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MINERAL RESOURCES OF ALASKA AND THE IMPACT OF FEDERAL LAND POLICIES ON THEIR AVAILABILITY

COAL

Open File Report 51

PURPOSE

PART I OF THIS REPORT INDICATES WHERE KNOWN AND HYPOTHETICAL COAL RESOURCES ARE LOCATED AND ESTIMATES HOW MUCH OF THE RESOURCE CAN BE ECONOMICALLY PRODUCED.

PART II DISCUSSES THE AVAILABILITY OF COAL IN ALASKA WITH REGARD TO PRESENT AND PROPOSED LAND USE POLICIES.

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PART I

ESTIMATED KNOWN AND HYPOTHETICAL RESOURCES

OF

COAL IN ALASKA

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INTRODUCTION

The Division of Geological and Geophysical Surveys has calculated the known and hypothetical resources of coal for the State of Alaska. The known coal is listed as demonstrated coal, which includes indicated, measured, and inferred coal. Hypothetical coal resources are difficult to obtain in that a sediment-volumetric study, similar to the study completed for oil and gas, is not feasible. To determine hypothetical coal reserves, it is necessary to obtain thickness control from surface outcrops or from electrical logs obtained from exploratory wells, and to protect these measurements into a known geological area. If well control is sufficiently dense, coal may be calculated with some degree of reliability even though individual coal beds are not continuous. A map of this nature indicates trends of coal deposition and abundance or density of groups of coal beds. This is a feasible approach in determining hypothetical coal reserves in the Cook Inlet region. There is much less assurance for hypothetical coal estimates in the northern Alaska coal areas, where there are less data available.

Included in this report is a map showing known areas of coal resources. Control for these areas is predominantly from field observations by the U.S. Geological Survey. Included also is Table I which summarizes coal under three classifications listed below:

A. Indicated Coal: Estimates of the quality and quantity have been computed partly from sample analyses and measurements and partly from reasonable geological projections. In this report the term "demonstrated" has been used, which is a collective term for the sum of coal in both measured and indicated resources.

B. Inferred: Coal in un explored but identified deposits for which estimates of the quality and amount are based on geological observations.

C. Hypothetical: Undiscovered coal that may reasonably be expected to exist in an area under known geological conditions. No consideration is given to the commercial extraction of this coal.

All coal in the indicated (demonstrated) and inferred categories has less than 1000 feet of overburden and the minimal thickness considered is 2 feet. This is coal which is considered economic with present mining technologies.

Hypothetical resources are subject to a high degree of error. These resources are confined, however, to depositional areas where coal occurs in outcrop, and in some cases where well control has established the presence of coal away from the outcrops. Hypothetical resource figures will be helpful when the technologies of coal gasification and liquefaction have developed to the point where extraction of coal or coal products becomes commercially feasible.

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CONCLUSIONS - PART I

1. It is estimated that Alaska has 41,552 square miles of land on shore and 4,389 square miles of land underlying contiguous offshore areas along the western Arctic coast and in Cook Inlet which have the potential of containing economic deposits of coal. These areas are outlined on the map titled "Known and Hypothetical Coal Areas in Alaska". Numerous isolated occurrences of coal are not included in these areal estimates. Very little is known about the quality or extent of the isolated occurrences.

2. Area by area, estimates of the demonstrated, inferred, and hypothetical coal resources in Alaska are indicated on Table I and on the map titled, "Known and Hypothetical Coal Resources of Alaska". Total recoverable coal resources, considered to be the coal listed under demonstrated and inferred coal resources are 132.9 billion tons. This quantity of coal converted to equivalent barrels of oil would exceed 500 billion barrels of oil; enough to satisfy the United States requirements for 68 years, based on an average daily consumption of 20 million barrels per day. Hypothetical coal resources are 1.9 trillion tons. Strippable coals are included in the demonstrated and inferred resources.

Map cc

CALCULATIONS

1. A map was constructed based primarily on coal areas previously delineated by the United States Geological Survey. Solid lines outline areas of known coal resources based on favorable geologic parameters and the known presence of coal. Isolated occurrences of coal are indicated by solid triangles and represent small areas where one or more coal beds have been observed. The extent of the isolated beds is largely unknown, but resource potential in nearly all cases is considered small.

2. Demonstrated Coal (includes measured and indicated coal)

Values for these resources were obtained directly from literature studies or calculated from geologic maps and measured coal sections previously published.

3. Inferred Coal

Includes coal resources in unexplored extensions of demonstrated resources for which estimates of the quality and size are based on geologic evidence and projection.

