

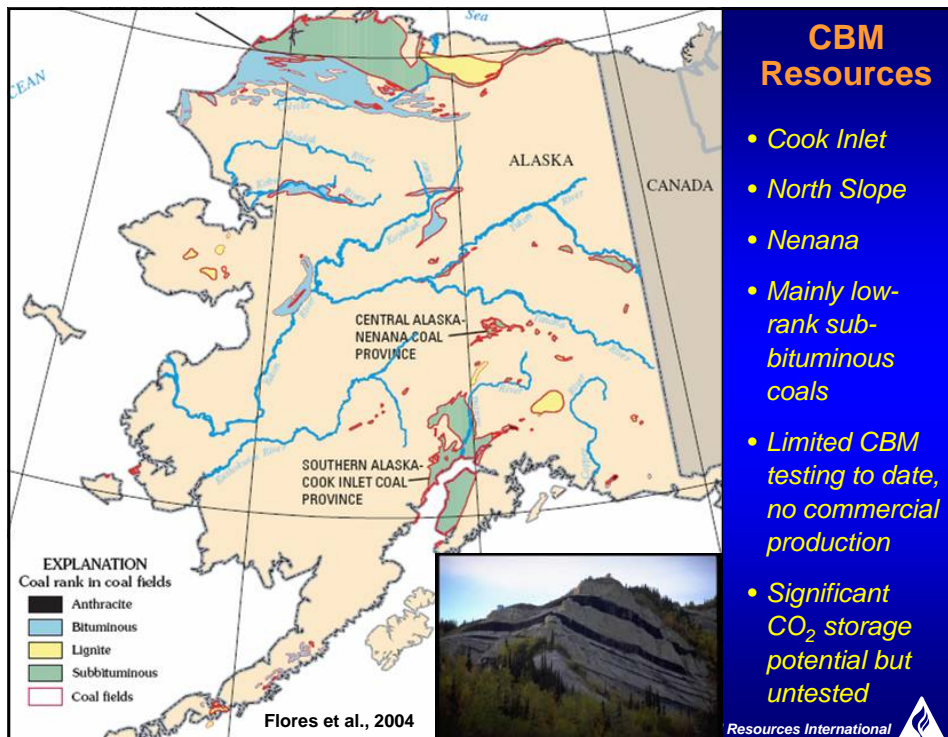
Alaska Deep Coal Seams Scoping CO₂ Sequestration Evaluation

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Alaska CBM Resources & CO₂ Storage Potential

- 1995 : Initial DNR estimate of 1,000 Tcf GIP CBM resources.
- 2004 : Updated USGS estimate of Alaska coal resources. CBM resources “exceedingly large” but did not quantify.
- 2006 : USGS updated North Slope coal resources and estimated N-S CBM resources to be 19 Tcf, implying average gas content of only 6 scf/ton (d.a.f.).

Smith, T.N., 1995. “Coalbed Methane Potential for Alaska and Drilling Results for the Upper Cook Inlet.” Intergas Conference, May 15-19, Tuscaloosa, Alabama, p. 1-21.

Flores, R., Stricker, G., and Kinney, S., “Alaska Coal Geology, Resources, and Coalbed Methane Potential.” US Geological Survey, DDS 77, 2004.

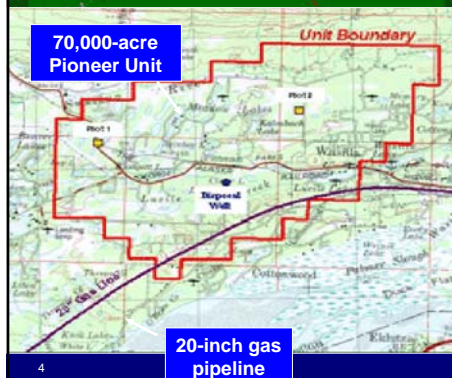
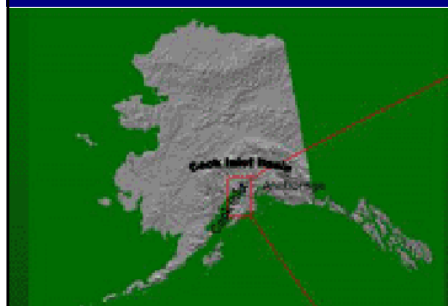
Roberts, S. et al., 2006. “Assessment of Coalbed Gas Resources in Cretaceous and Tertiary Rocks on the North Slope, Alaska, 2006.”

