

ANWR 1002 Area

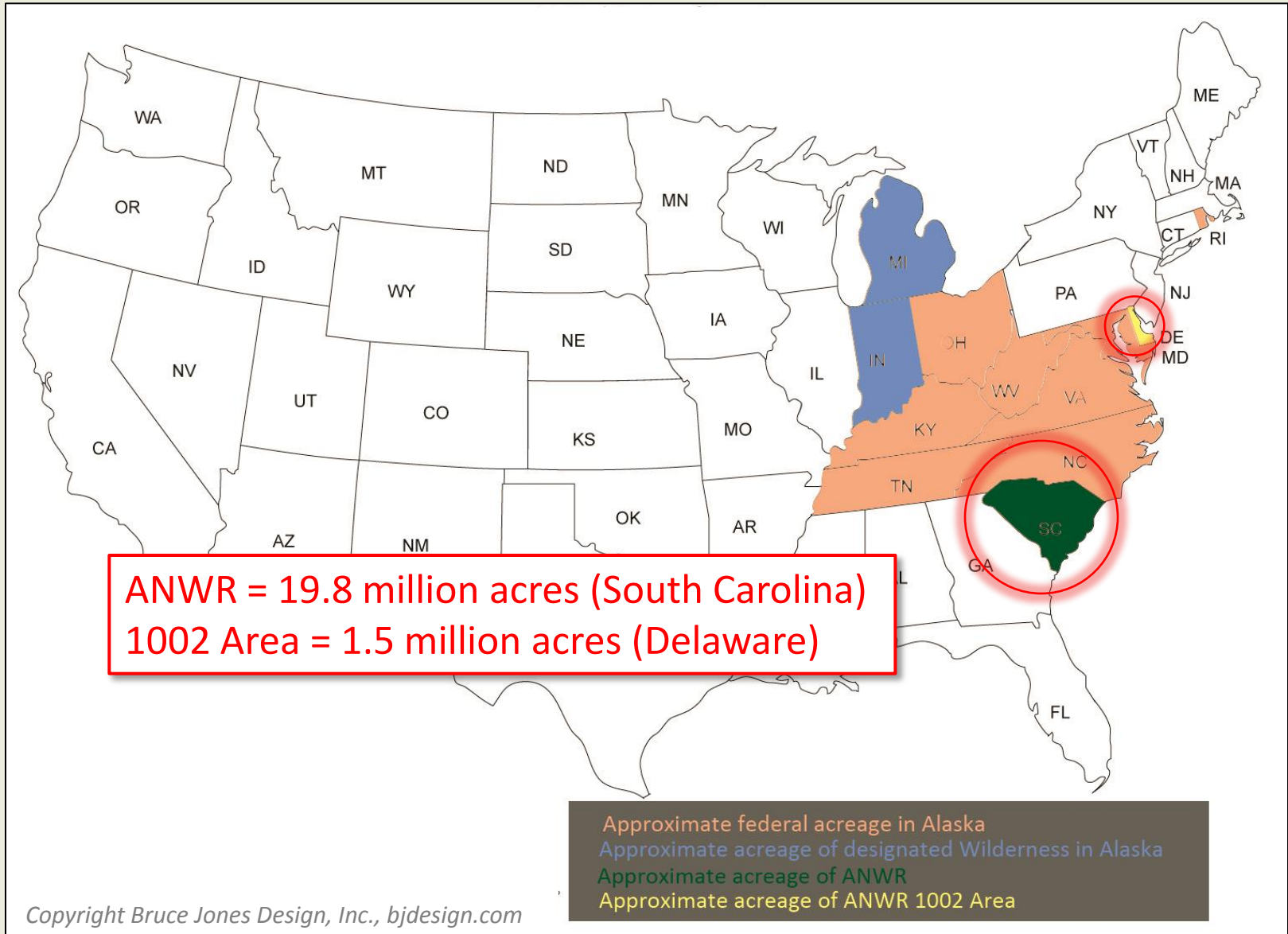
House Resources Committee
February 23, 2015

Paul Decker, Petroleum Geologist and Acting Director
Alaska Division of Oil and Gas