4. Hypothetical Coal

Hypothetical resource values were calculated by estimating the total acreage of an area considered favorable for coal-bearing sediments, usually confined to a single depositional basin. An estimate was then made for a minimal coal thickness that might be expected to underlie the area. The minimal coal thickness is based on all the known information including surface measurements, areas of active mining, and wells drilled either as hydrocarbon tests or in actual exploration for coal. This method of estimating hypothetical resources is subject to large errors.

a. Cook Inlet Offshore Hypothetical Coal Resources

Coal counts were made from electric logs in 47 exploratory and development wells on the west side of the Cook Inlet from the surface to 5,000 feet drilled depth. Accumulative coal thickness maps were constructed from the results. The data calculated from these maps is hypothetical although the information may be sufficiently dense to consider the coal resources as inferred.

b. North Slope Hypothetical Coal Resources

A coal thickness map was constructed for this area based on surface exposures of coal that have been examined

and on sparse core hole information. The data are very scanty and contoured thicknesses were reduced by half in order to present a conservative resource value.

c. Offshore Cape Lisburne-Colville River Region

The strip of water adjacent to the known coal areas, from a point east of Cape Lisburne to Franklin Point where coal beds crop out on and near the shoreline, and extending three nautical miles seaward, is considered to be underlain by sediments containing 3 billion tons of coal. This coal may have economic value in the future through gasification and liquefaction processes. These resources have been included as part of the hypothetical coal resources of northern Alaska.

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RESULTS

Scattered coal occurrences not included in the resource evaluations.

Central Alaska Region

Kobuk Region

Coal occurs in scattered localities in rocks of probably Cretaceous age in a belt that extends along the Kobuk River and eastward to the headwaters of the Koyukuk River.

Localities	Grade	Remarks
1. North side of the Kobuk between Trinity Creek and the Kallarichuk River	Bituminous	Several thin beds exposed in the river bluffs, including a few 2 to 3 feet thick.
2. Hunt River		
3. Lower Ambler River		
4. Kogoluktuk River		
5. Lockwood Hills near the Pah River		
6. Koyukuk River	Bituminous	9 to 10 feet of clean coal on the Middle Fork of the Koyukuk River.
7. John River	Bituminous	Suggested from abundant coal float. None has been found in place.

Seward Peninsula

Localities	Grade	Remarks
1. Sinuk River Valley	---	Small occurrences
2. Koyuk River Valley	---	Small occurrences
3. Kugruk River Valley	Lignite	Along the river, 18 feet of lignite in three beds reported. Dips 70°. Probably all in Cretaceous rocks. In 1908 drilling showed coal to be present about 7 feet below the surface half a mile northwest of the outcrop.
4. Other scattered occurrences		See map

Southeastern Alaska Region

Localities	Grade	Remarks
1. Kootznahoo Inlet, west side Admiralty Island	Bituminous?	Estimated 20 square miles. Coal beds 2-3 feet thick with shale partings.
2. Icy and Yakutat Bay	Lignite	Small occurrences with very thin coal beds.
3. Murder Cove, southern tip of Admiralty Island	Lignite	Small occurrences
4. Kasaan Bay, Prince of Wales Island	Lignite	Small occurrences

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Southeastern Alaska Region (cont.)

Localities	Grade	Remarks
5. Hamilton Bay on Kupreanof Island	Lignite	Small Occurrences
6. Kuiu Island	Lignite	Small Occurrences

South Central and Central Alaska Region

Other isolated small occurrences of coal have been noted in the following areas:

1. South of Eagle about 60 miles
2. Near Poorman, Alaska
3. Forty miles north of Georgetown in Cretaceous sediments
4. Near Seldovia
5. Near Cape Vancouver
6. Forty miles southeast of Broad Pass coal field in small areas of Tertiary sediments
7. Thin bedded coals have been reported on the southeast part of Kodiak Island where they occur in tightly folded Tertiary sediments.