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Onshore Cook Inlet Alaska CBM : Evergreen Resources Pilots



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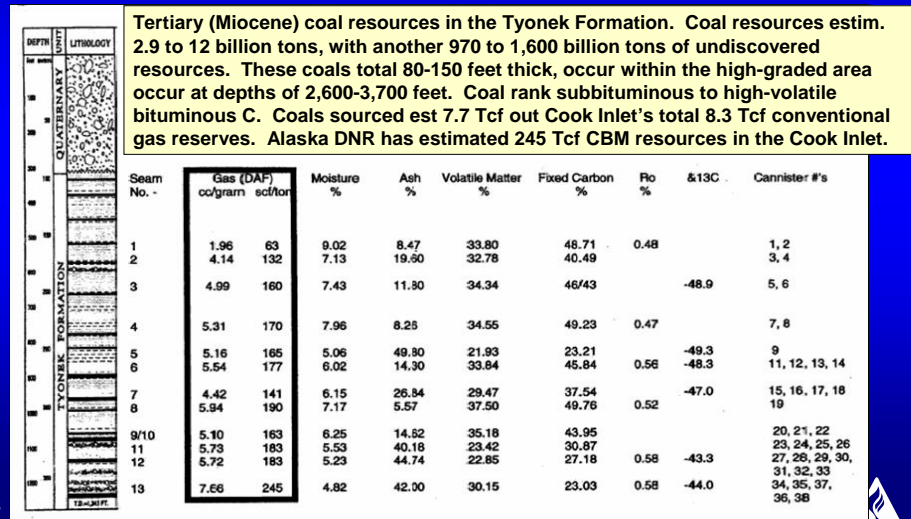
- Coal sources estimated 7.7 Tcf of Cook Inlet's total 8.3 Tcf conventional gas.
- Evergreen Resources (now Pioneer) drilled two 4-well CBM pilots in 2002.
- Only multi-well production pilots attempted in Alaska to date.
- 300k ac, 35 mi N of Anchorage in Matanuska-Susitna Valley.
- Vertical wells drilled with air percussion rig to TD in 3 days, then fraced.
- High-vol bituminous Oligo-Miocene Tyonek coals, total 80-150 ft thick.
- TD ranged from 2,600–3,700 ft.
- “Probably not capable of commercial production.”

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Alaska CBM Resources & CO₂ Storage Potential

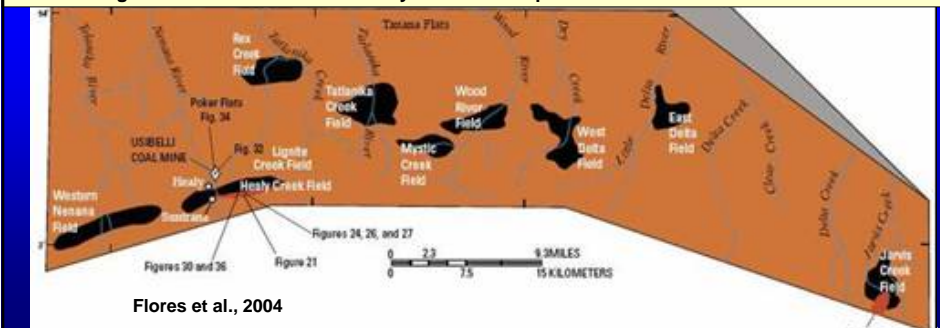
- State of Alaska test corehole AK-94-1, onshore Cook Inlet.
- Gas content increased from 63 ft³/ton at shallow depth (sea level) to 245 ft³/ton at -745 ft.

