatic invertebrates and detrital material. Attainment of maximum diversity lagged behind density by about one month. Gore (1979) notes, "This period represented a time of dynamic adjustment within the community to match the undisturbed source area communities."

Terrestrial herbivores are generally more mobile and occupy a more heterogeneous environment than aquatic organisms. Patterns of colonization are also more complex and reflect each species' life-

style. Some species would exploit new habitats faster than others. Most North American bovids, e.g., Ovis spp., Oreamnos spp, Ovibos spp, are at the extreme end of the spectrum. These animals are slow to colonize unoccupied habitats. For example, colonization of new range by mountain sheep occurs in the following manner (vide Geist, 1970). Prior to lambing, sheep segregate by sex and age into like bands. Males two years old and older form one type of aggregation and females and young the second type. Sheep ranges are typically composed of isolated, discontinuous pockets of seasonal habitat scattered throughout the mountains. Interaction between bands commonly occurs as sheep from one band travel through pockets of habitat occupied by others in transit to their own perferred grazing areas.

The precocious young frequently follow strange individuals from trespassing bands to their destination. Once there, the young "imprint" on the area and it, like their birth areas, becomes part of their seasonal home range when adults. In the process of travelling to this "new" habitat, the band may have travelled through one or more prime sections of habitat.

If these pockets of habitat were unoccupied at the time, however, they would not be recognized. An essential component of sheep range is the presence of other sheep. Adjacent prime, but unoccupied, range is unrecognizable to sheep as habitat. Recolonization by sheep has to await the chance utilization of the reclaimed area by a band with attendant young.

Fortunately, most terrestiral herbivores are not so rigidly attuned to their environment. For example, moose typically exploit new range opportunistically. Generally recolonization by terrestrial herbivores would progress as soon as an adequate food supply is established.

Recolonization by carnivorous fauna is easier to describe. Carnivorous organisms have evolved in close association with their respective prey animals. Changes in prey distribution and abundance are quickly mirrored by their predators. For example, Gore (1979) described fairly rapid upstream colonization in a reclaimed strip-mined river channel by predaceous dragonflies following recolonization of the site by benthic macroinvertebrates. Similarly, Allen (1979) described the natural reintroduction of wolves onto Isle Royale, Michigan following the re-establishment of moose.

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