



Division of Oil and Gas

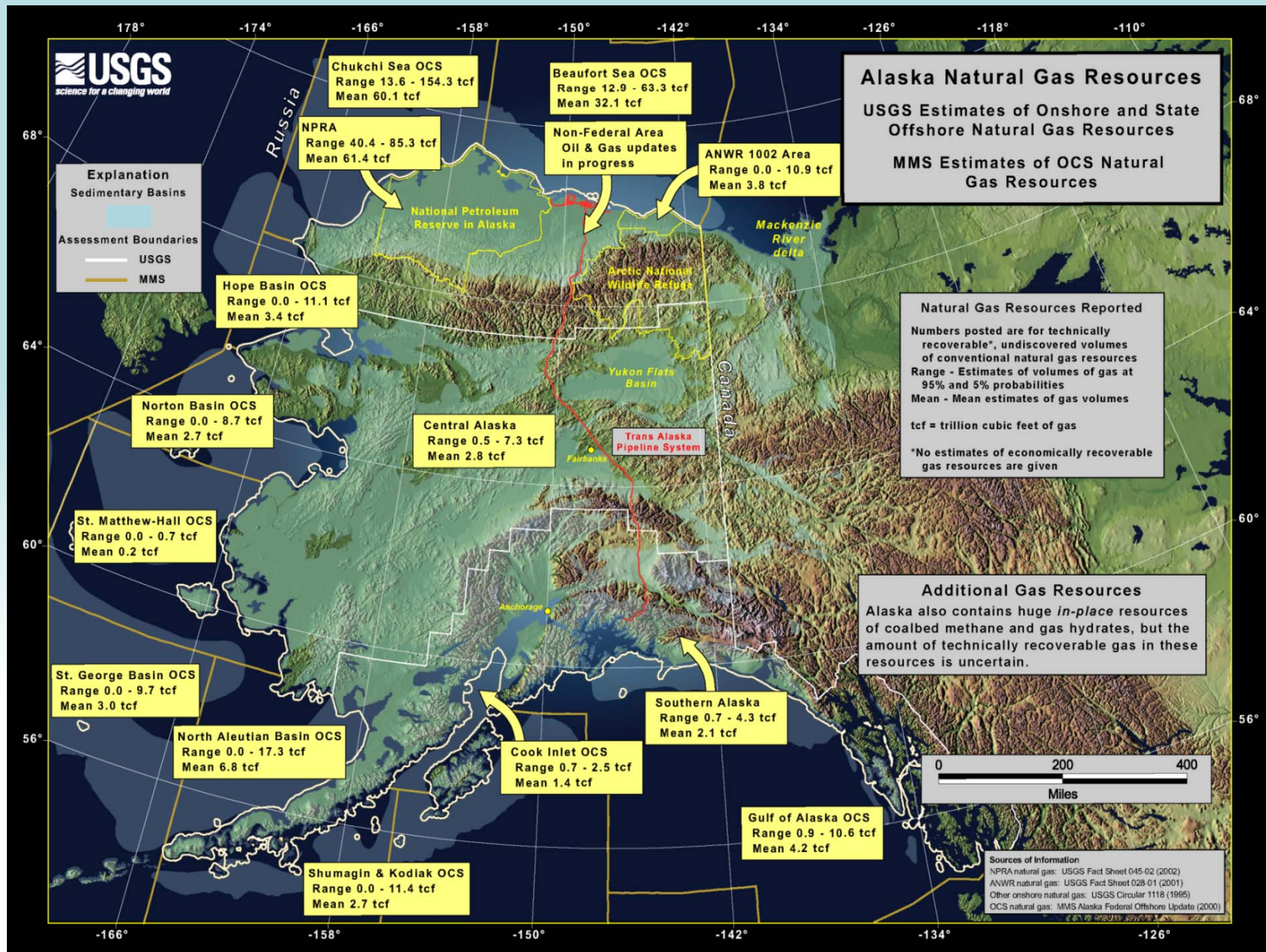
House Energy Committee

Cook Inlet Oil & Gas

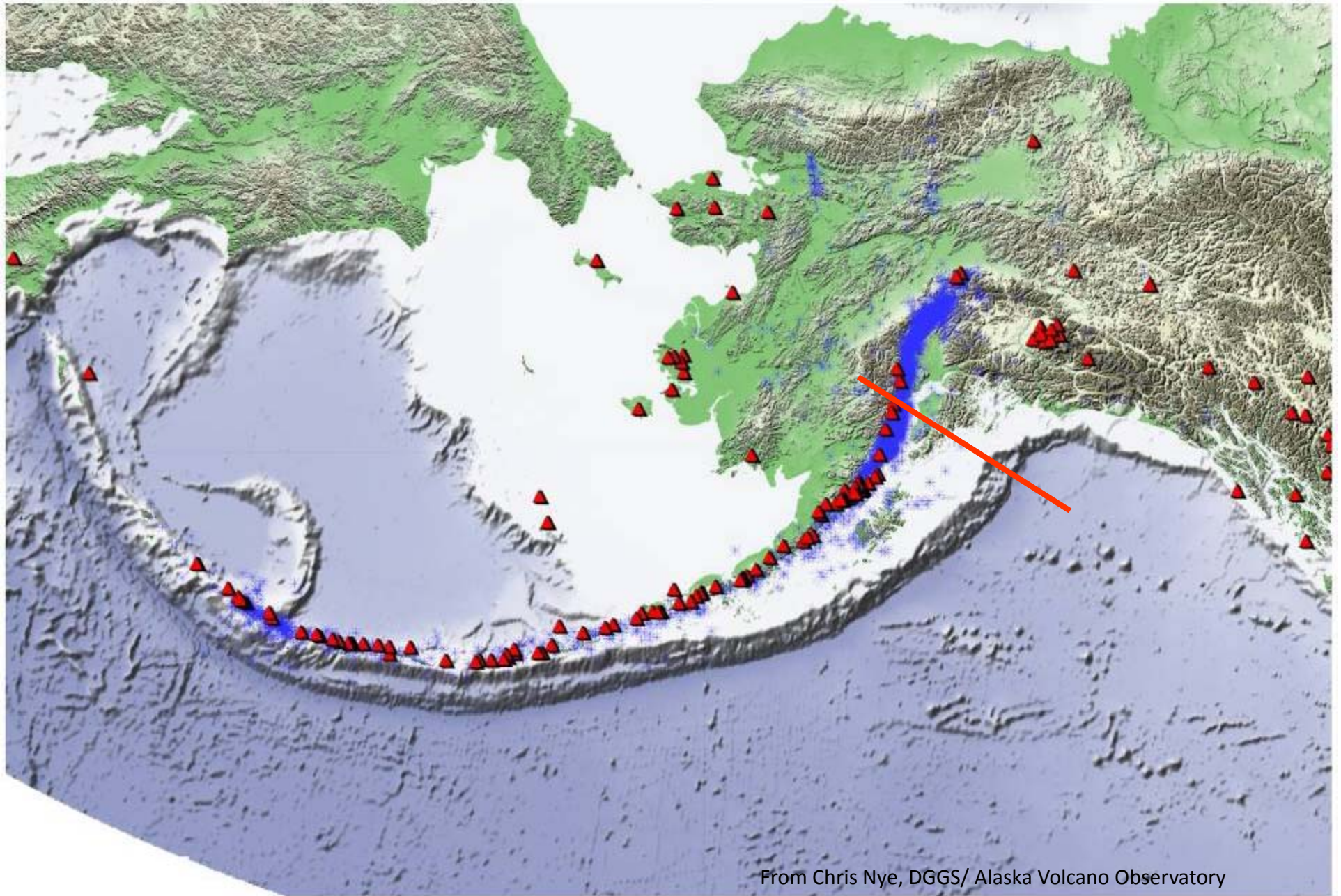
Kevin R. Banks

Director

March 2009



Cook Inlet Geology

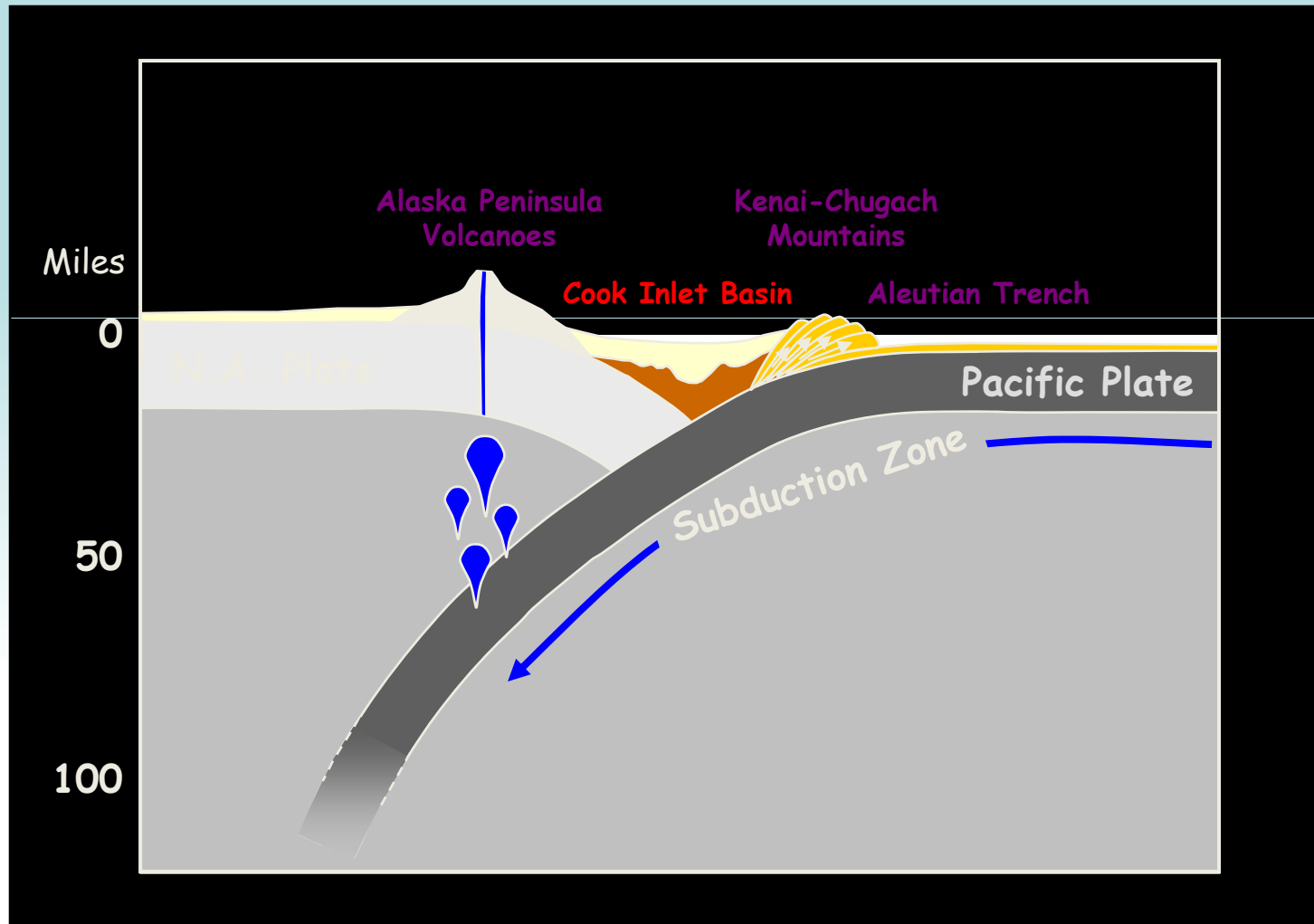


UPPER COOK INLET BASIN