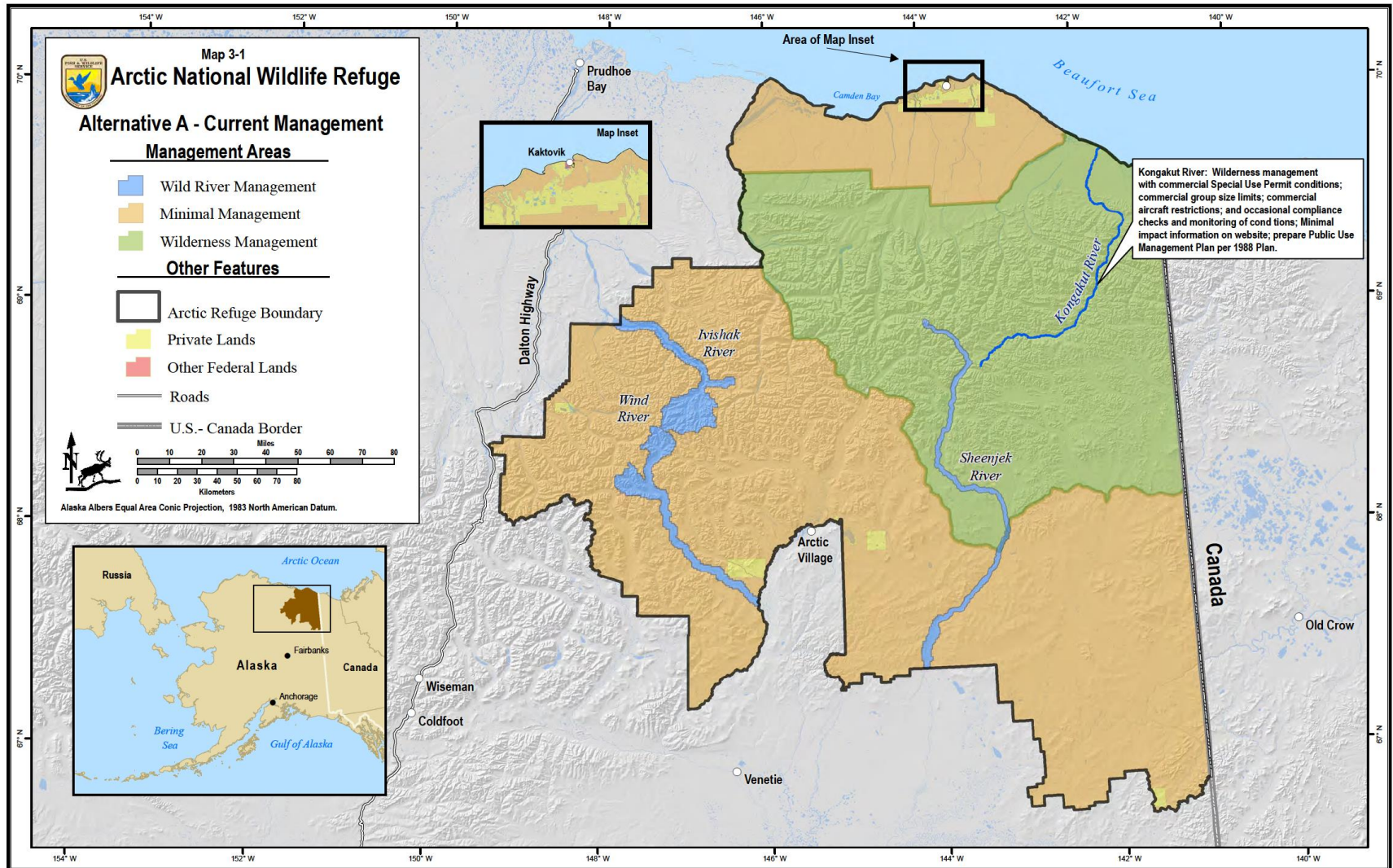


Size Comparisons

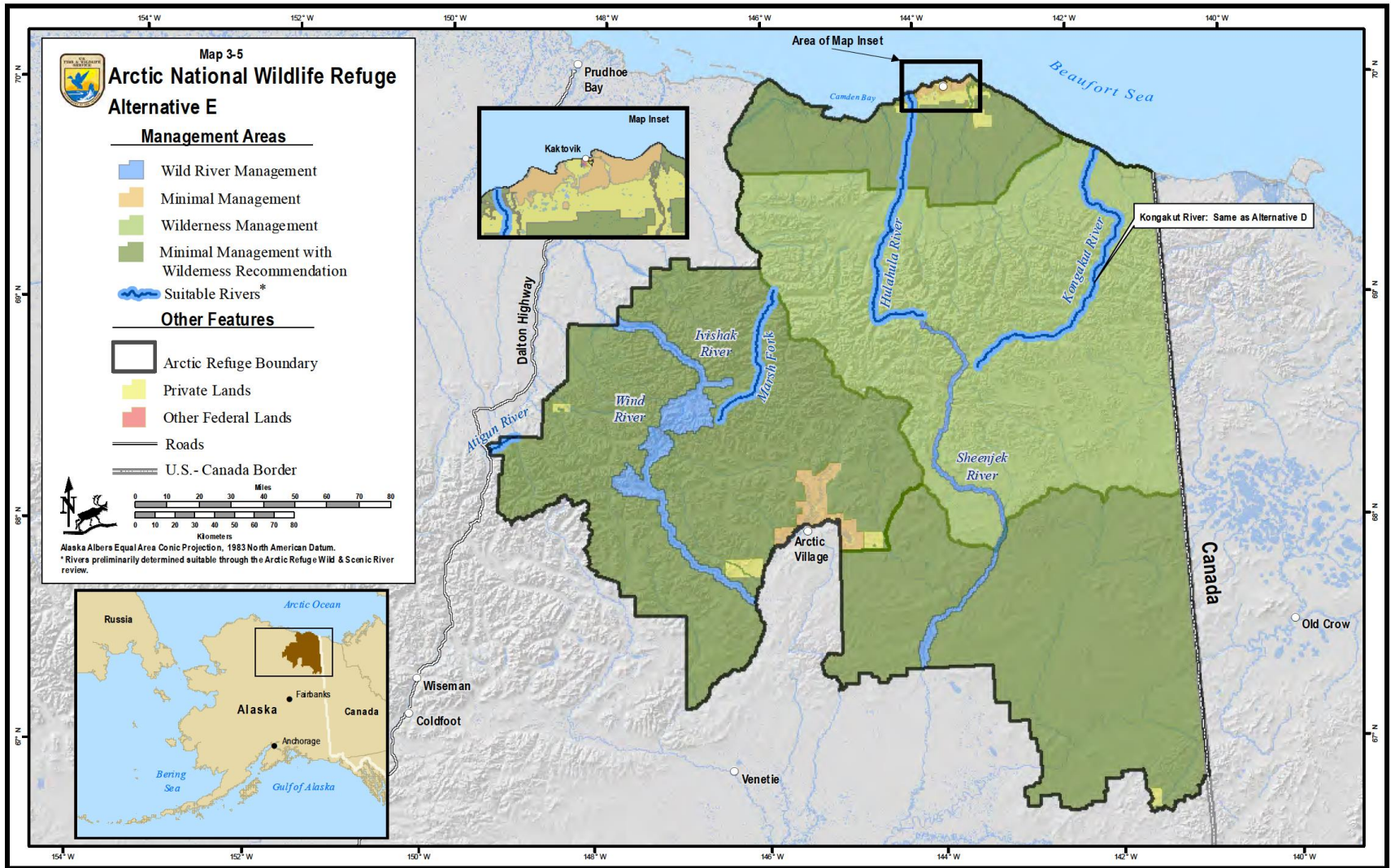
ANWR & other Federal lands in Alaska vs. Lower 48



