

EXPLANATION

COAL RESOURCE RATING CRITERIA

The following resource rating criteria are organized on a scale of 1 - low to 5 - high potential. A rating of 1 indicates virtually no potential for substantial coal discovery, and no known coal in the area. Categories 2 and 3 are for possible but unverified occurrences of coal. A 5 is the highest possible rating under this system. The letters "a" through "m" that accompany the numbers 2 through 5 are meant to clarify and justify the number ratings assigned. In some cases, more than one letter is used, as in "2b,c". These letters are only explanatory, like footnotes, and do not weight the ratings.

The areas outlined in heavy black on the map have been calculated according to the U.S. Geological Survey resource classification system (U.S.G.S. Circular 889), using available surface and subsurface data. The kind and reliability of data available determine how the resource potential is calculated (see "Coal Reserves," Glossary).

- Very low to low possibility for substantial coal discoveries; sedimentary and other rock units not known to host coal; these "barren" units vary from map to map; this rating based almost entirely on published general, broad-brush geological maps.
 - a units with very minor coal shows elsewhere; possibly favorable rocks but no coal known at location;
 - b queried rock unit or undifferentiated group (two or more rock units mapped together, so presence of coal-bearing unit is uncertain);
 - c cover of recent (Quaternary) unconsolidated sediments suspected of being underlain by a formation that hosts coal elsewhere;
 - d Tertiary basin; most of the coal on the Seward Peninsula is lignite (lower quality coal) found within Tertiary-aged sedimentary rocks confined in areas called basins (see "basin," Glossary); therefore, all such basins on the Peninsula potentially contain coal deposits;
 - e unverified report of coal occurrence; off-hand reference to coal in published geological report; other second-hand or unconfirmed reports.
- Low to medium possibility for substantial coal discoveries; these ratings based mostly on published general, broad-brush geology:
 - f coal bearing formation close to exposed coal, e.g. other end of basin or syncline (see 2d, above, and Glossary) from known coal deposits;
 - g scattered, small surficial coal shows or float (see Glossary) that may be weathering out of a hidden coal deposit;
 - h "mined out" or formerly subeconomic sites where future investigation may reveal usable coal resources;
 - i Cretaceous basin (see 2d, above, and Glossary): composed of Cretaceous-age rocks known elsewhere to contain medium to large tonnages of good quality (subbituminous to bituminous) coal; rated higher than 2d both because of likely higher coal quality and because of high tonnage potential demonstrated, for example, by the large Cretaceous-aged Cape Beaufort coal field.
- Medium to high possibility for substantial coal discoveries:
 - j marginal because of low rank (low Btu), low tonnage, structural complexity, or thin beds (even if coal is good quality and present in large amounts, thin beds may mean too much admixed waste).
 - k indicated and inferred resources (see Glossary) of 5's in favorable geology.
 - m may include cases where drilling has disclosed some coal but where its extent is still unknown.
- Known coal, lesser occurrences, and/or less well studied than 5's:
 - j marginal because of low rank (low Btu), low tonnage, structural complexity, or thin beds (even if coal is good quality and present in large amounts, thin beds may mean too much admixed waste).
 - k indicated and inferred resources (see Glossary) of 5's in favorable geology.
 - m may include cases where drilling has disclosed some coal but where its extent is still unknown.

Coal Rank - Based on Moist, Mineral Matter Free Btu/lb

Lignite	8,000 to 8,500 Btu/lb.
Subbituminous	subbituminous-A = 8,500 to 9,500 Btu/lb. subbituminous-B = 9,500 to 11,000 Btu/lb.
Bituminous	subbituminous-A to high volatile bituminous-C = 11,000 to 13,000 Btu/lb. high volatile bituminous-A = 13,000 to 14,000 Btu/lb. high volatile bituminous-B = 14,000 to 16,000 Btu/lb.

Coal Rank - Based on Dry, Mineral Matter Free Fixed Carbon %

Bituminous (medium volatile)	11,000 to 16,000 Btu/lb	68-78%
Bituminous (low volatile)	16,000 Btu/lb	78-84%
Semi-anthracite		84-92%
Anthracite		92-98%