Basin / Reservoir Origins

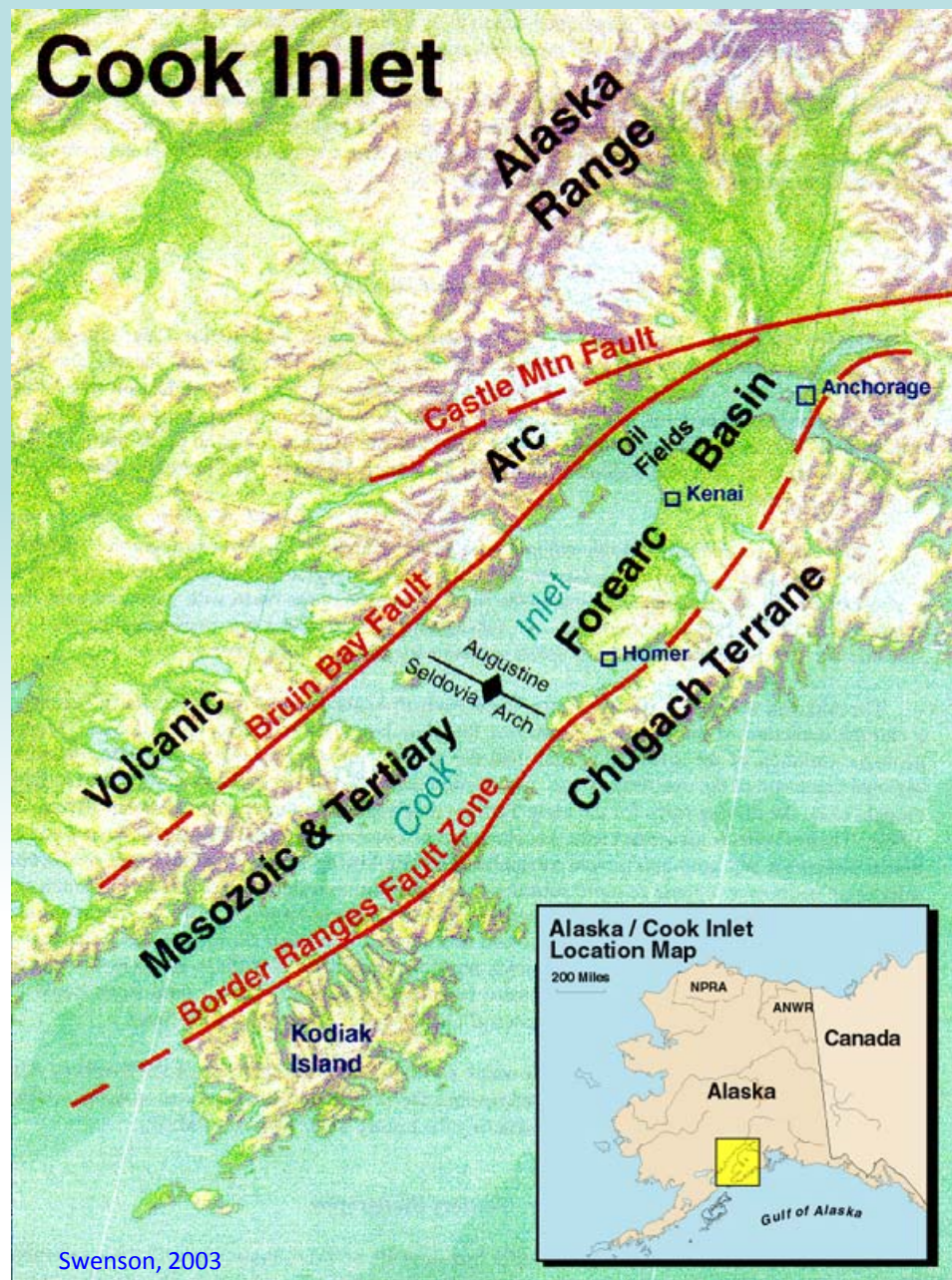
NW

SE

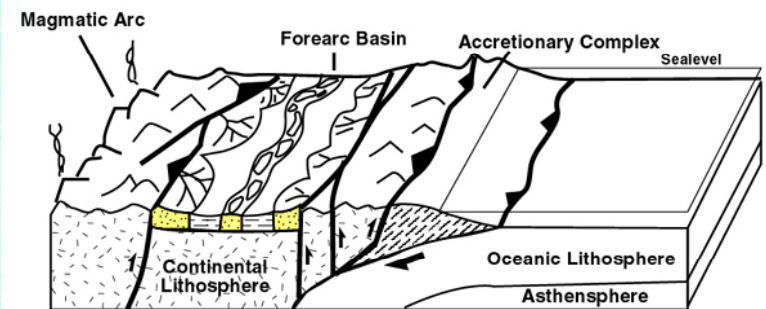
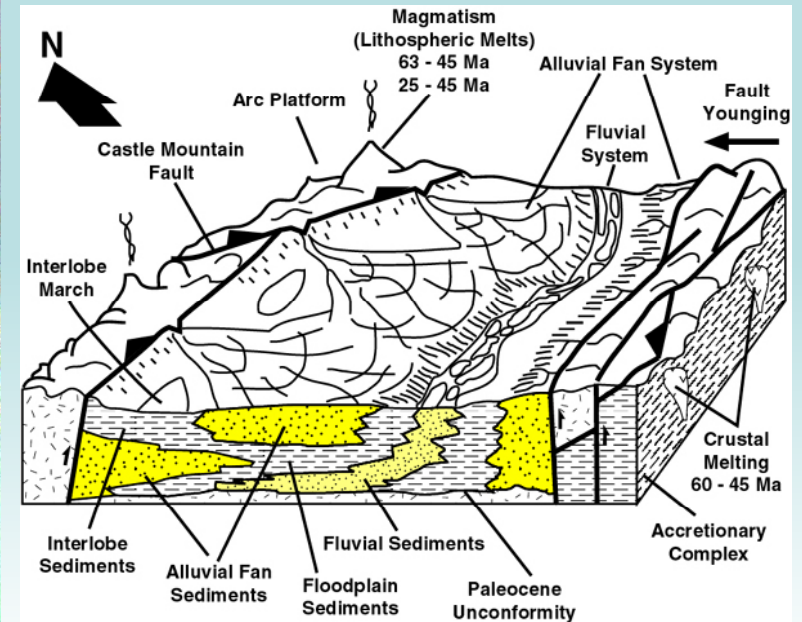


Modified from:
Tornqvist, T., 2005, Principles of Sedimentology and Stratigraphy, University of Chicago,
<http://www.uic.edu/classes/geol/eaes350/>