ANWR Management under previous plan



ANWR Management under new plan

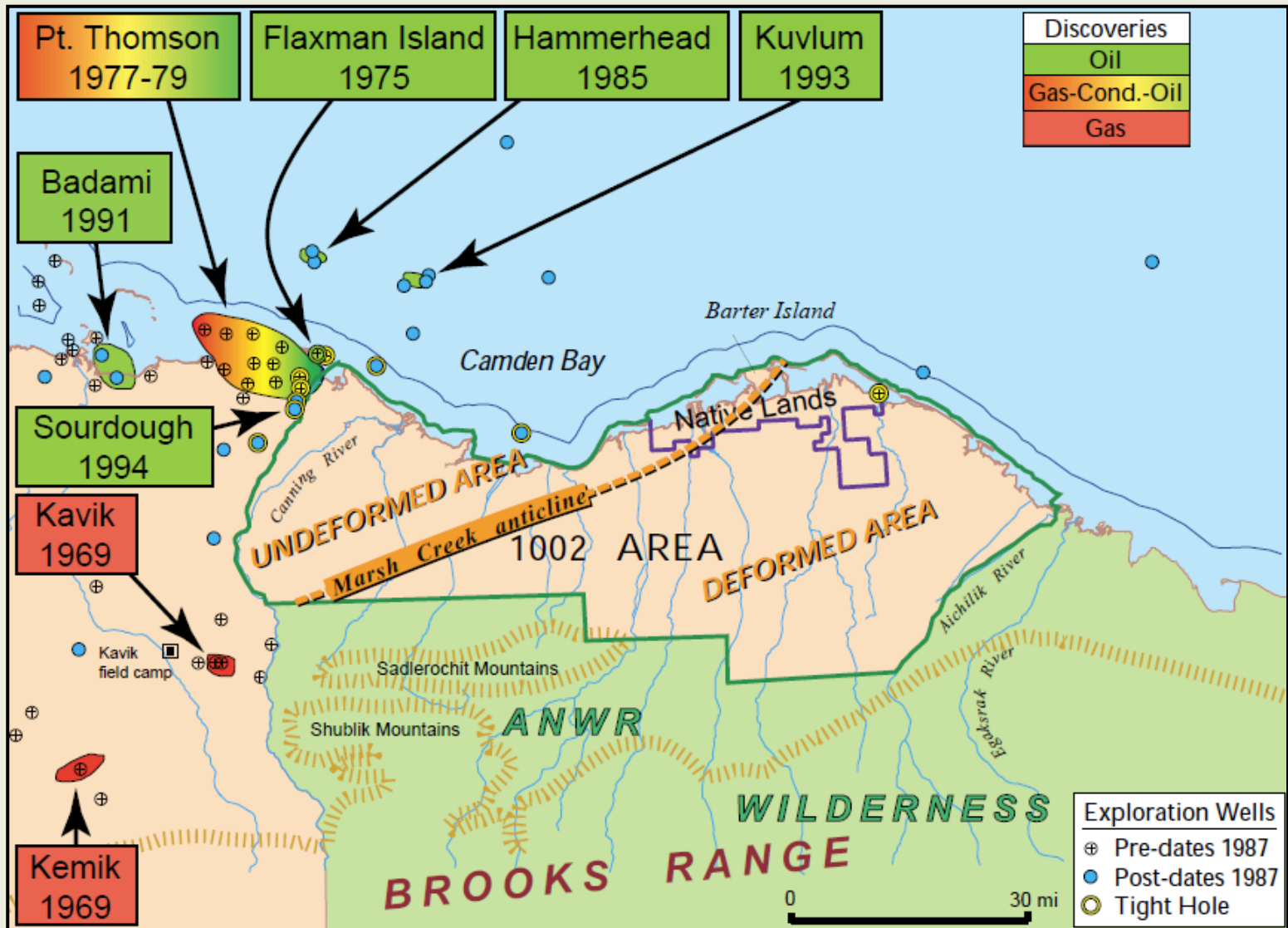


ANWR 1002 Area History

- 1960 – Arctic National Wildlife Range established
- 1971 – ANCSA establishes 69,000 acres of Kaktovik Inupiat Corp/ASRC native lands
- 1980 – ANILCA Section 1002 (a) directs Interior to 1) assess the area for fish & wildlife, 2) an analysis of the impacts of O&G exploration, development, and production, and 3) authorized certain low-impact O&G exploration activities
- 1983-1985 – 2-D Seismic program completed 1,180 survey line miles
- 1987 – Department recommends Congress open coastal plain to oil and gas exploration
- 1995 – President Clinton vetoes ANWR provision
- 1998 – USGS assesses a mean of 7.7 BBO recoverable oil from 1002 federal lands
- 2001 – Department Solicitor General opinion of permit for exploratory activity expired
- 2013 – DNR applies for survey Permit with winter survey plan
- 2014 – DNR sues over Solicitor General's opinion on ANWR exploratory permit
- 2015 – Revised Comprehensive Conservation Plan calls for 1002 area for designation as wilderness area.

ANWR 1002 Area Location Map

Undeformed vs Deformed Areas



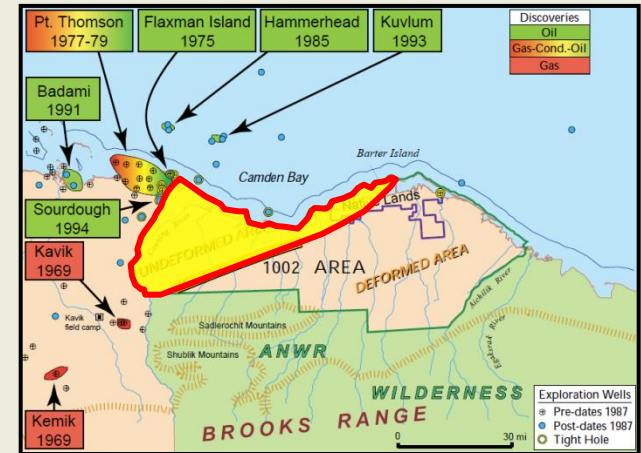
USGS, 1998; Bird, 1999

USGS 1998 Resource Assessment

Undiscovered, Technically Recoverable Resource

Part of study area	Volume of oil, in millions of barrels		
	F ₉₅	Mean	F ₀₅
Entire assessment area ¹	5,724	10,360	15,955
ANWR 1002 area (Federal), TOTAL	4,254	7,668	11,799
Undeformed part	3,403	6,420	10,224
Deformed part	0	1,248	3,185

¹ Includes 1002 area shown on figure 2, Native lands, and adjacent State water areas within 3-mile boundary (see fig. 2).



- Most of the estimated resource is in the Undeformed Area
 - *Northwestern one-third of the coastal plain is geologically simpler, more favorable to hosting oil accumulations*
 - *Adjacent to State lands, including Point Thomson, Sourdough, and other discoveries*
 - *The undeformed area is estimated to hold more than five times as much oil (mean case) as the deformed area farther to the east*
 - *10 times more valuable on a barrel-per-acre basis*