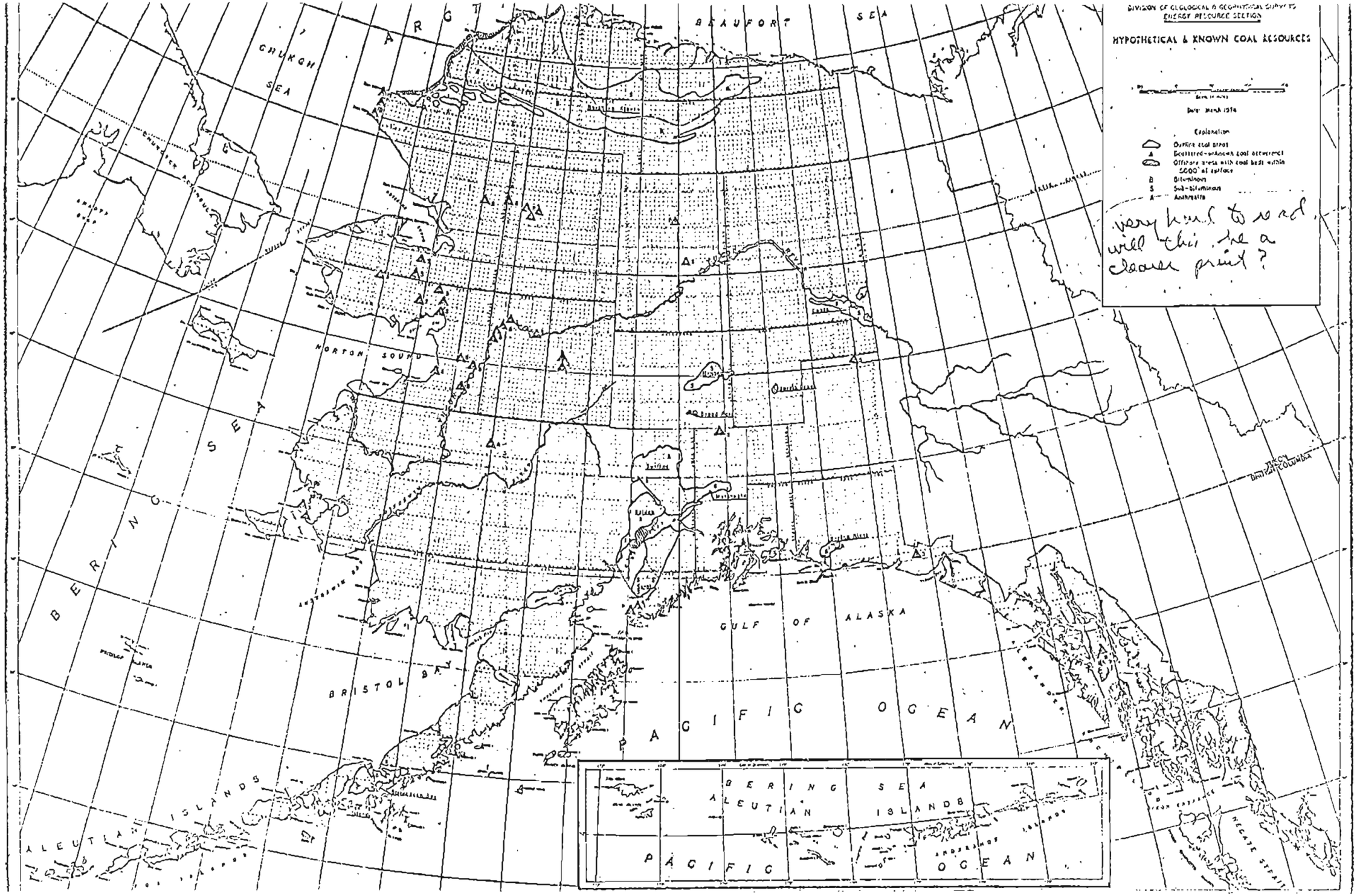
Unalakleet District

Localities	Grade	Remarks
1. Two localities near Unalakleet		
a. East shore of Norton Sound about 10 miles south of Unalakleet	Subbituminous	One coal bed 4 to 8 feet thick in shale of probable late Cretaceous age.
b. Unalakleet River about 40 miles above its mouth.	Subbituminous	------

Ruby-Anvik District

Localities	Grade	Remarks
1. Several localities on the Yukon River between Ruby and Anvik		In the late Kaltag formation of late Cretaceous age.
a. Twenty miles above Galena	----	One foot coal bed.
b. Ten miles above Nulato	Bituminous	One to three-foot beds.
c. One mile above Nulato	Bituminous	Six inch bed.
d. Four miles below Nulato	Bituminous	Two feet.
e. Nine miles below	Bituminous	Unknown thickness with pockets to 8'.
*f. Fifty miles below Kaltag	Bituminous	Three foot bed.
*g. Sixteen miles above Blackburn	Bituminous	Two to three foot beds.

*Several hundred tons of coal mined from these areas prior to 1903.


DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
ENERGY RESOURCE SECTION
HYPOTHETICAL & KNOWN COAL RESOURCES
Date March 1976
Explanation
Onshore coal areas
Scattered-unknown coal occurrence
Offshore areas with coal beds within 5000' of surface
B Bituminous
S Sub-bituminous
A Anthracite
very hard to read. will this be a clearer print?
BEAUFORT SEA
CHUKCHI SEA
NORTON SOUND
BERING SEA
BRISTOL BAY
GULF OF ALASKA
PACIFIC OCEAN
ALEUTIAN ISLANDS
YUKON TERRITORY
BRITISH COLUMBIA
BERING SEA
ALEUTIAN ISLANDS
PACIFIC OCEAN

Map and 3431

PART II

LAND RESOURCE EVALUATION

(AVAILABILITY OF COAL IN ALASKA)

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INTRODUCTION - PART II

This report has been written in an effort to objectively evaluate the effect of previous and proposed public land withdrawals on the coal potential land in Alaska with respect to its ultimate use. Part of the lands are being withdrawn under section 17 (d) of ANCSA, and the proposals to classify them were made by the Secretary of the Interior in December of 1973. The remainder have been previously withdrawn.