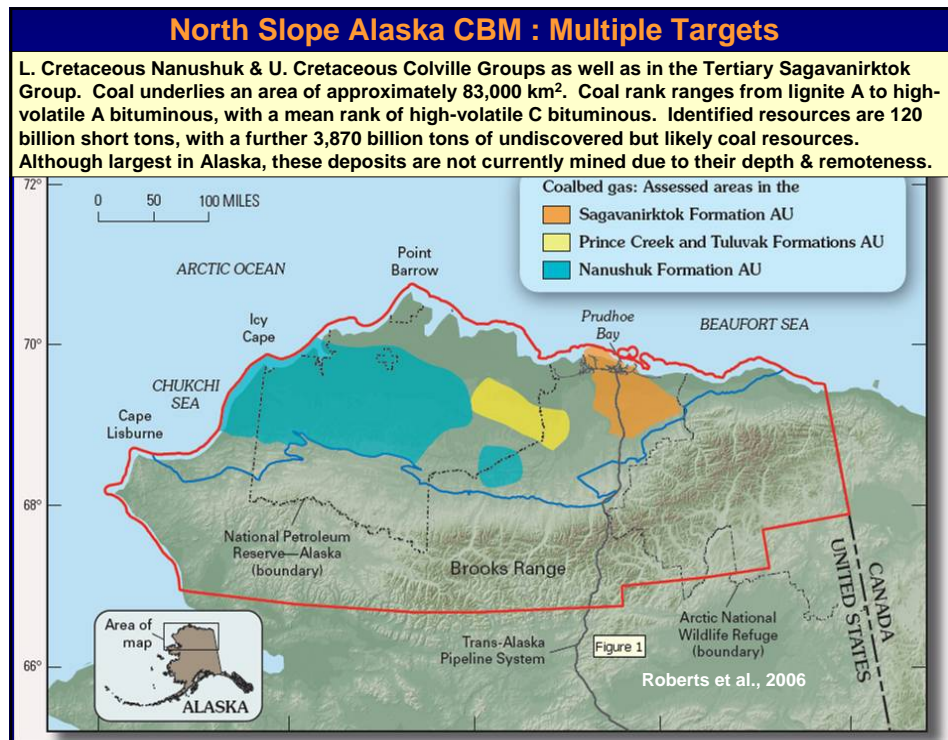


Central Alaska CBM : Coal Fields Small & Isolated

- Nenana coal field in central Alaska.
 - CO₂ storage potential appears very small.
-
- Oligo-Miocene Suntrana Fm contains coal seams up to 60 ft thick.

Tertiary coals estimated at 6.4 to 7.7 billion tons of identified resources, with an additional 10 billion tons of undiscovered resources. Coal thickness is approximately 50 to 66 feet and occurs at depths ranging from surface to around 3,000 feet. Coal rank ranges from lignite to subbituminous, mainly subbituminous C. Although smaller than the North Slope and Cook Inlet, the Nenana basin is the only coal province in Alaska that is currently being mined. The region is not continuously underlain by coal, but instead comprises numerous small structural basins (synclines) that are separated by anticlinal highs. Coal occurs in the Tertiary Usibelli Group.





Alaska CBM Resources & CO₂ Storage Potential

- USGS 2006 estimate of North Slope coal resources assumed gas content of only 6 scf/ton (d.a.f.).
- ARI combined USGS coal resource estimate with more “reasonable” CH₄ content based on typical coal depth and rank (100 to 200 scf/ton, d.a.f.).
- **758 Tcf** of CBM gas in place (not far from DNR’s initial 1,000 Tcf estimate); equivalent to L-48 CBM resources.
- Using 2:1 CO₂/CH₄ ratio yields total CO₂ storage capacity of around **84 Gt**.

Region	Identified & Undiscovered Coal Resources (Btons)	Mean Ash Content (%)	Mean Moisture Content (%)	Identified & Undiscovered Coal Resources (Btons, daf)	Mean Volatile Matter (%)	Methane Content (scf/ton, daf)	CBM Resources (Tcf)	CO ₂ Storage Capacity (scf/ton) (daf)	CO ₂ Storage Capacity (Tcf)	CO ₂ Storage Capacity (Gt)
North Slope	4,020	10.3	12.5	3,103	30.1	USGS 6	18	-	-	-
North Slope	4,020	10.3	12.5	3,103	30.1	ARI 200	621	400	1,241	65
Nenana	17	9.9	24.7	11	35.9	ARI 100	1	200	2	0
Cook Inlet	1,292	10	20	905	35	ARI 150	136	400	362	19
ARI Total	5,329			4,019		ARI	758		1,605	84