Exploration Terminology

Informal but practical definitions

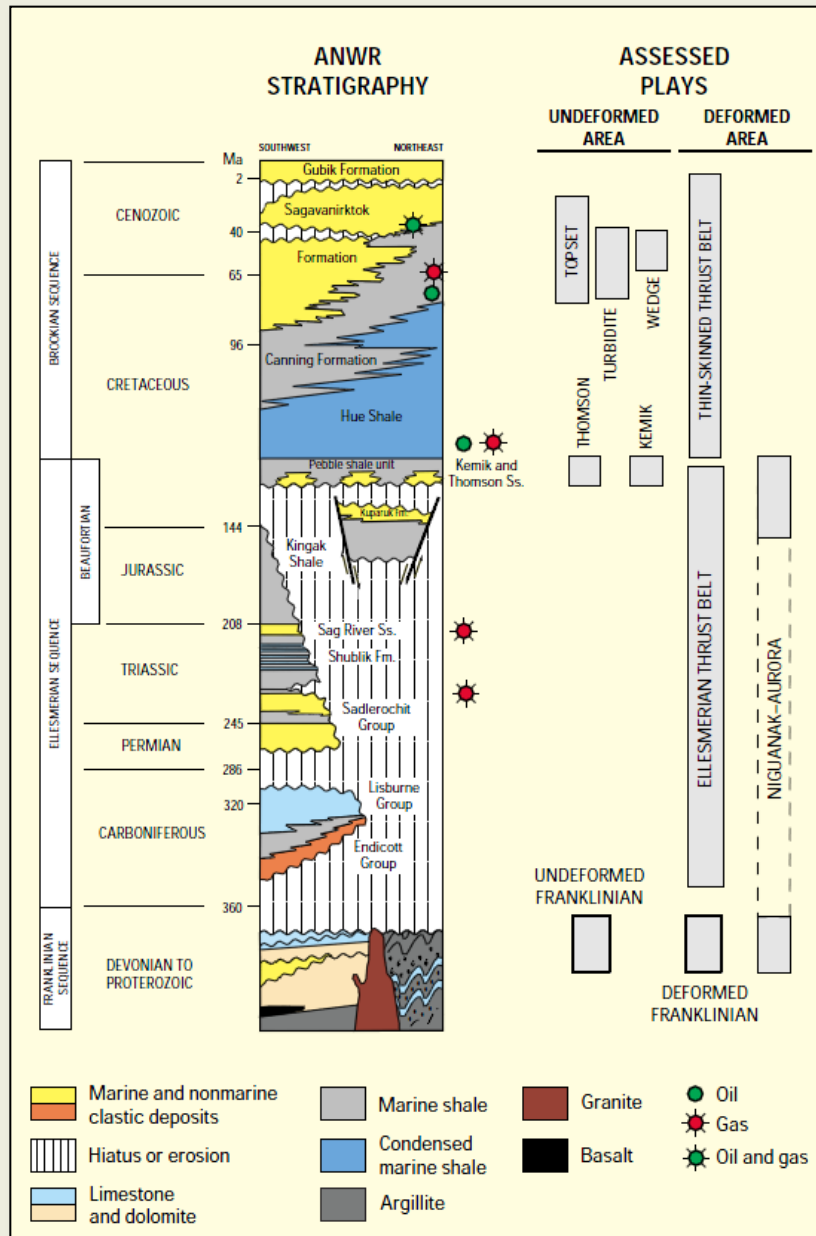
Play: a set of known or postulated hydrocarbon accumulations closely related to each other through key geologic characteristics, usually the same reservoir rock unit, also commonly the same trap type

Prospect: a postulated hydrocarbon accumulation identified from geological and geophysical interpretation; typically not yet confirmed by a discovery well, but in other cases includes discoveries that have not yet been commercially sanctioned

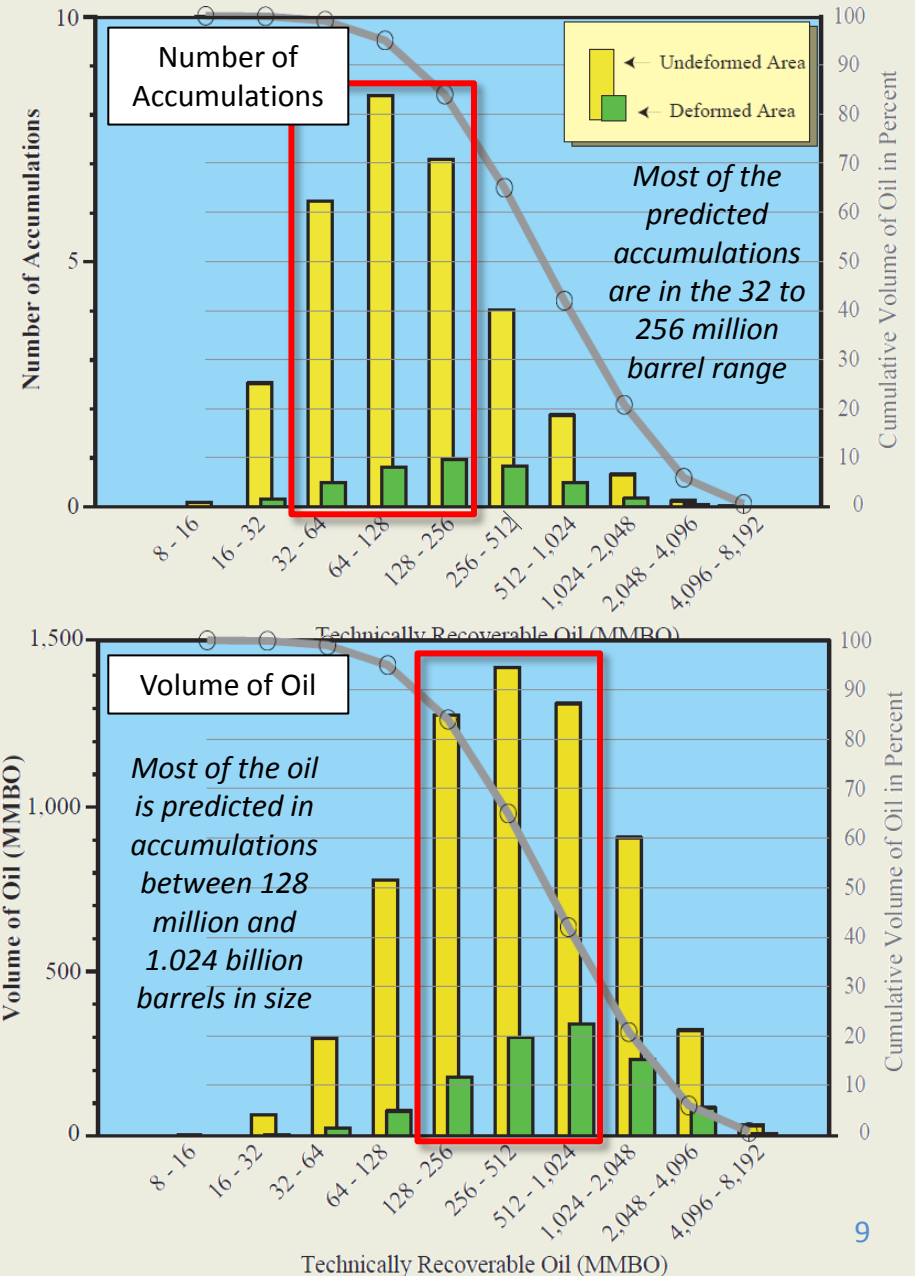
Accumulation: oil or gas known to be trapped in a viable reservoir rock at sufficient concentration (saturation) that it can be recovered in wells

Reserves: resources that have been discovered and are known or believed to be commercially producible; does not apply to undrilled prospects or technically recoverable volumes; different categories based on level of certainty. There are no reserves booked in ANWR at this time.