The following overlays indicate the total amount of prospective onshore coal land and scattered coal locations which lie in the various pre-existing and proposed classifications of land in Alaska. The accompanying tables list the amount of land in each classification which lies within a coal potential area. This is expressed as a percent of the total coal potential land in onshore Alaska. For example, it is estimated that the State contains 41,552 square miles of onshore coal potential land. Within the 41,552 square miles there are 19,602 square miles of proposed national park or otherwise restricted land. This is 47% of the total potential coal land in Alaska. This is tabulated in Figure 3 and shown on the accompanying map. The scattered coal occurrences are not listed in the tables, because their quality and extent are unknown.

A summary of the present and estimated ultimate impact of existing and proposed public land withdrawals on coal potential land is given in Figures 1 and 2. Approximately 82% of the total onshore coal potential land is unavailable for leasing at the present time.

Due to the uncertainty of how the land will be ultimately classified, the summary diagram (Figure 2) is based on statistical averages from the other overlays. For example, in the case of "Area of Ecological Concern" one-third of the land was estimated to remain in Federal ownership and possibly be highly restricted or closed to coal development. The other two-thirds were assumed to be selected by the Natives or the State. Also it is assumed that the same regulations will apply to the proposed land withdrawals that apply to existing withdrawals. For example, proposed refuges and monuments are considered closed to development because the Arctic National Wildlife Range and other wildlife refuges are effectively closed to development by regulations, stipulations, or restrictions.

Much of the land discussed in the report falls into more than one category. The areas of ecological concern overlap many other classifications such as the D-1 land category. The situation can be easily seen on the map and overlays accompanying Figure 3. This causes some difficulty when estimating the final effect of the withdrawals.

The areas of D-2 withdrawals, (Parks, Wildlife Refuges, etc.) were taken directly from the environmental impact statements furnished by the National Park Service. The land overlays for other than D-2 withdrawals were compiled from unofficial Federal sources. The State pf Alaska does not recognize these overlays as official documents.

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CONCLUSION - PART II

1. The present impact of the public lands withdrawn under section 17 (d) of ANCSA is not as great on the availability of coal as it is on oil and gas. At this time, 82% of the total coal potential land is not leasable for coal development. The greatest single impact is caused by NAVAL PETROLEUM RESERVE NUMBER 4, which includes approximately 44% of the total known coal potential land in Alaska. 17% of the presently available area is found on state patented and tentatively approved land in the Cook Inlet and Matanuska Valley areas.

2. Approximately half of the total coal potential area in the State may be closed to private development indefinitely. 19% may be opened in one to five years, and 17% may be open in five to ten years. These estimates are summarized in Figure 2, and detailed in Figures 3 through 6. The accompanying maps and overlays show the impact of various Federal withdrawals on potential coal land in Alaska.

RECOMMENDATIONS

This report emphasizes the large coal potential of Alaska. This resource should be developed in an orderly and unwasteful manner. If the present trend of Federal land administration continues in Alaska, its natural resource development will be chaotic.

IT IS RECOMMENDED THAT:

a. A thourough scientific inventory of all mineral resources be conducted on Federal lands;

b. That a plan for the development of the resources under proper environmental guidelines be undertaken immediately;

c. That the State of Alaska be allowed its right of selection on these potential lands enacted by Congress in the Statehood Act of 1958;