Cook Inlet

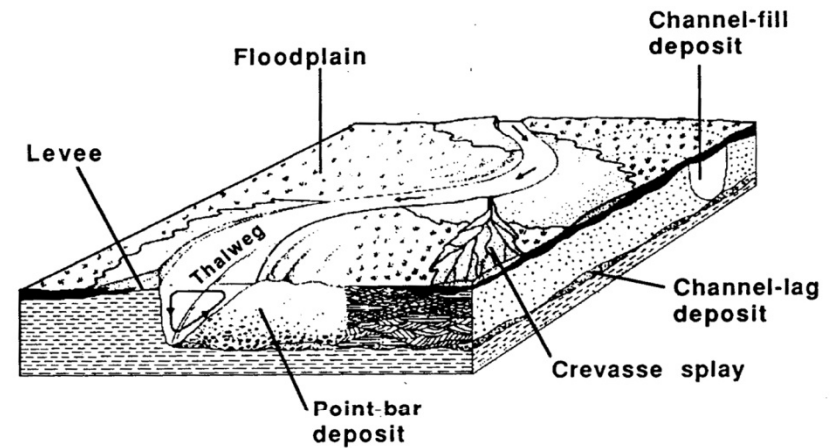


Importance of Provenance

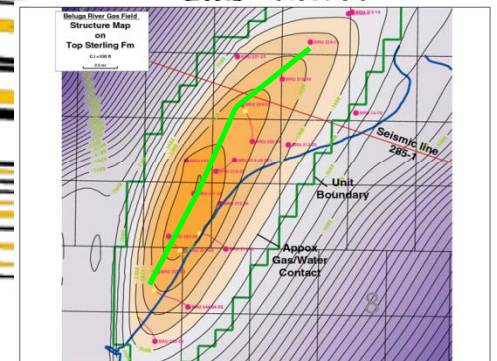
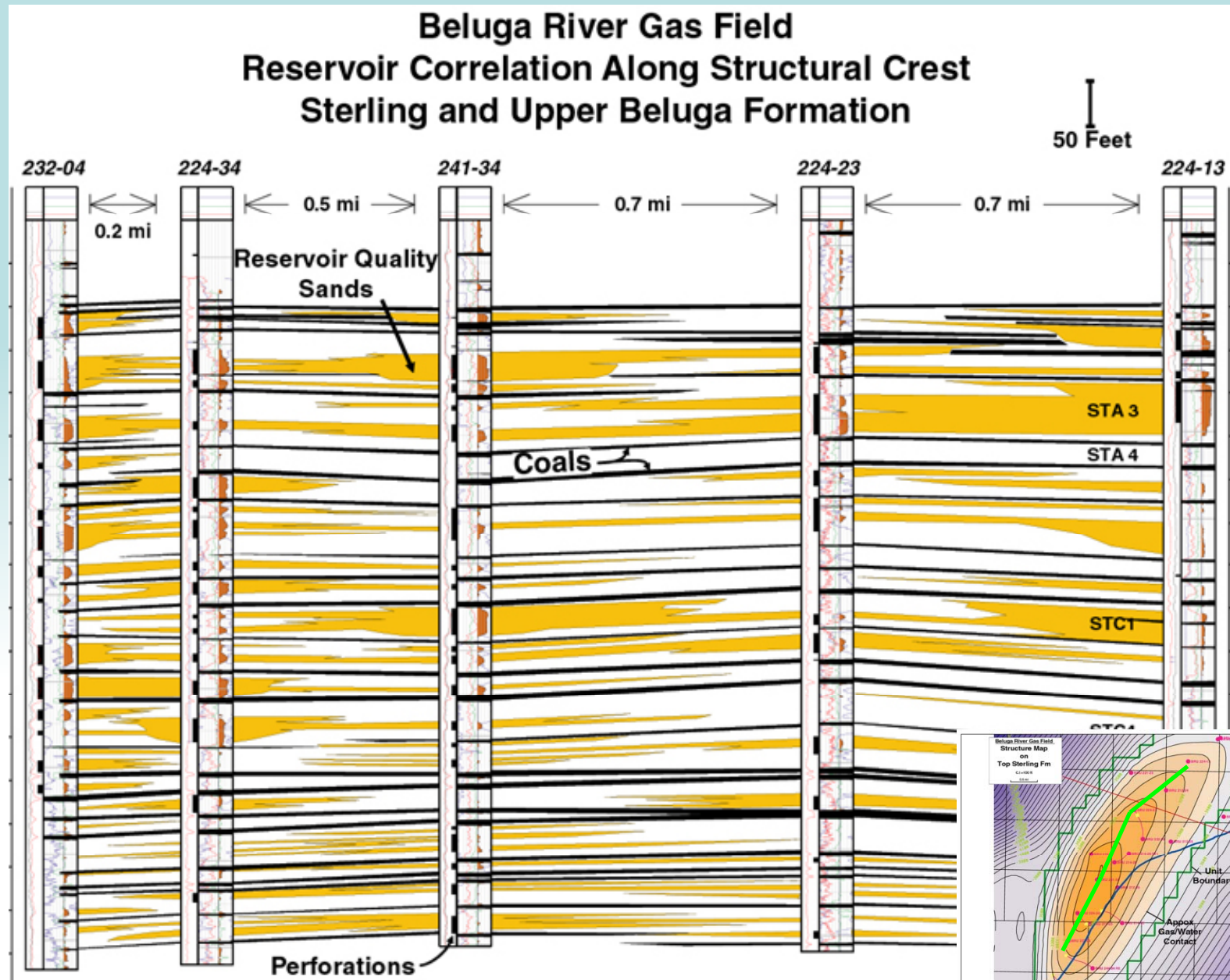