USGS 1998 Assessment



Undiscovered Field Size Distributions



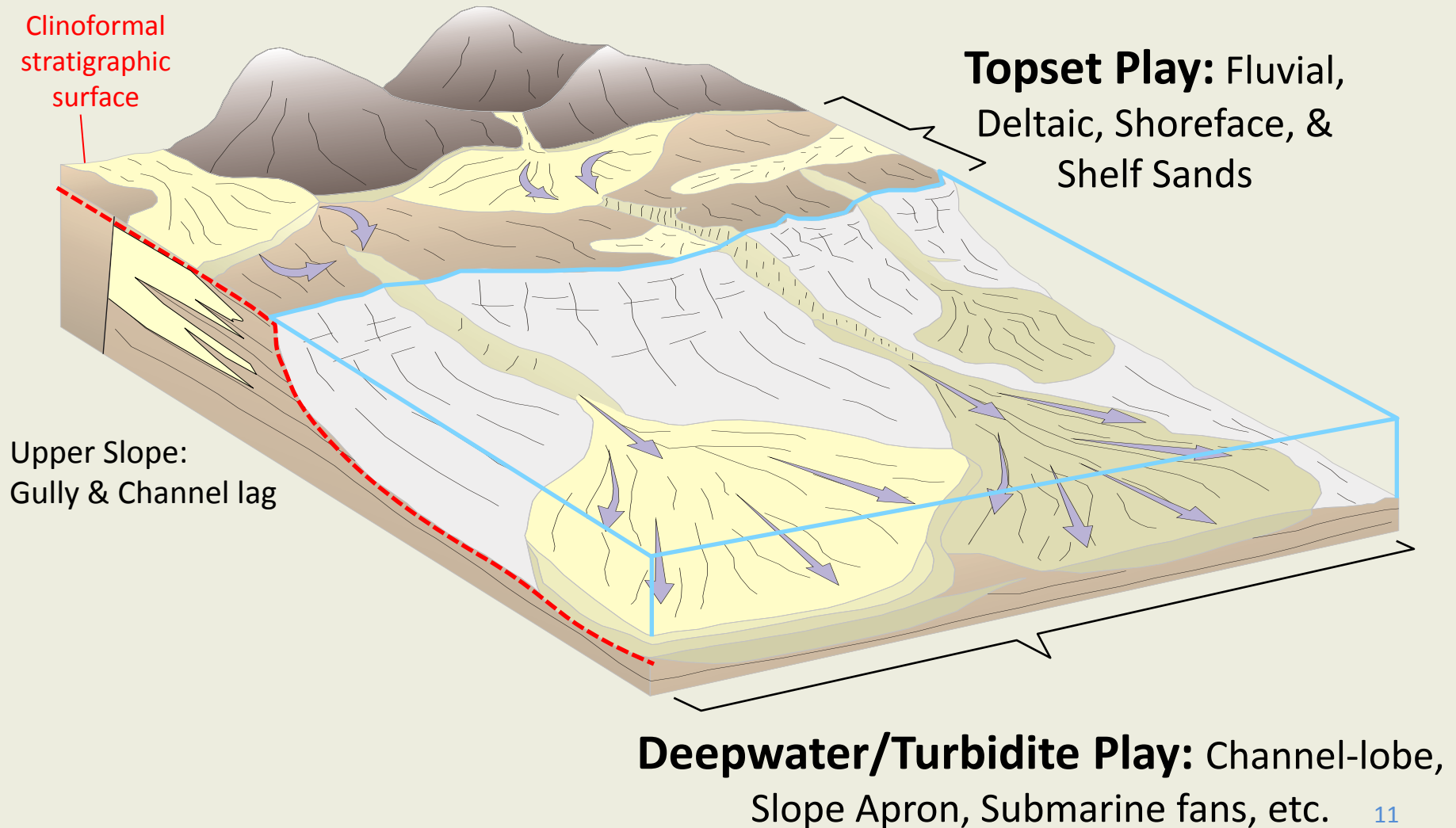
Major Exploration Plays

Entire ANWR assessment area mean = **10.4 billion barrels technically recoverable**

Stratigraphic and Structural trapping potential	• Brookian Topset play 6.2 BBOR – <i>Hammerhead (Sivulliq) and Kuvlum accumulations + SOA, ANWR, and OCS prospects</i> • Brookian Turbidite play 1.6 BBOR – <i>Badami, Flaxman A-1, Sourdough, Yukon Gold, and Stinson accumulations + SOA, ANWR, and OCS prospects</i> • Brookian Wedge play 0.5 BBOR – <i>No well penetrations or outcrop examples – inferred from seismic data</i> • Thomson and Kemik Sandstone plays 0.4 BBOR – <i>Point Thomson reservoir + SOA and ANWR prospects</i>
	• Ellesmerian & Brookian Thrust Belt plays 1.2 BBOR – <i>Kavik and Kemik gas fields + ANWR prospects</i> • Franklinian fractured basement play 0.1 BBOR – <i>Point Thomson Unit and Stinson + ANWR prospects</i>
Mainly Structural trapping potential	

Brookian Sequence Depositional Model

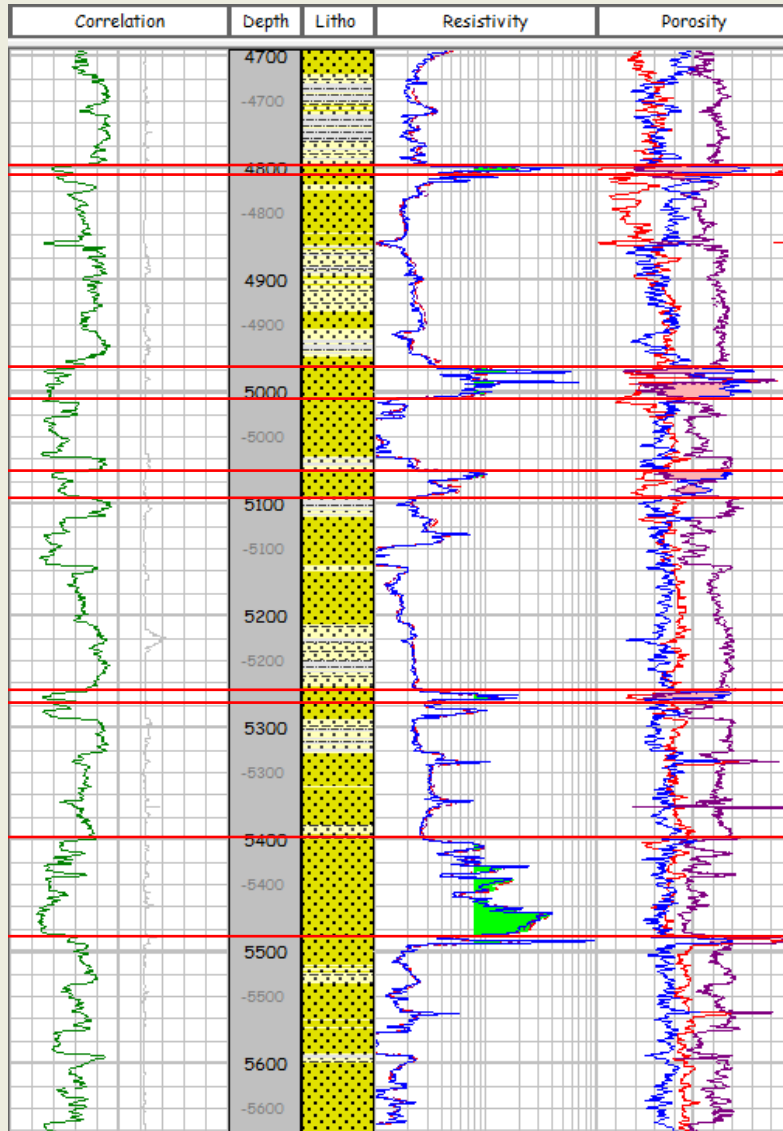
Foreland basin filled by nonmarine, shallow marine, and deepwater deposits