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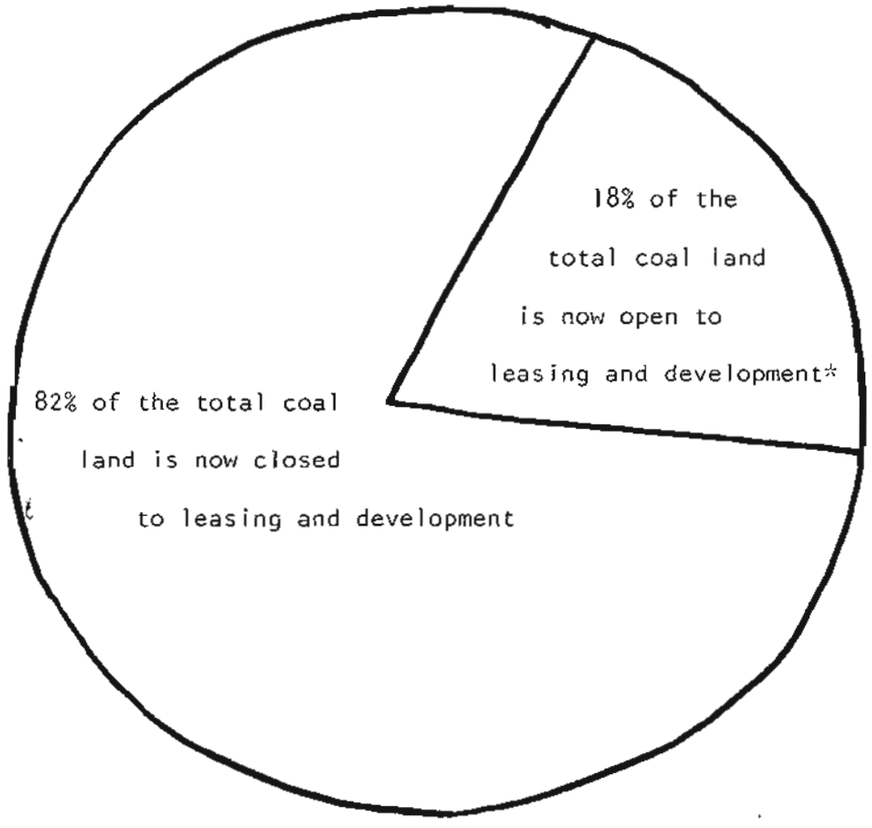
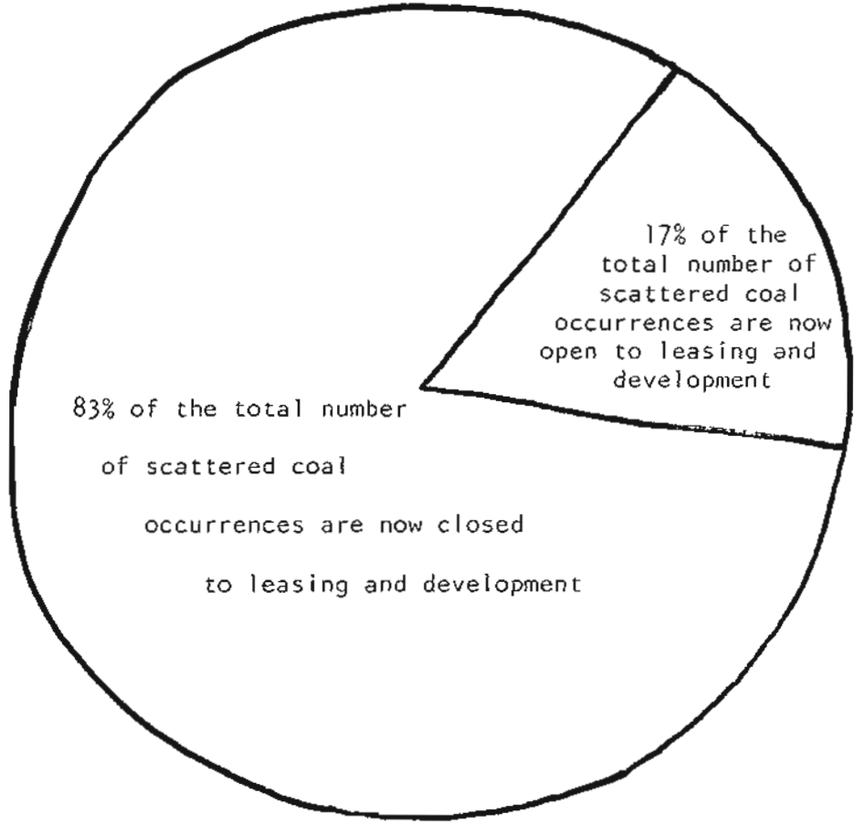
Figure 1 - PRESENT IMPACT OF PREVIOUS AND PROPOSED PUBLIC LAND WITHDRAWALS ON COAL POTENTIAL LAND IN ALASKA (ONSHORE)

Known Coal Areas



Scattered Coal Occurrences



*17% of the available coal land is located on State patented and tentatively approved land in the Kenai, Beluga, Matanuska and Nenana areas.

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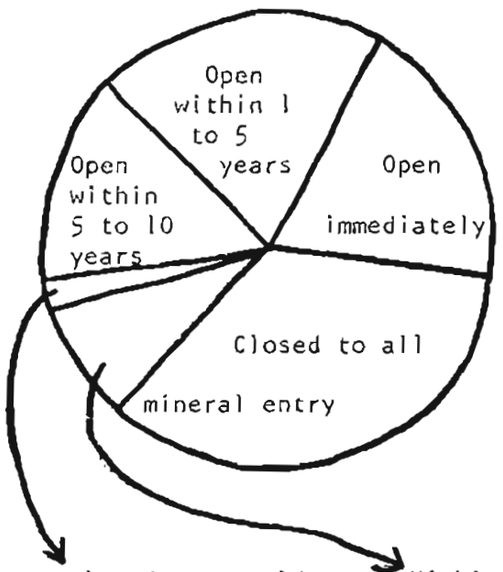
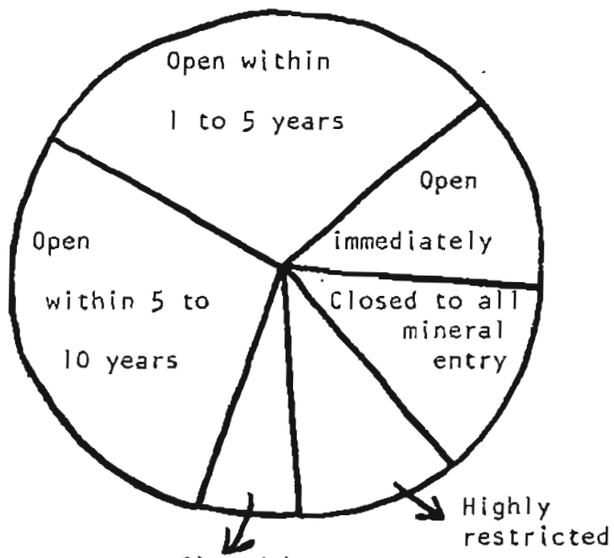
Figure 2 - ESTIMATED ULTIMATE IMPACT OF PREVIOUS AND PROPOSED PUBLIC LAND WITHDRAWALS ON COAL POTENTIAL LAND (ONSHORE)