McGowen, et. al., 1994

Tertiary Basin Depositional Systems



Sand Distribution in a Fluvial System

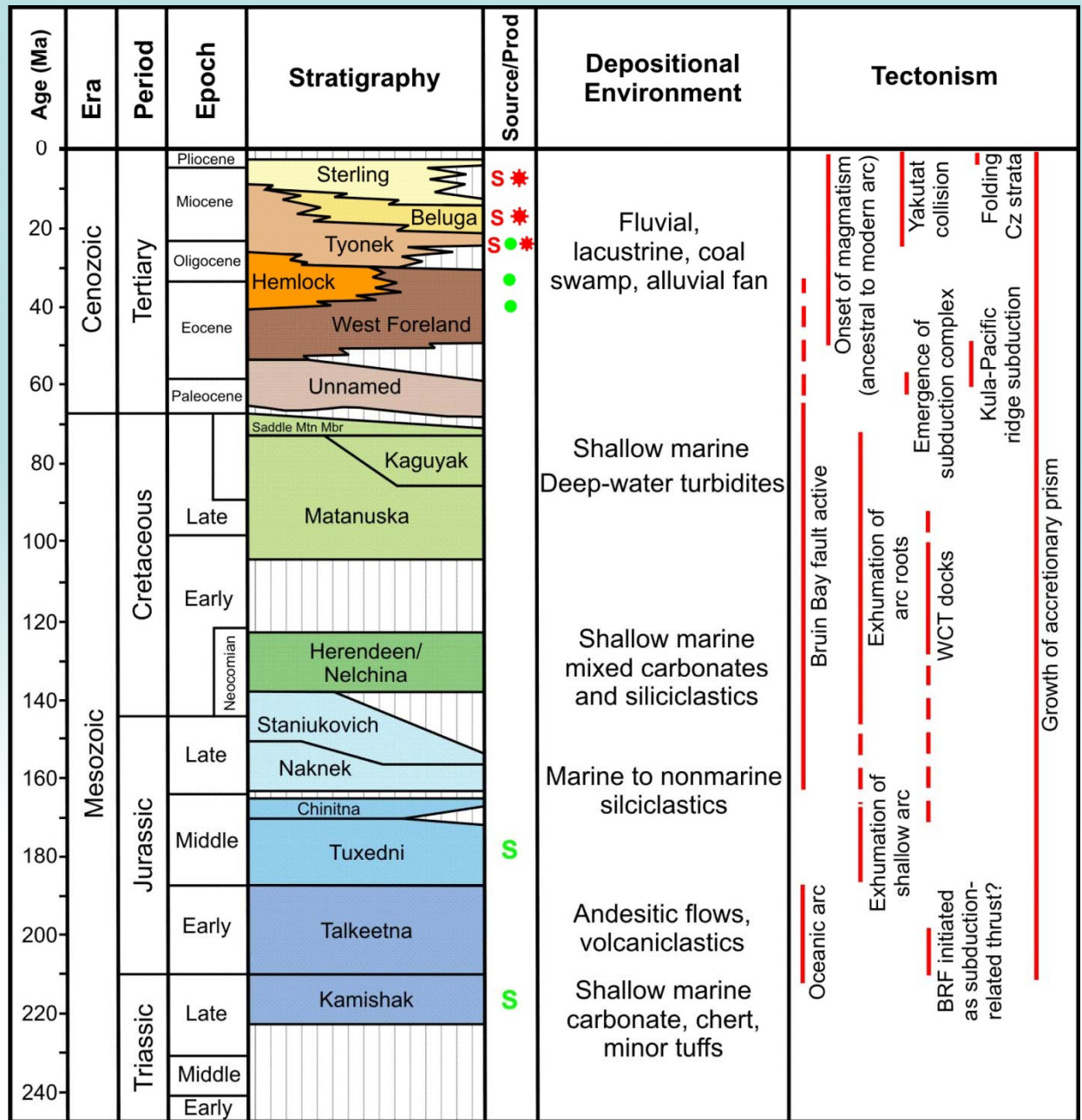


From Swenson, 1997, courtesy of ConocoPhillips, Chevron, MLP

Up to 30,000 feet of Mesozoic marine and marginal-marine strata

Up to 25,000 feet of Tertiary age nonmarine strata

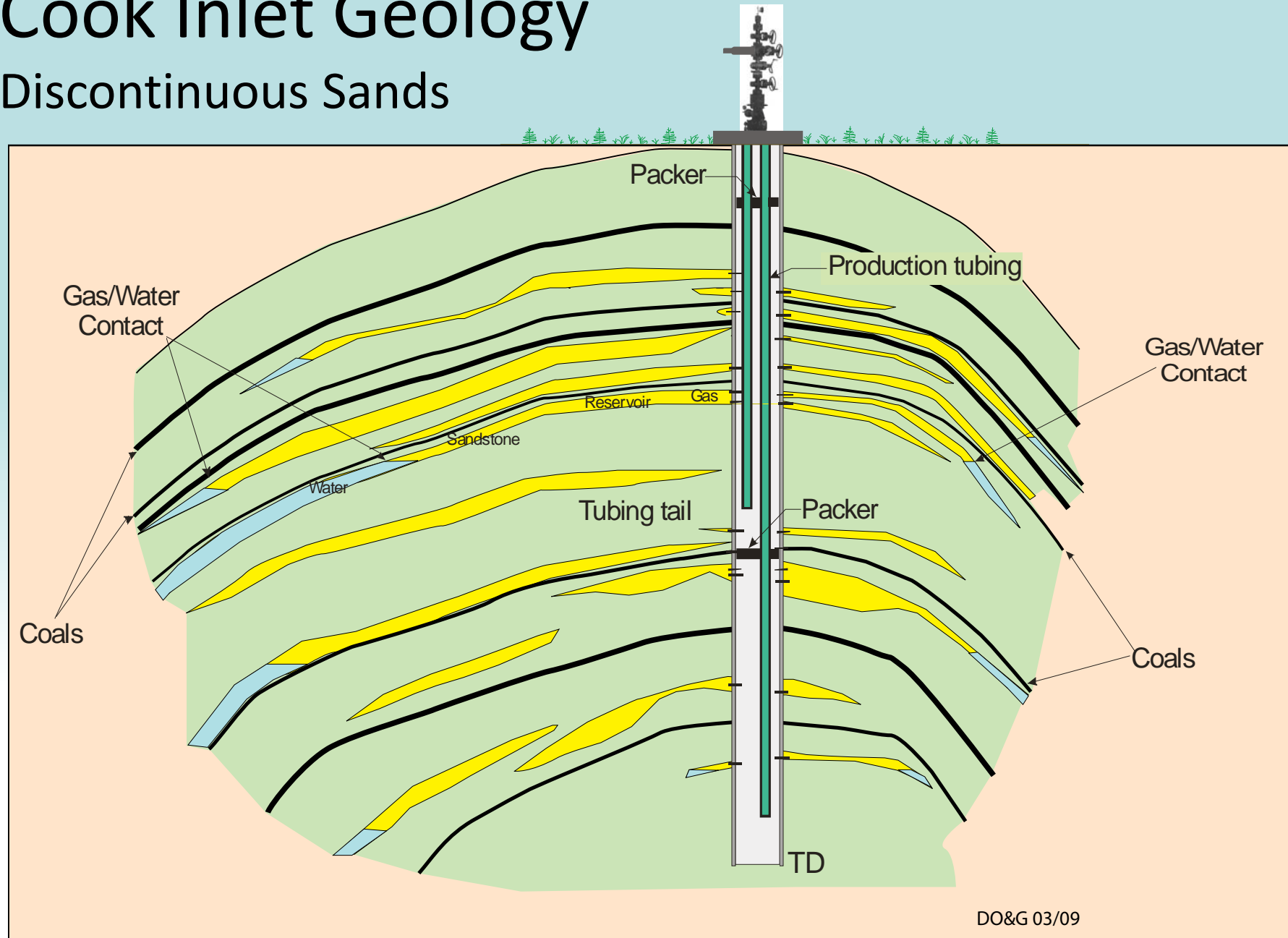
Basin fill modified by folding and faulting



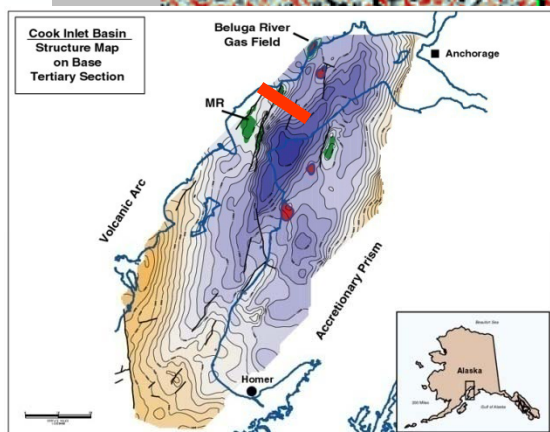
Modified from Curry and others (1993) and Swenson (2002)

Cook Inlet Geology

Discontinuous Sands



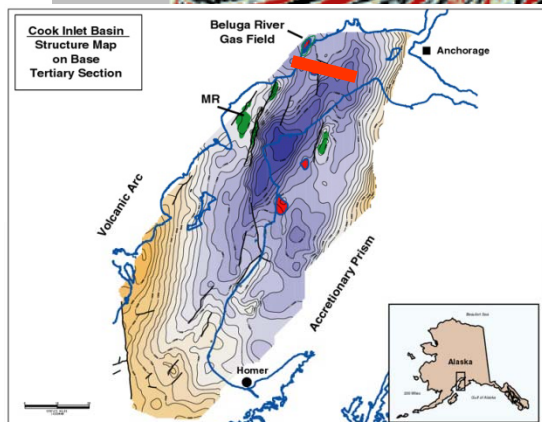
EW 1 - Granite pt



Seismic Data provided courtesy of
Veritas Geophysical Corporation

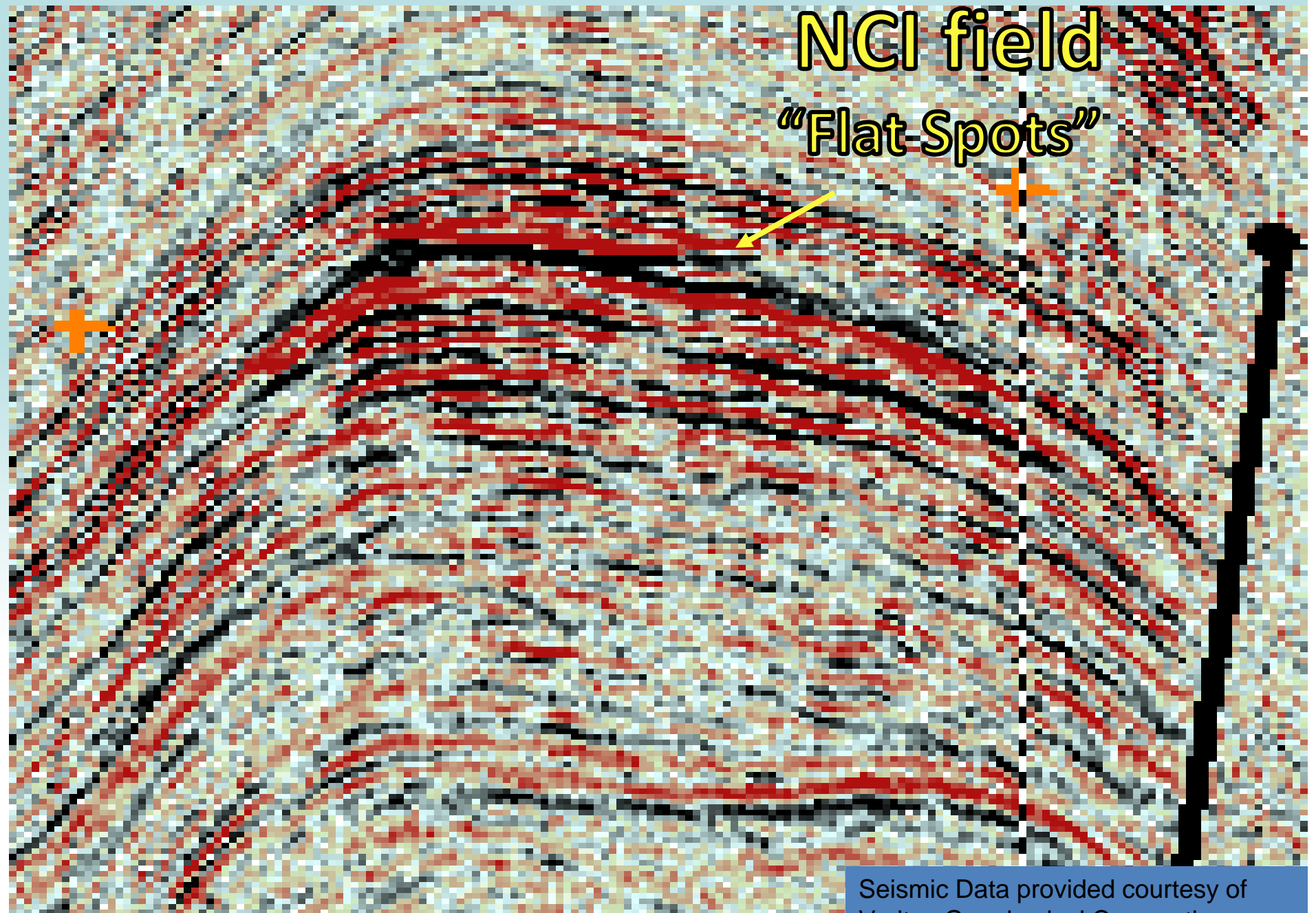
NCI field

“Low Hanging Fruit”