Brookian Topset Play

Tertiary Sagavanirktok Formation

Hammerhead 2 well, Eastern Beaufort OCS



- *Non-marine fluvio-deltaic and shallow marine sandstone and conglomerate reservoirs with intervening siltstone & mudstone seals*
- *High porosity and permeability*
- *Oil and gas in stacked pay zones at Hammerhead (Shell's Sivulliq area) and Kuvlum in OCS*

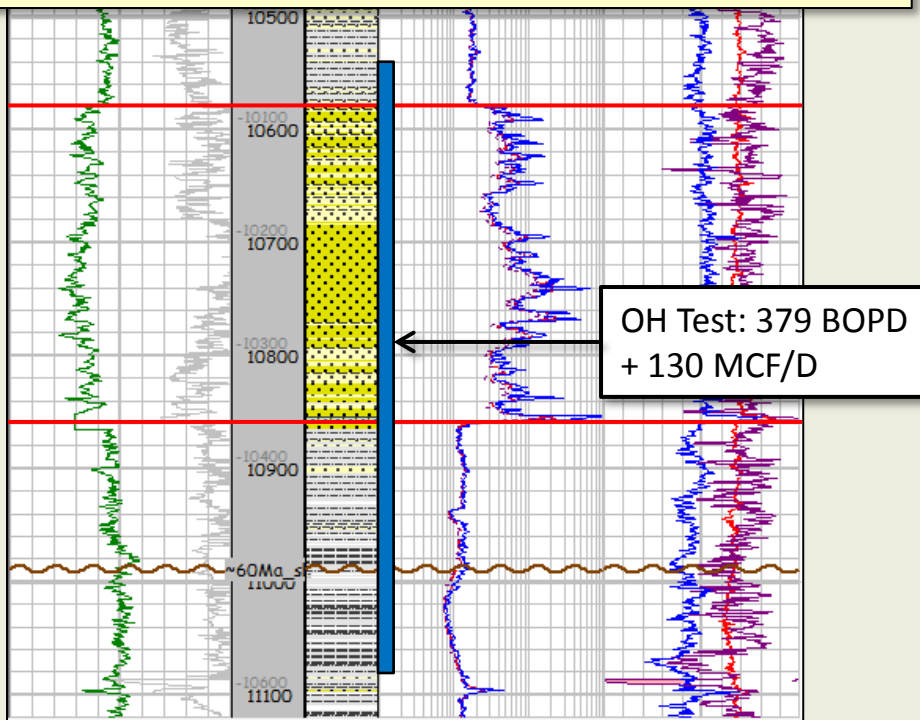
Gas effect (neutron-density crossover)

Oil-bearing sandstone (high resistivity, no crossover)

Brookian Turbidite Play

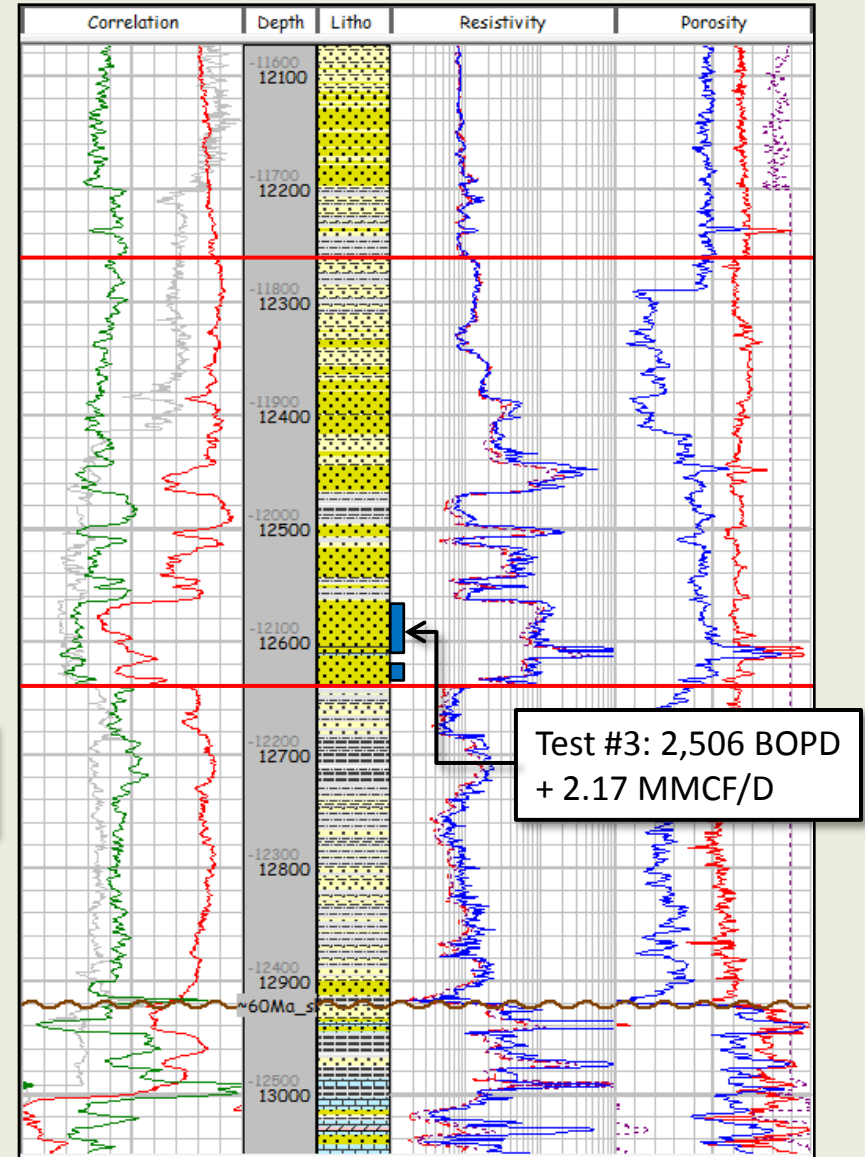
Badami 2

- Deepwater sandstone reservoirs encased in mudstone seals → stratigraphic traps
- Moderate porosity and permeability
- Moderate overpressure and consistently charged with oil of varying quality/viscosity