SYMBOLS

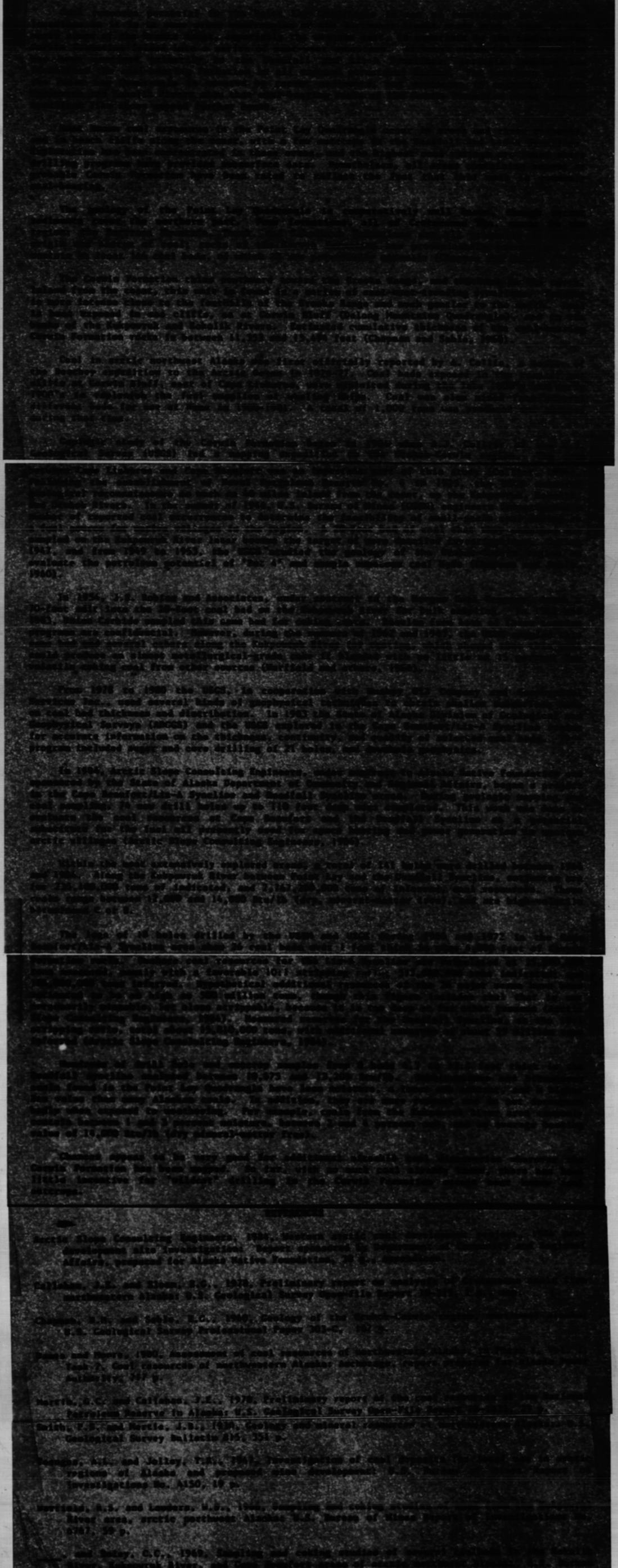
- ▲ FORMER COAL MINE
- COAL OUTCROP OR PROSPECT
- ✕ COAL FLOAT (GENERAL LOCATION)
- DRILLING DONE IN THIS AREA

Each number rating, 1 through 5, has typical typical levels of data confidence. A rating of 1 often implies limited geological data as well as a lack of coal potential. A rating of 3 usually implies more and better data, as well as greater coal potential. It is, however, possible to have a rating of 1, signifying low or non-existent coal potential, based upon a high level of data. This is the case in parts of the Point Lay Quadrangle for example, where detailed geological mappings have shown that certain rock units are not coal-bearing. Conversely, it is also possible to have a high rating of 4 for which the data base is limited, but for which geologic conditions are highly favorable for significant coal resource potential, as in "a" - as a very general indication of the amount and depth of information upon which ratings are based, each rating above has been assigned one of the following confidence symbols:

- Good data base
- △ Medium data base
- Poor or very general data base

These symbols are not meant as comment on the quality of work done by previous investigators, which in most cases is difficult to judge without rechecking the geology on the ground.

SUMMARY: POINT LAY QUADRANGLE



Types of Coal

Subbituminous	11,000 to 16,000 Btu/lb	68-78%
Bituminous (low volatile)	16,000 Btu/lb	78-84%
Semi-anthracite		84-92%
Anthracite		92-98%

Classification and use are determined by a coal's rank, its heating capacity, and its weathering characteristics. (Whether it remains compact readily crumbles and decomposes under surface conditions.) Lignite and subbituminous coals are often satisfactory for local use, such as home heating and power generation, but poor weathering behavior and low heating values typically make the long distance transportation and storage of low-rank coal impractical. Bituminous coals are of higher rank than lignite and subbituminous coals, and may be coking, caking or non-caking. The main coal rank classification used in Alaska is lignite. The escape of volatile components, under heat in the absence of oxygen, results in a dull-gray, porous mass called coke. Caking and non-caking bituminous coals are not suitable for metallurgical use, but have high heating values, and do not weather as badly as lower rank coals. Long distance transportation and storage of these coals may therefore be feasible. Anthracite, the highest rank of coal, has the highest heating value per pound, with the lowest residual moisture, but there is very little anthracite coal in Alaska. At a very high fixed-carbon content, anthracite becomes graphite, which cannot be used for fuel.