Seismic Data provided courtesy of
Veritas Geophysical Corporation

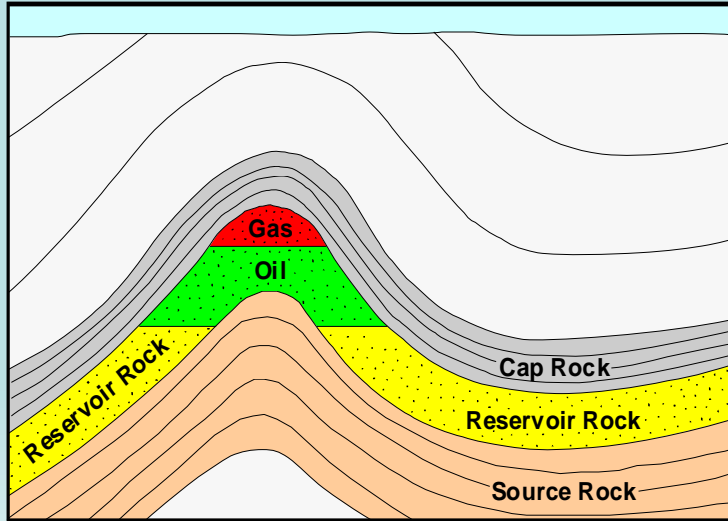
NCI field "Flat Spots"



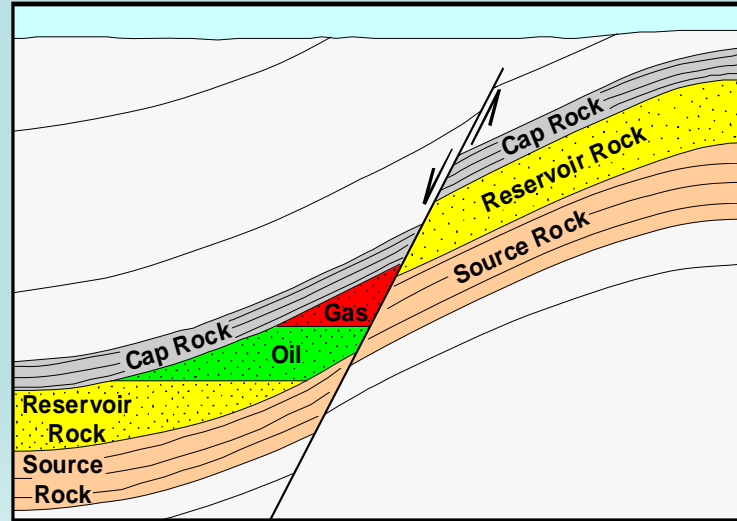
Seismic Data provided courtesy of
Veritas Geophysical Corporation