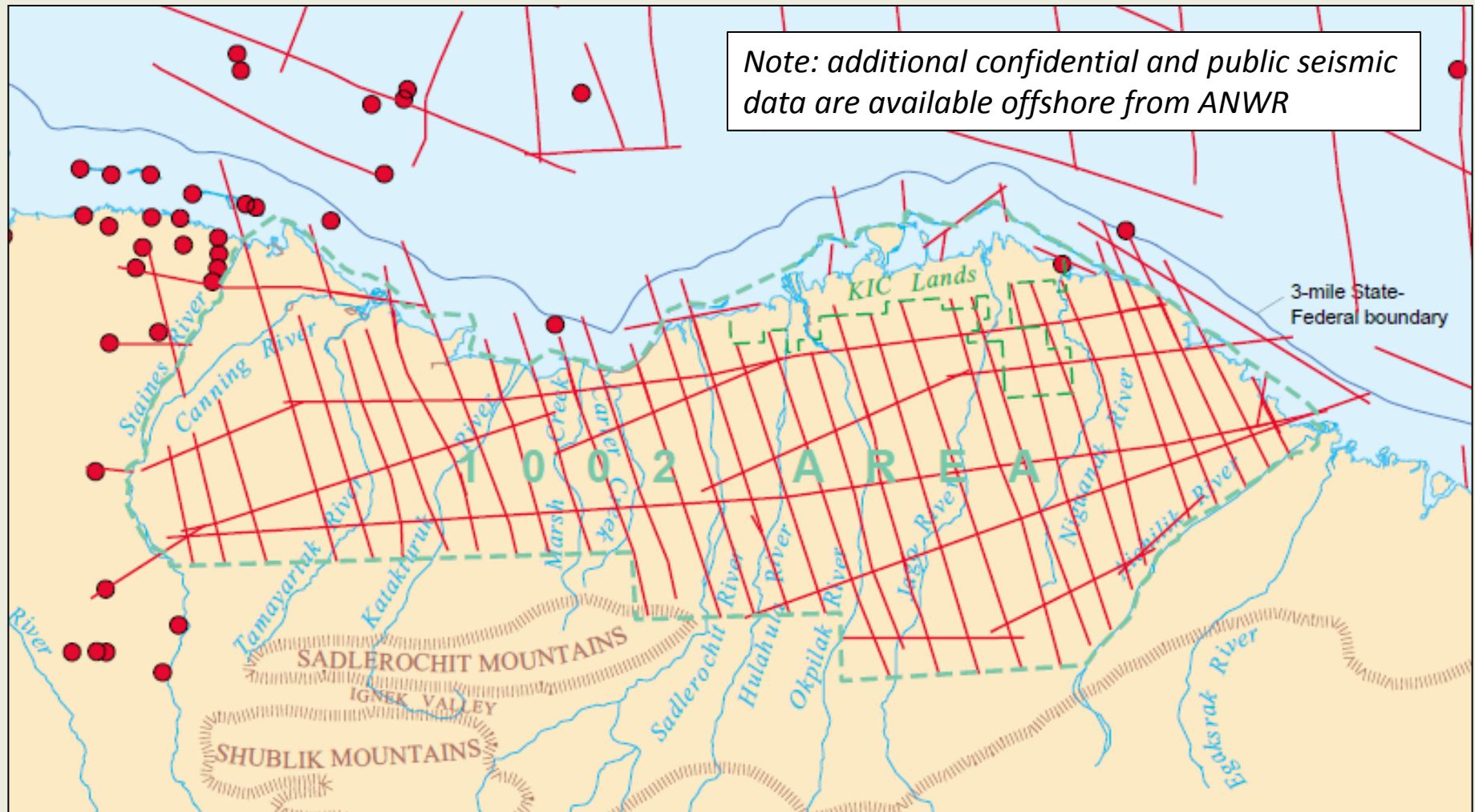
Paleocene Canning Formation

Flaxman A-1 discovery, PTU



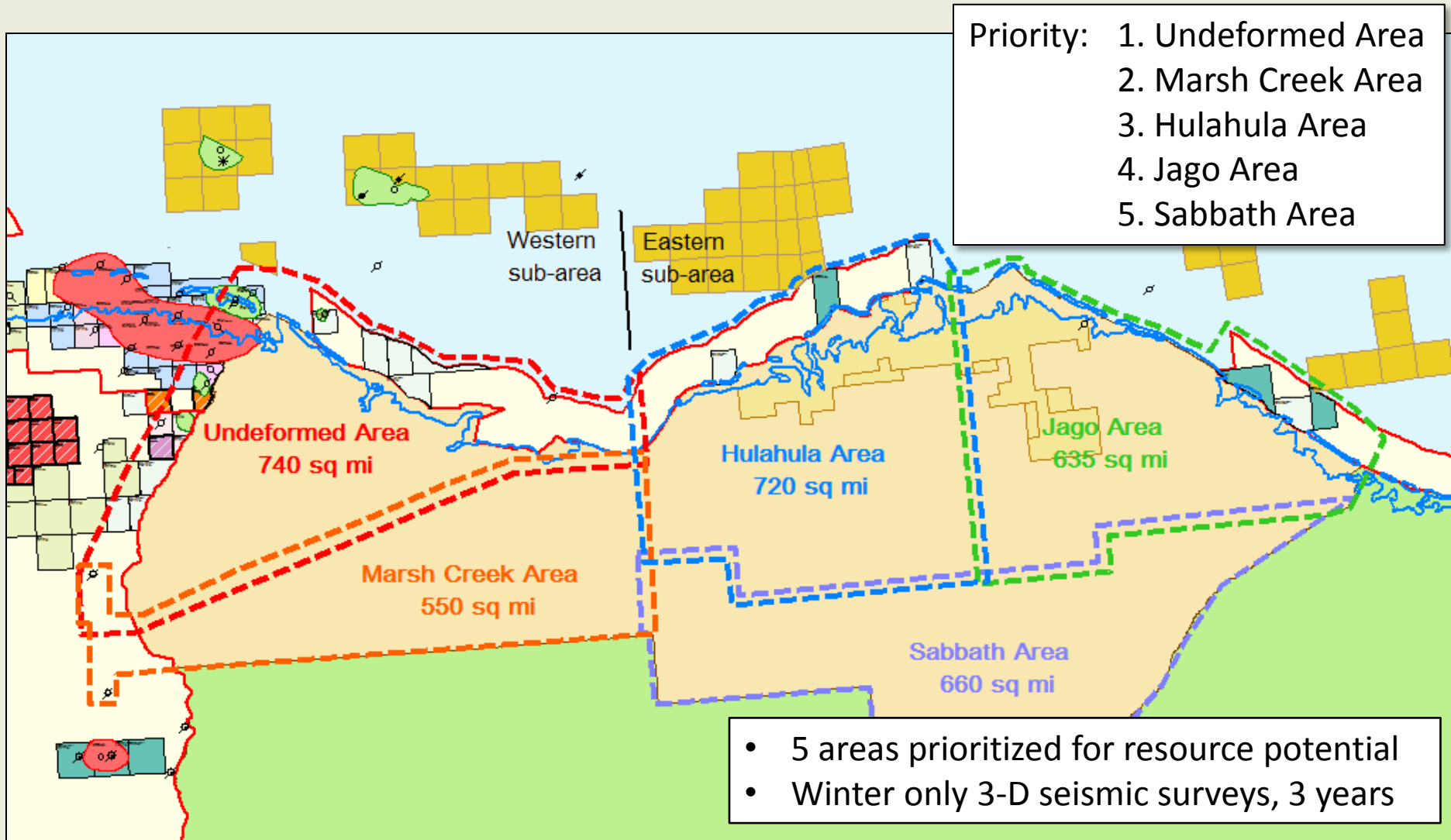
Existing Wells and 2-D Seismic Data

USGS 1999 assessment had 1984-85 vintage data at 3-8 mile line spacing



State of Alaska Exploration Proposal

Phase 1: Acquire up to 3,305 square miles 3-D Seismic



Rationale

State of Alaska's Proposal for 3-D Seismic in 1002 Area

- 1002 Area specifically intended for assessing oil and gas resource potential
- 2-D seismic survey in 1983-1985, one exploratory well on KIC/ASRC lands – both are proprietary
 - Better understanding of oil and gas potentials of 1998 assessments.
 - New technologies will assess significant areas for further exploration.
- Authority for exploration under 1002 (e) expired only by DOI interpretation. State challenges that point.
- Congress approved exploration as late as 1995; vetoed by President Clinton
- Interior has not recognized
 - 1002 (e) authority not revoked by Congress
 - NEPA standards for “decisions with incomplete or unavailable information”

ANWR: Not the First Time for Alaska

- DNR 2003 Report
 - Oil and Gas in the ANWR? It's Time to Find Out!
 - In-depth explanation of USGS 1998 resource assessment
 - Differential importance of “Undeformed Area” adjacent to State lands
 - Importance of modern 3D-Seismic assessment
 - Decreased footprint due to advances in directional drilling and improvement in development and production technologies
 - Need better information on resource base before making decision that would permanently take it off the table