KNOWN COAL AREAS



SCATTERED COAL OCCURRENCES



Estimated Land Status	% of Total Coal Potential Land	% of Total Number of Scattered Coal Occurrences	Land Classification
I Open for development:			
A. Immediately	18%	17%	State land, present National Forests
B. Within 1 to 5 years	4 - 34% (17% ave.)	12 - 74% (43% ave.)	Native selections, future state selections
C. Within 5 to 10 years	0.14-34% (17% ave.)	24 - 98% (61% ave.)	D-1 land, proposed National Forests
II Closed to development:			
A. Closed, but could be opened by the Secretary of the Interior*	1%	7%	Refuges and Monuments
B. Highly restricted to no mineral entry	0 - 6% (3% ave.)	0 - 21% (11% ave.)	Areas of Ecological Concern
C. Closed to all mineral entry	47%**	14%	Parks, NPR-4, Utility corridors, etc.
TOTAL	105%***	153%***	

* Based on rules now in effect on Arctic National Wildlife Range and National Wildlife Refuges in Alaska

** 44% is NPR-4 land

*** The excess is due to over-lapping of two or more classifications. See text for further clarification. The circle diagrams are constructed using proportions and are meant only to show relative proportions of the various classifications.

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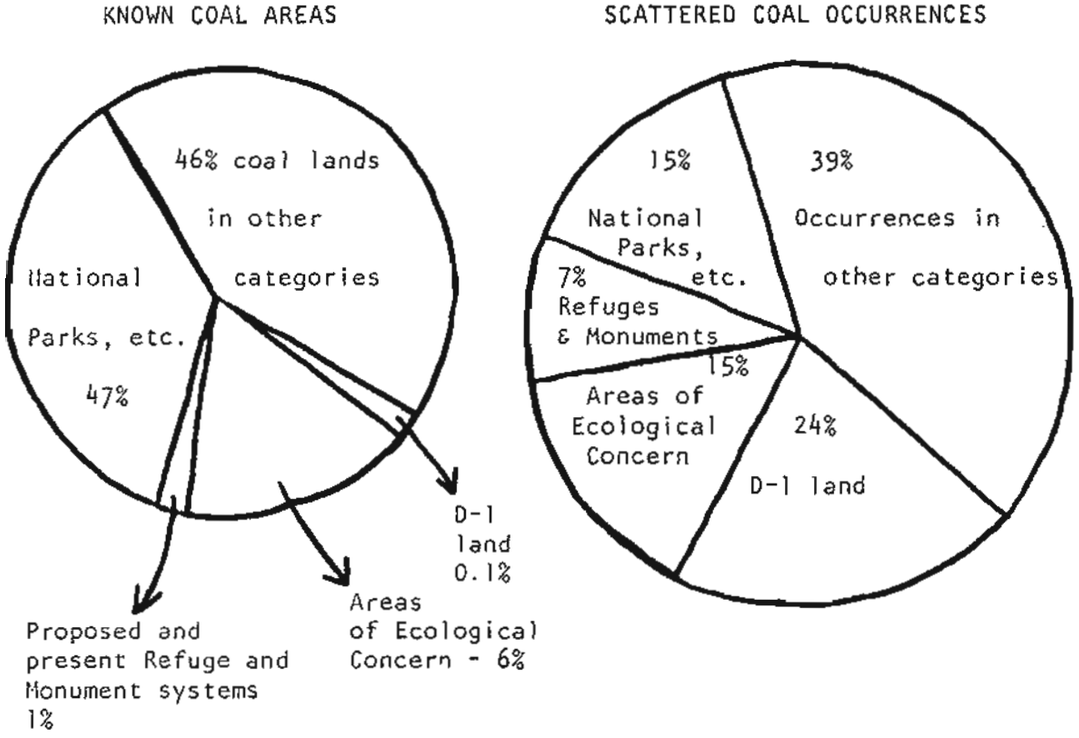
Figure 3 - EFFECT OF LANDS OF HIGH ADVERSE IMPACT ON COAL DEVELOPMENT