New Gas from New Exploration Play Types

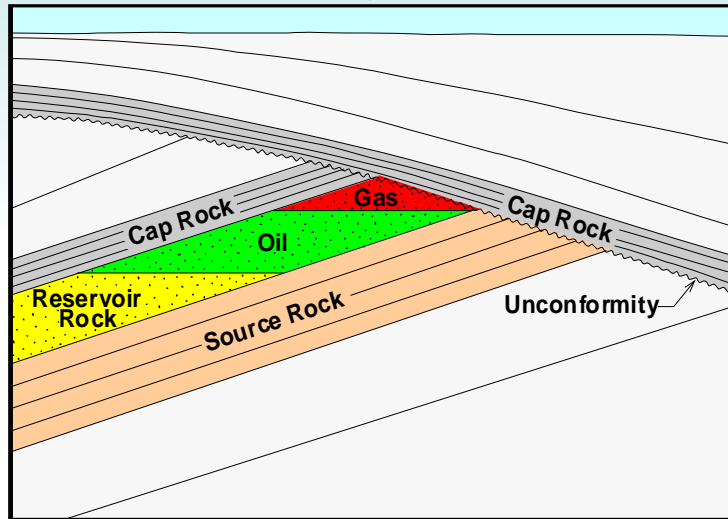
Anticline



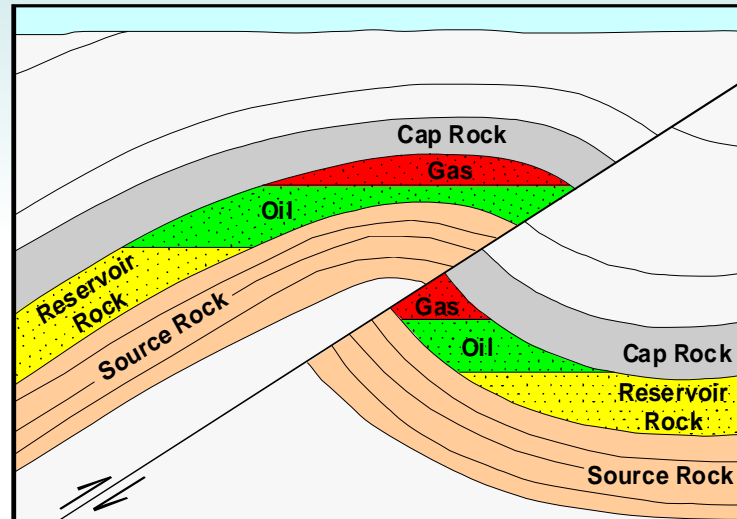
Normal Fault



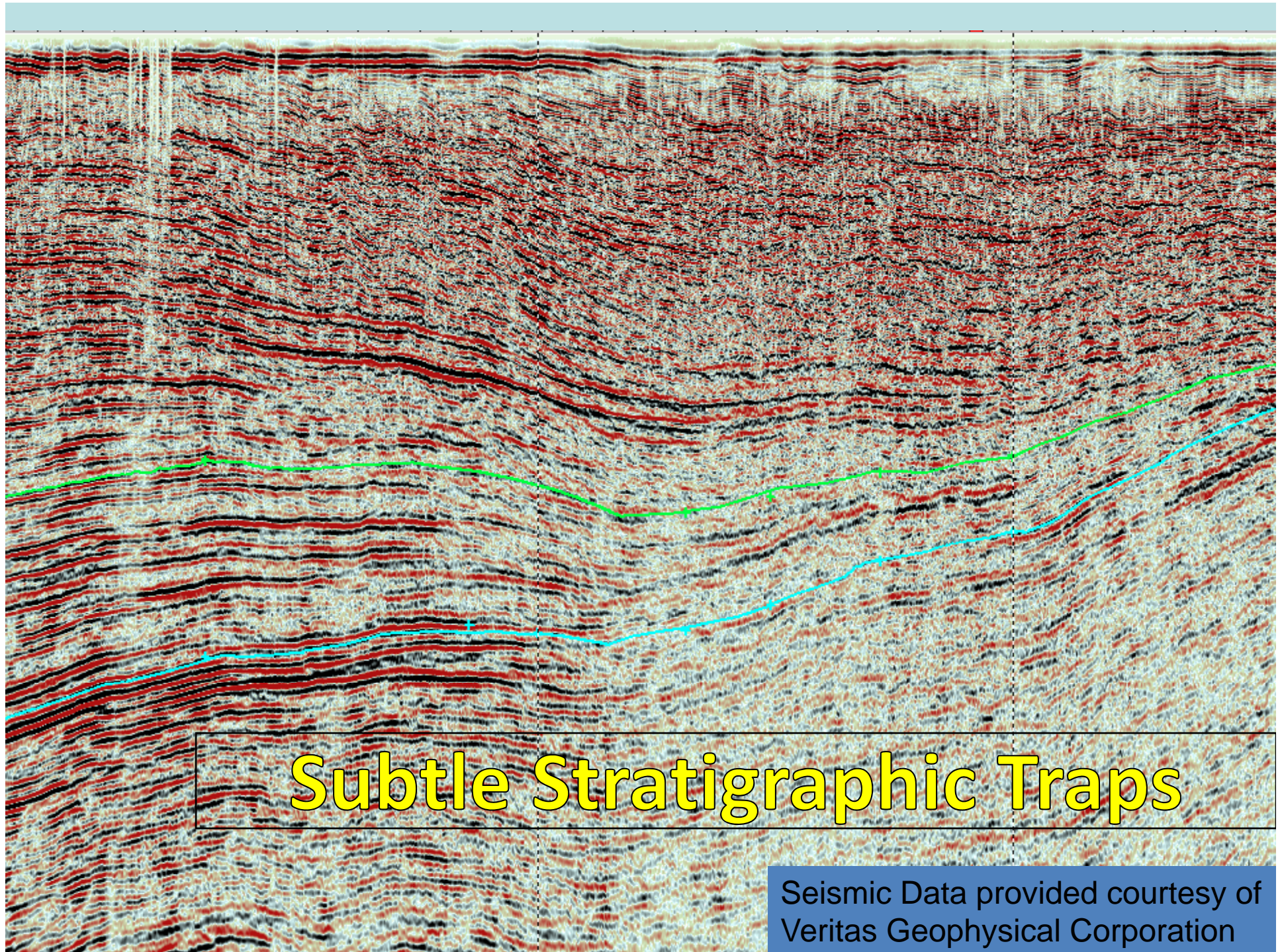
Stratigraphic



Thrust Fault



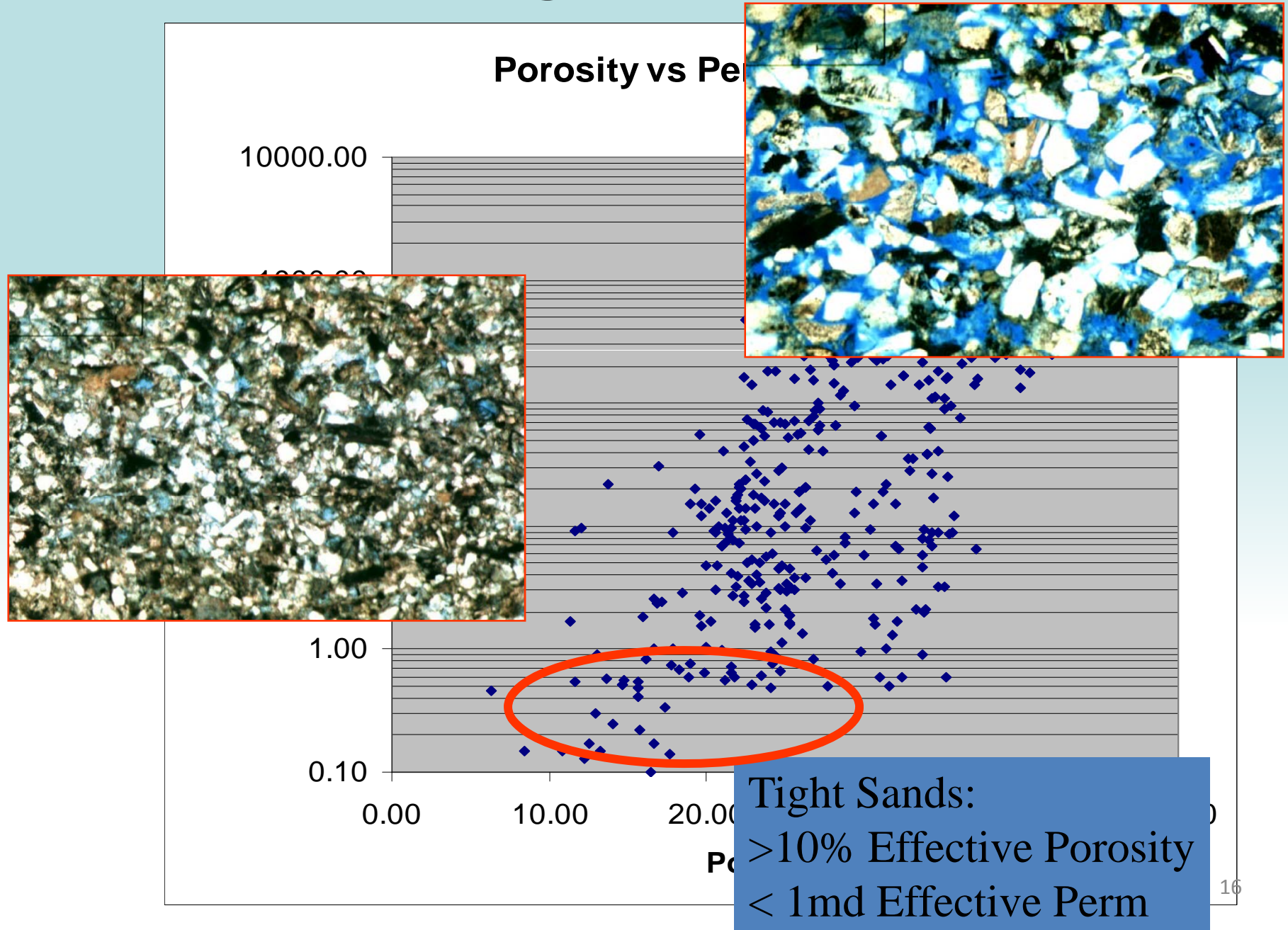