- Alaska Legislature support actions since 1993
 - Endorsements and appropriations
 - Education, Exploration, & Leasing
 - Opposing Wilderness designation

Informed Decisions

- Alaska Constitution Natural Resource Policy
“its (the State’s) resources by making them available for maximum use consistent with the public interest.”
- Decisions for use based on
 - Current information
 - Findings of *“best interest”* for the State
- Believe the National interest in Alaska resources, whether State or Federal merit same consideration.
- NEPA cautions against decisions based on *“incomplete or unavailable information”*.

ANWR Exploration Plan

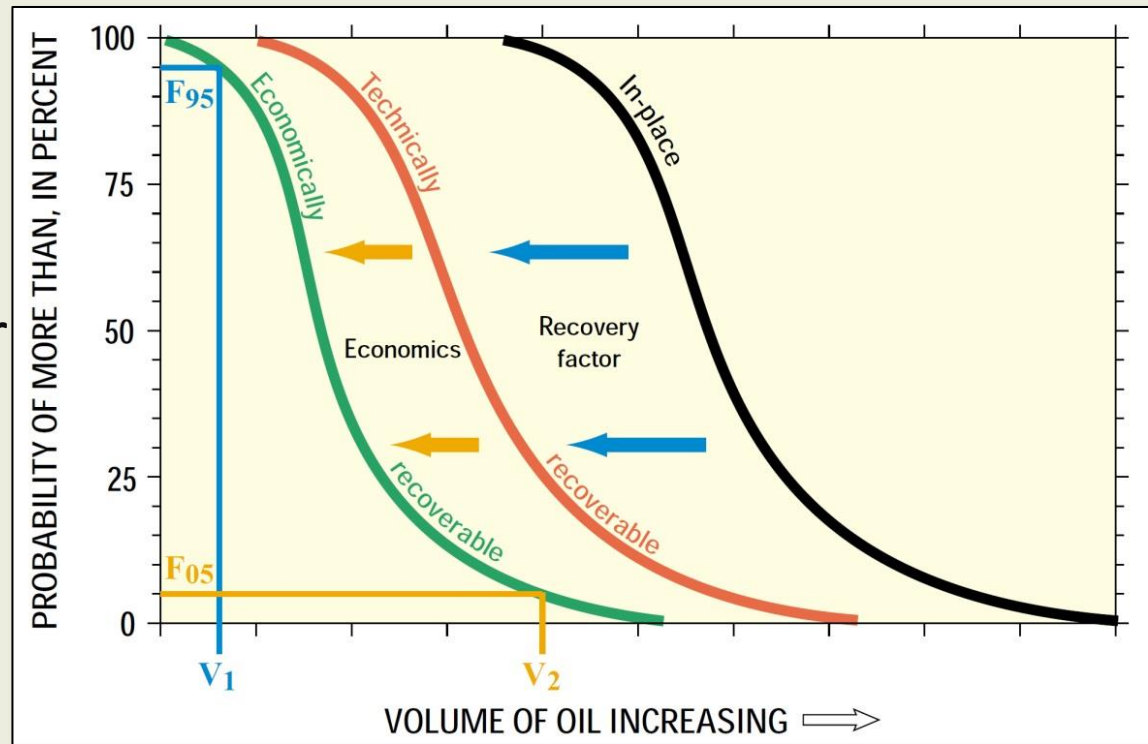
Special Use Permit Application

- Compliance with ANILCA 1002 (e)
- Consistent with CFR 37 C Exploration Plans
 - CFR 37.21 Application Requirements
- Interior has not approved special use permit
 - Secretary Jewell, DOI in support of USFWS :

“We, nevertheless, have reviewed your offer and conclude that any new ‘exploratory activity,’ is prohibited by the Alaska National Interest Lands Conservation Act (ANILCA) and would require Congressional authorization.”

Questions Unanswered

- Where on this probability curve is the ANWR 1002 Area?
- Is the undeformed area significantly richer and more cost effective than the deformed?
- What is the best decision for United States and Alaska's interest?





Let's Know, Before We Walk Away



http://dnr.alaska.gov/commis/priorities/ANWR/ANWR_Exploration_Plan_7_9_13.pdf

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