Land Category	Estimate of Proposed Land Use	% Resources In Land Category	Amount of Resource In Land Category (Sq. Mi.)	% Scattered Occurrences In Land Category	No. Scattered Occurrences In Land Category
Proposed National Park or otherwise restricted	Closed to mineral entry	47%	19,602*	10%	4
Proposed and present Refuge and Monument systems	Old systems: Development precluded by regulation New systems: Closed to mineral entry by law. This will probably continue indefinityly**	1%	433	12%	5
Proposed areas of Ecological Concern	These areas not selected by State or Natives will probably be highly restricted to mineral entry	6%***	2,484	21%	9
D-1 land	Closed to non-metallic mineral staking or leasing from 5 to 10 years	0.1%	36	24%	10
	TOTAL	54%	22,555	67%	28

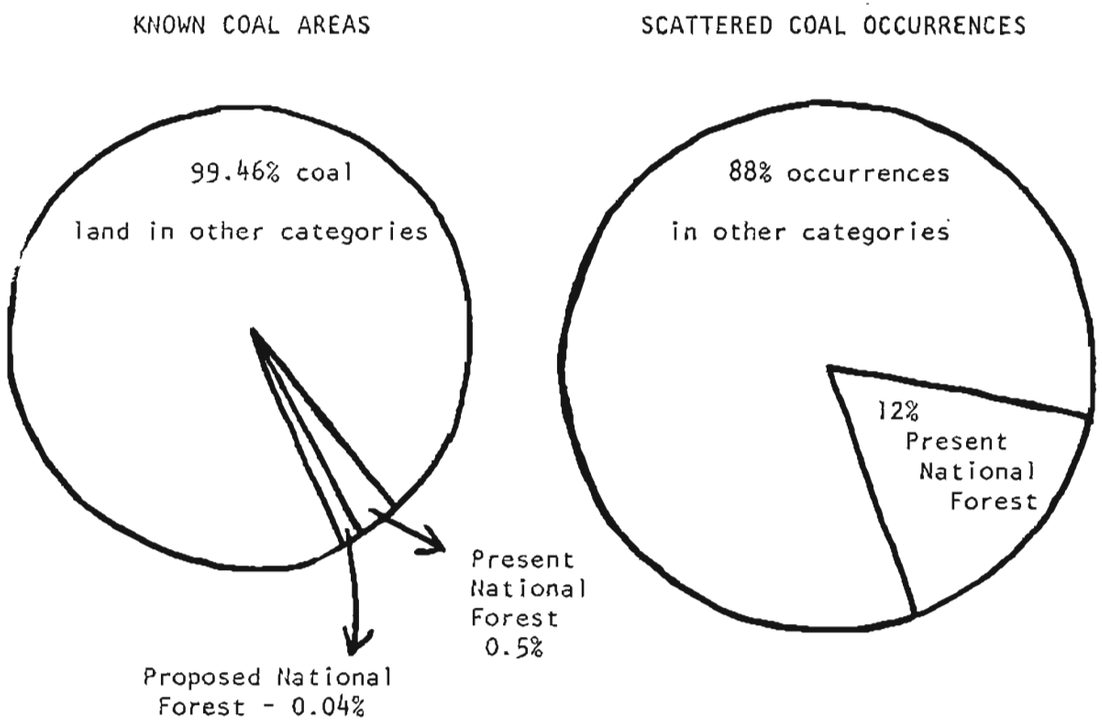
* Includes NPR-4 which is 44% of the total coal potential land.

** Based on rules in effect on Arctic National Wildlife Range and other refuges.

*** This assumes that all land remains in Federal ownership.

Map Card 3831

Figure 4 - EFFECT OF MULTIPLE USE LANDS ON COAL POTENTIAL AREAS



Land Category	Estimate of Proposed Land Use	% Resources In Land Category	Amount of Resource In Land Category (Sq. Mi.)	% Scattered Occurrences In Land Category	No. Scattered Occurrences In Land Category
Present National Forest	Multiple use	0.52%	216	12%	5
Proposed National Forest	Presently closed to development. Multiple use in 5 to 10 years?	0.04%	18	0	0
	TOTAL	0.56%	234	12%	5