Oil and Gas Trapping Mechanisms



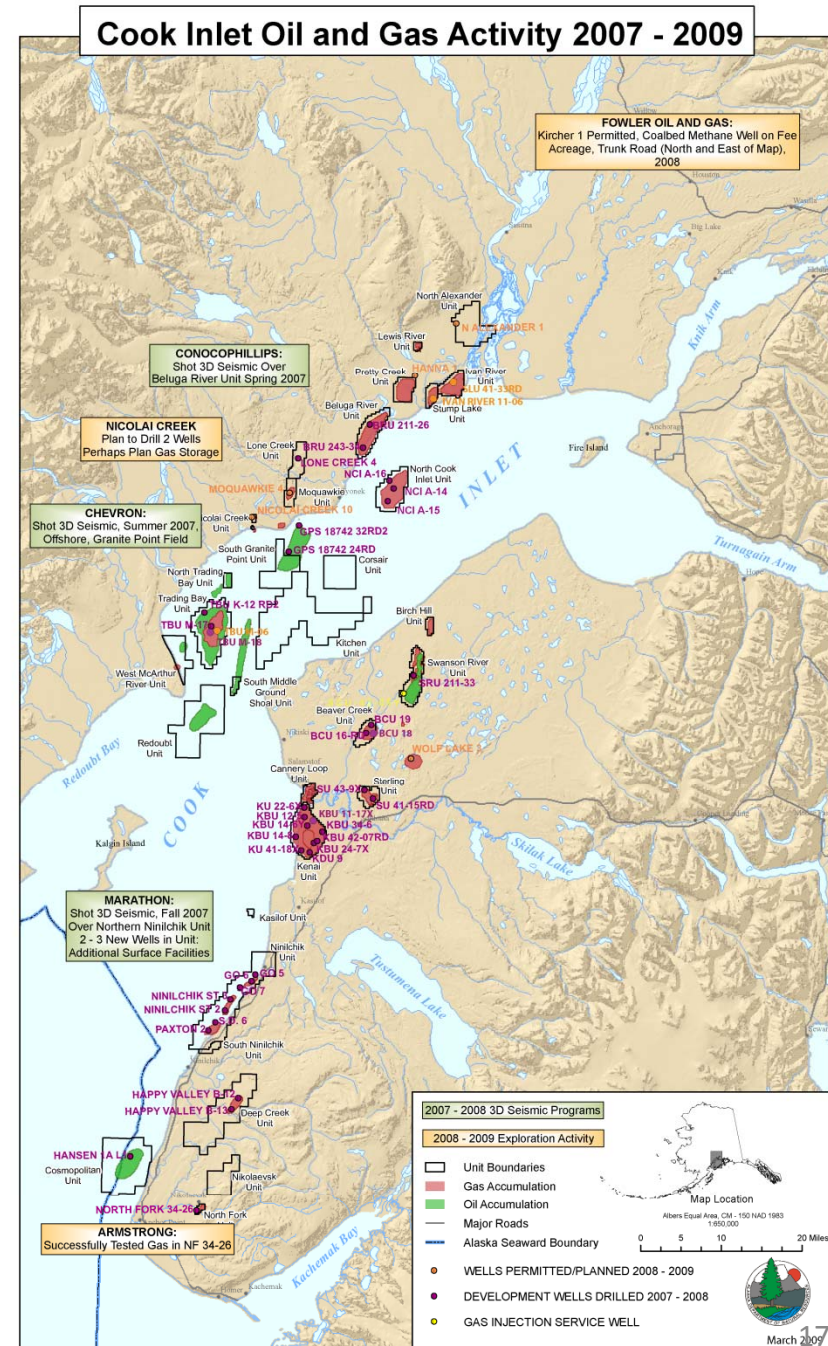
Subtle Stratigraphic Traps

Seismic Data provided courtesy of
Veritas Geophysical Corporation

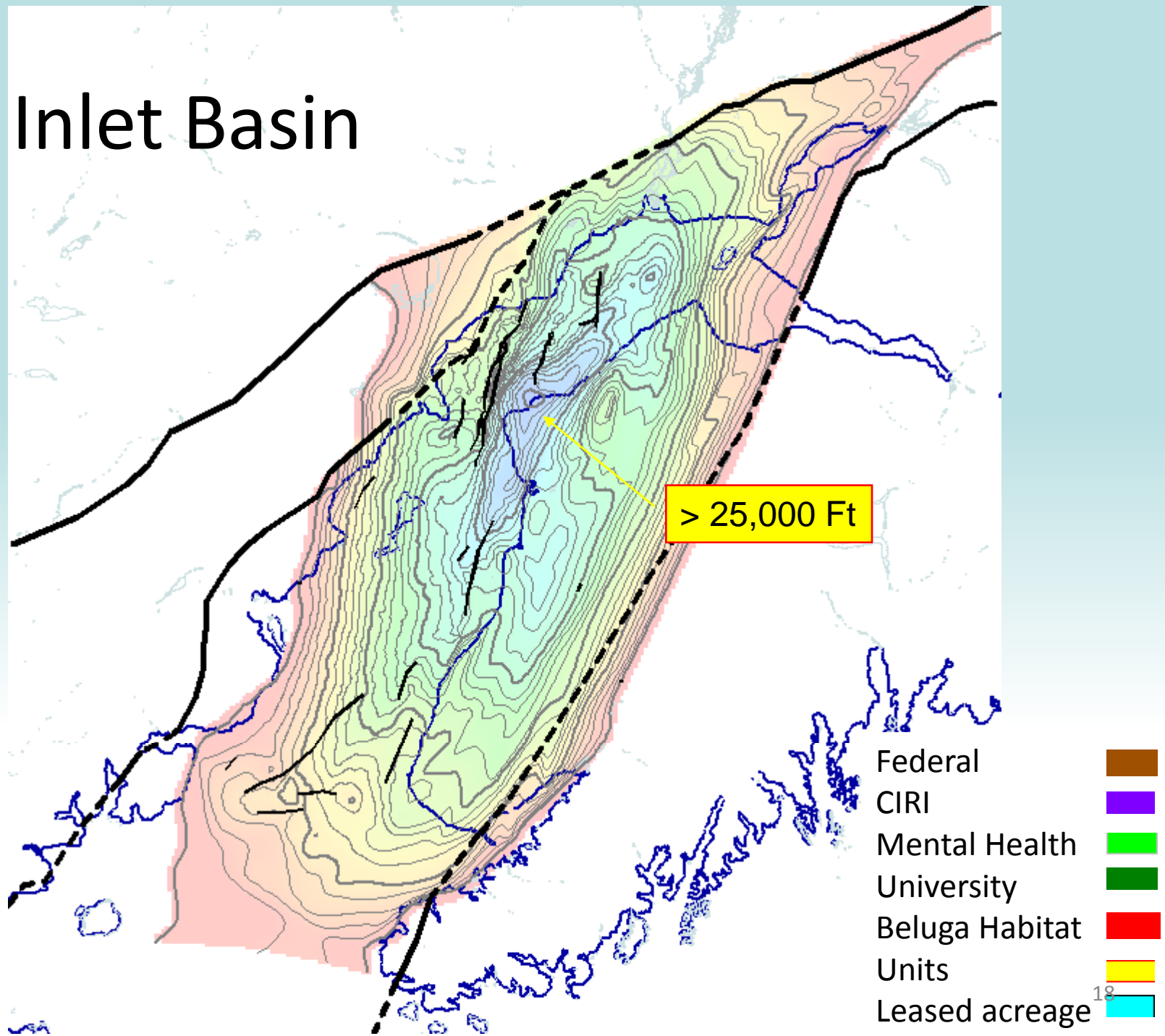
Tight Gas Sands