GLOSSARY

anticline/syncline - Rock structures formed from the large-scale folding of massive rock units; the upward folded portion of the rock is the anticline, with an inverted U-shaped cross section; the downward folded part is the syncline, with a U-shaped cross section.

basin - 1) Structural: a syncline that dips inward in all directions (see "syncline"); usually formed by the oblique intersection of two anticlines, or by downfaulting of underlying rock strata; the relationship of a structural basin to present topography is largely coincidental; for example, rocks (and coal) of the Cretaceous structural basins of the Point Lay Quadrangle probably formed in a relatively flat environment; were buried by continued sedimentation, and were later folded in two cross-cutting directions to form structural basins; present topography of these basins is a product of differential weathering of the various rock types of which they are composed. 2) Topographic: sediments (and vegetable matter) deposited in an existing valley or basin, where they are compacted into rock (and coal) by subsequent burial; for example, coals of the Tertiary basins of the Bendeleben Quadrangle are much younger than the rocks (forming the old valleys they now occupy); such valleys or basins may be relatively undisturbed.

folded rocks - do not necessarily occur in pairs and can cut across each other forming more complex structures like basins.

ash - Residual mineral impurities left after the combustion of coal. High-ash coal has more than 15% total ash; coal with less than 8% total ash is low-ash coal.

ASTM - American Society for Testing Materials; sets many specifications for materials and standards for materials testing used in the United States.

coal - A compact, light-weight, dark-brown to glossy-black rock composed of vegetable material that has been physically and chemically altered to a concentrated combustible product.

coal float - Fragments of coal displaced from the parent coal bed by erosion; found in stream gravel, in valley floor deposits, and in the basins of bluffs, in landslide material, and elsewhere down slope of a coal outcrop.

coal reserves - Identified, recoverable coal resources:

- measured - identified undeveloped coal reserves with the highest degree of geological assurance; calculated by extrapolating 1/4 mile beyond coal outcrops and drill-hole intercepts; by convention includes only coal beds of at least 10' thick.
- indicated - undeveloped coal reserves with a moderate degree of geological assurance; calculated by extrapolating coal outcrop and drill-hole data to a depth of 1,000' and for a horizontal distance of 1/2 to 1 mile.
- inferred - undeveloped coal reserves with the lowest degree of geological assurance; calculated by extrapolating coal outcrops and drill-hole data to a depth of 1,000' and a horizontal distance of 1 to 3 miles.

coal seam - Natural deposit of coal in the earth's crust, occurring in a form and amount such that economic extraction is currently or potentially feasible; includes both reserves and presently non-economic deposits most likely to become mineable in the future.

coal rubble - Similar to coal float, but often the fragments of a fractured sub-surface coal bed (not linked to the surface through freeze-thaw action, or the fractured and fragmented coal particles that accumulate from the weathering of a surface or near-surface coal occurrence; found close to the parent coal bed.

caking coal - A form of coal, usually of bituminous rank, that softens and flows when heated to just below the point of ignition; during this process, volatile compounds escape as gases, leaving a dull-gray, porous mass called coke.

deformation - Any physical change in the attitude, shape, or volume of rocks from the configuration they had when formed; folding, tilting, and warping are forms of deformation, as are compression (squashing) and tension (stretching).

dip - The angle a tabular rock unit forms with the horizontal.

STRIKE AND DIP OF ROCKS

results from one or more types of deformation, such as uplift, fault movement, or downwarping of rocks due to the weight of overlying sediments.

fixed carbon - The solid residue, other than ash, obtained by destructive distillation of coal; determined by definite prescribed ASTM methods.

strike - The line formed by the intersection of the dip plane of a tabular rock unit with the horizontal; for example, if the dip is some angle toward the west, then the strike is north-south (see "dip").

stripping ratio - The ratio of overburden (soil and rock covering the coal) to coal being mined by strip mining methods; reserve estimates usually omit coal deposits with stripping ratios higher than about 10:1 because these are seldom economic.

volatile matter - In coal, those products, exclusive of moisture, given off as gas and vapor, determined by definite prescribed ASTM methods.

Mississippian - The older 1/2 of the geologic period called the Carboniferous, during which many of the world's coal deposits formed; the Mississippian subdivision spans the time from 360 million to 320 million years ago; in this report, occurs only in the summary for the Point Lay Quadrangle.

Cretaceous - Geologic period spanning the time from 140 million to 65 million years ago; many of Alaska's coals were formed during the Cretaceous period.

Tertiary - Geologic period spanning the time from 65 million to 1.5 million years ago; many of Alaska's coals are Tertiary in age.

Quaternary - Geologic period spanning the time from the end of the Tertiary through the present, or the last 1.5 million years.