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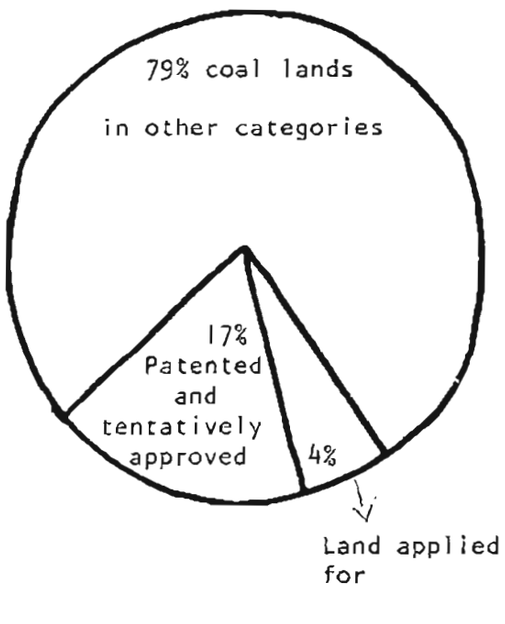
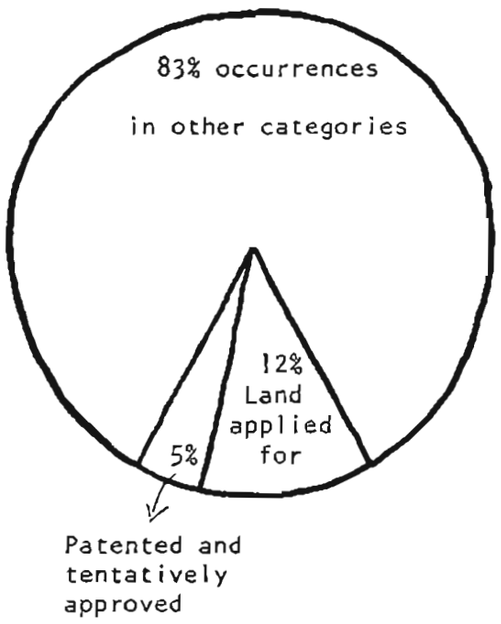
Figure 5 - EFFECT OF STATE LAND ON COAL POTENTIAL AREAS

KNOWN COAL AREAS



SCATTERED COAL OCCURRENCES



Land Category	Estimate of Proposed Land Use	% Resources In Land Category	Amount of Resource In Land Category (Sq. Mi.)	% Scattered Occurrences In Land Category	No. Scattered Occurrences In Land Category
Patented and tentatively approved	Patented - leasable Approved - leasable when patented	17%	7,128	5%	2
Land applied for	Leasable when patented	4%	1,638	12%	5
	TOTAL	21%	8,766	17%	7

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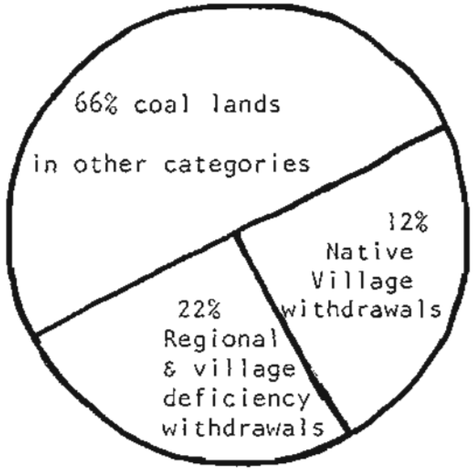
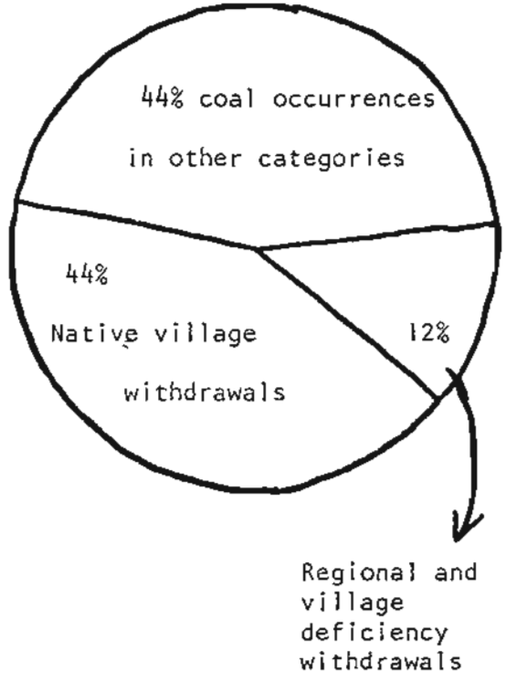
Figure 6 - EFFECT OF NATIVE LANDS ON COAL POTENTIAL AREAS

KNOWN COAL AREAS



SCATTERED COAL OCCURRENCES



Land Category	Estimate of Proposed Land Use	% Resources In Land Category	Amount of Resource In Land Category (Sq. Mi.)	% Scattered Occurrences In Land Category	No. Scattered Occurrences In Land Category
Regional and village deficiency withdrawals	0% - 100% of this land may be selected by the natives	22%	8,982	12%	5
Native village withdrawals	100% - 0% may revert to D-1 status	12%	5,076	50%	21
	TOTAL	34%	14,058	62%	26

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Mag and 4523

This report is one of the following series:

I	OIL AND GAS
II	COAL
III	URANIUM (SEDIMENTARY)
IV	GEOTHERMAL
V	MINERALS
VI	RESOURCE SUMMARY
VII	HYDROELECTRIC
VIII	OIL SHALE AND TAR SANDS
IX	GRAVEL AND BUILDING MATERIALS
X	SUMMARY

Reports I thru V are considered of highest priority and should be completed in 1974. The Results of reports I thru V will be combined into a land resource evaluation summary. This summary will indicate priority lands for selection by the State of Alaska and show the relative resource potential of Alaskan lands.