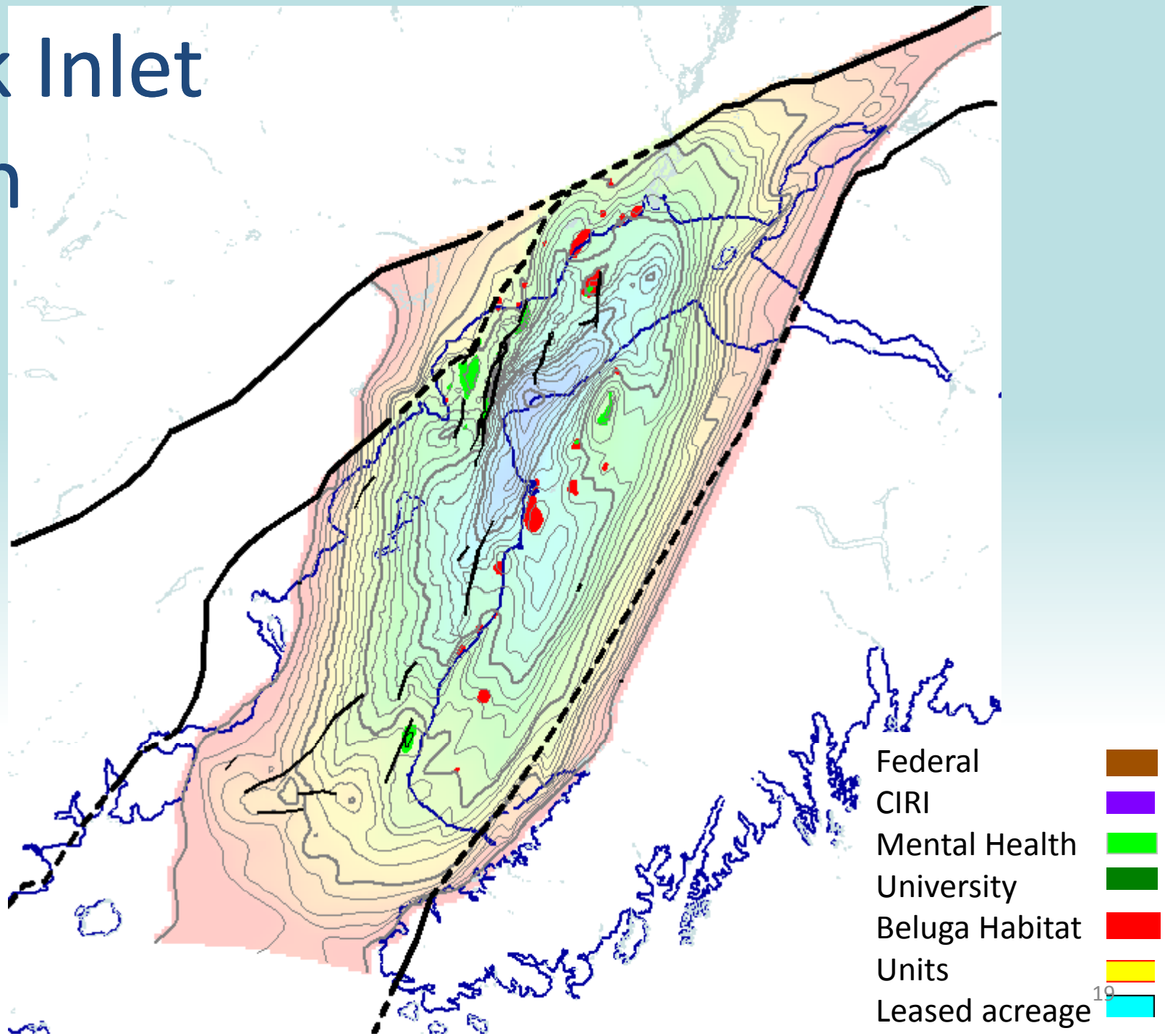
Cook Inlet Industry Activity



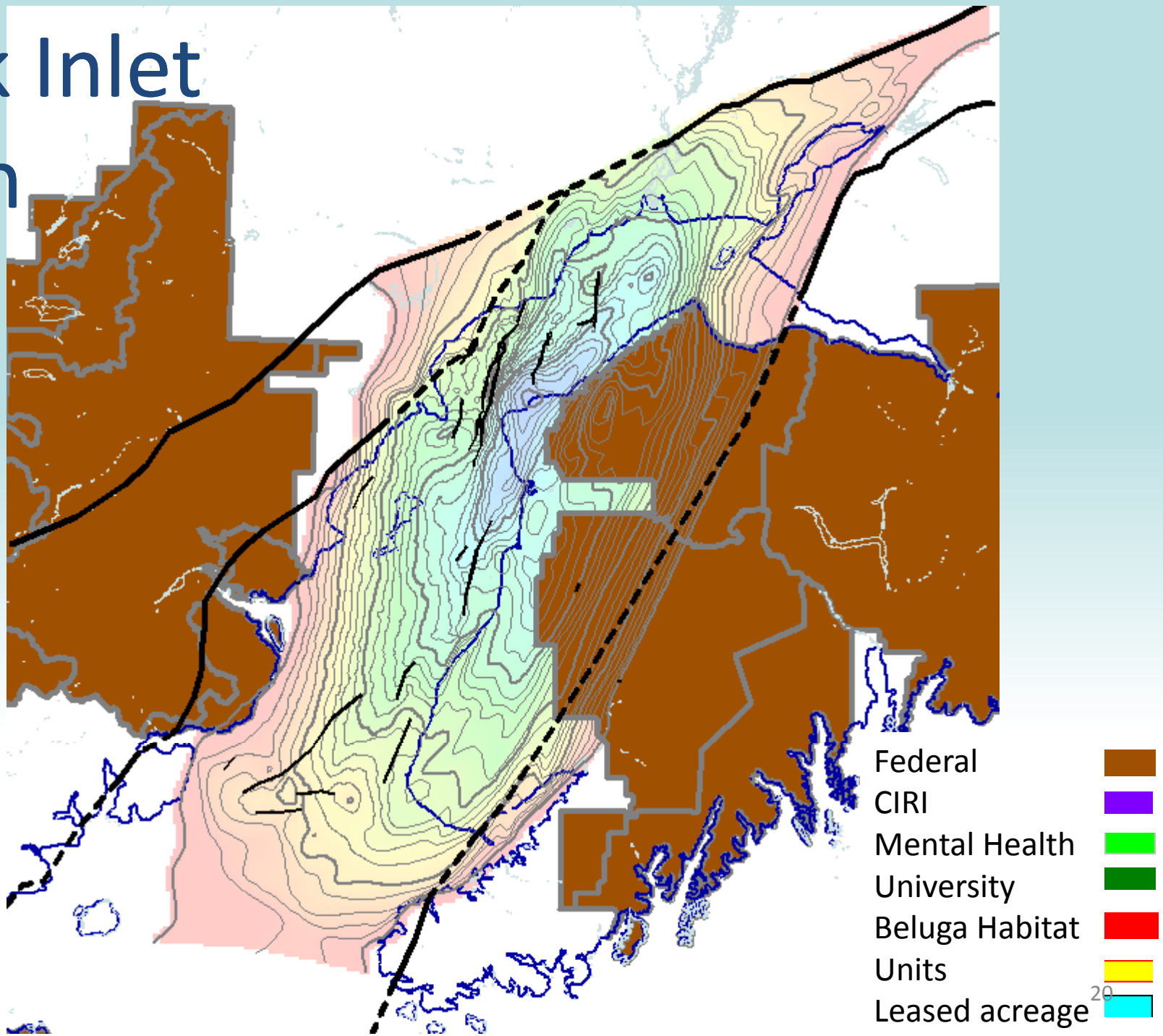
Cook Inlet Basin



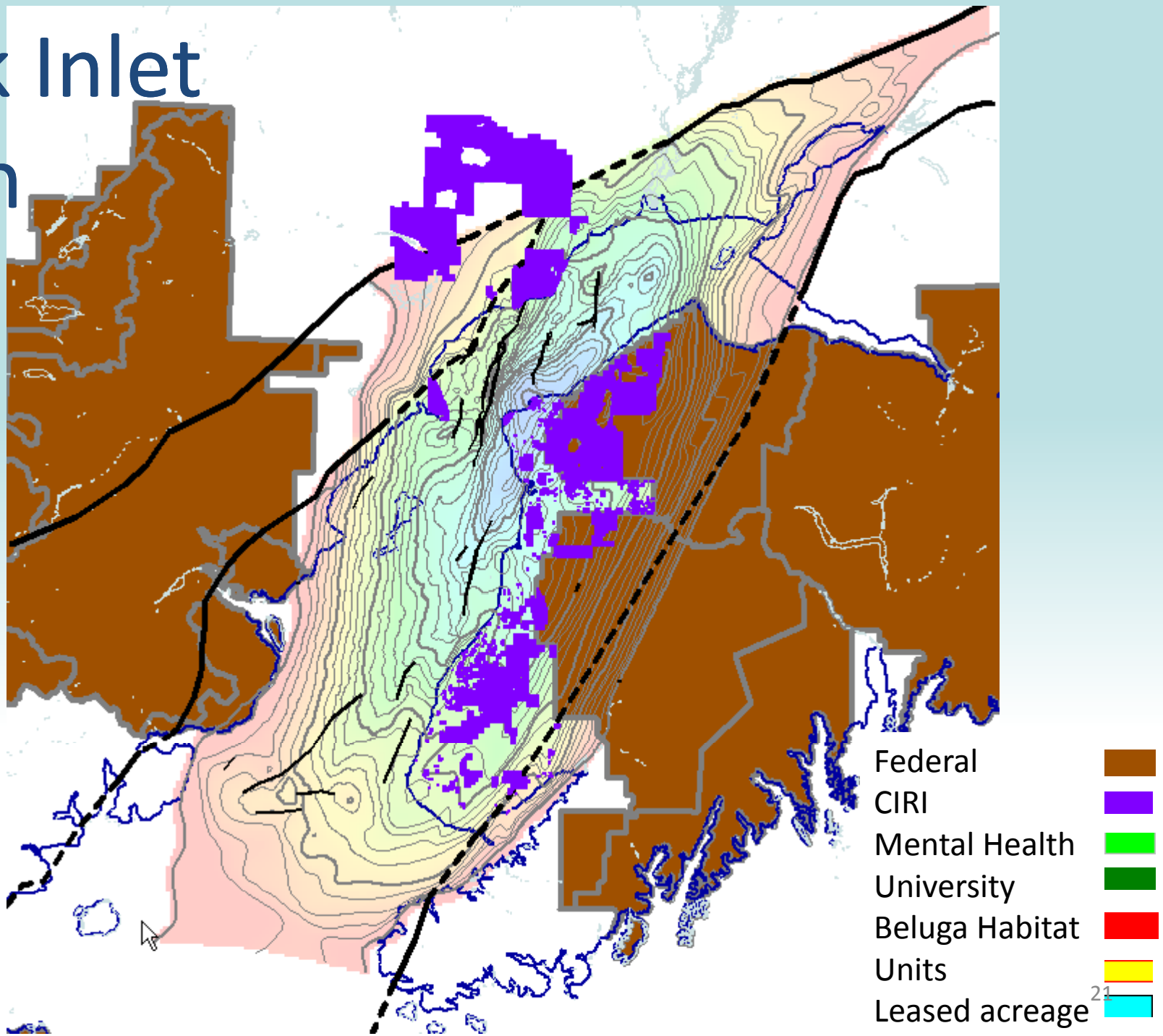
Cook Inlet Basin



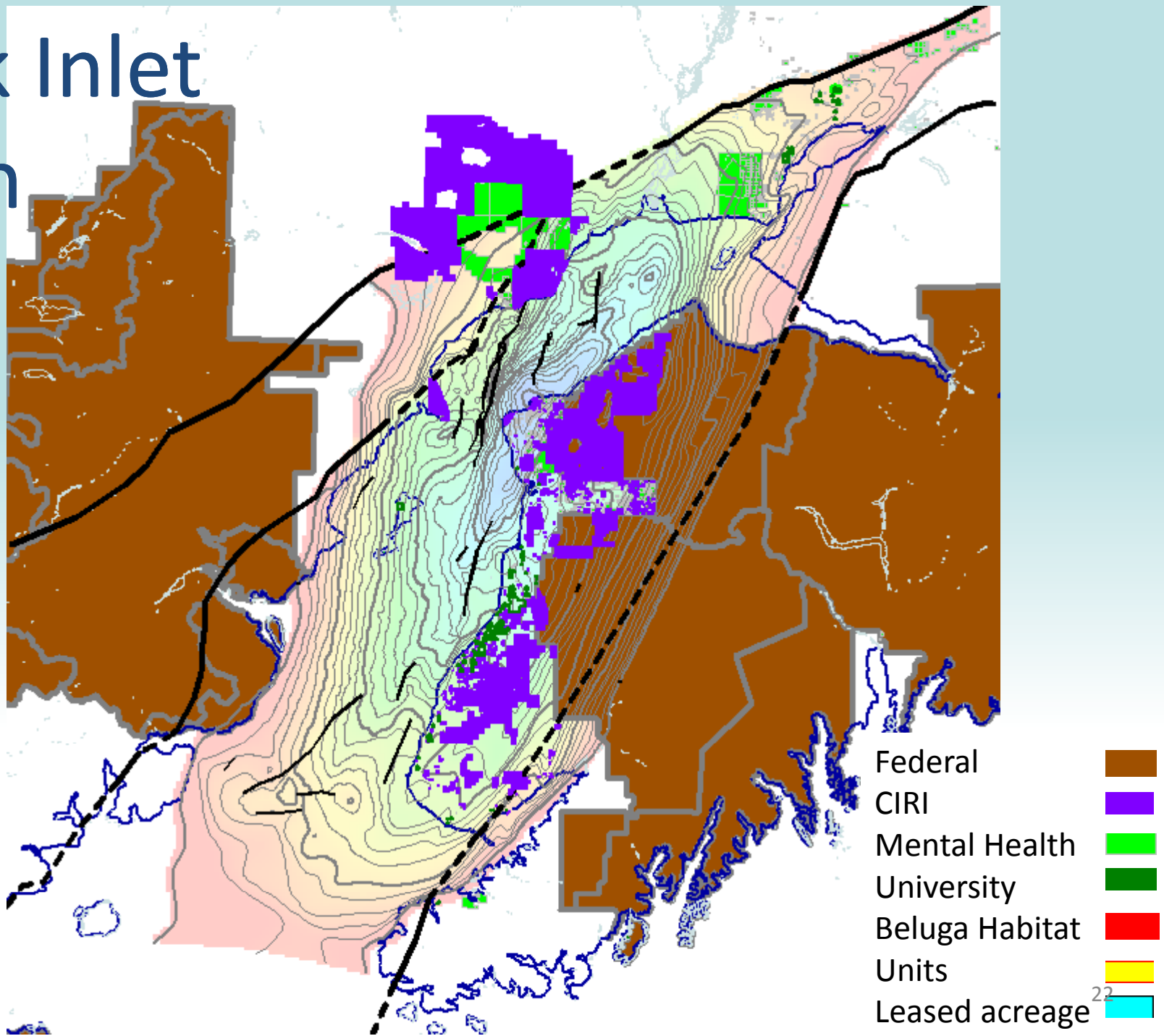
Cook Inlet Basin



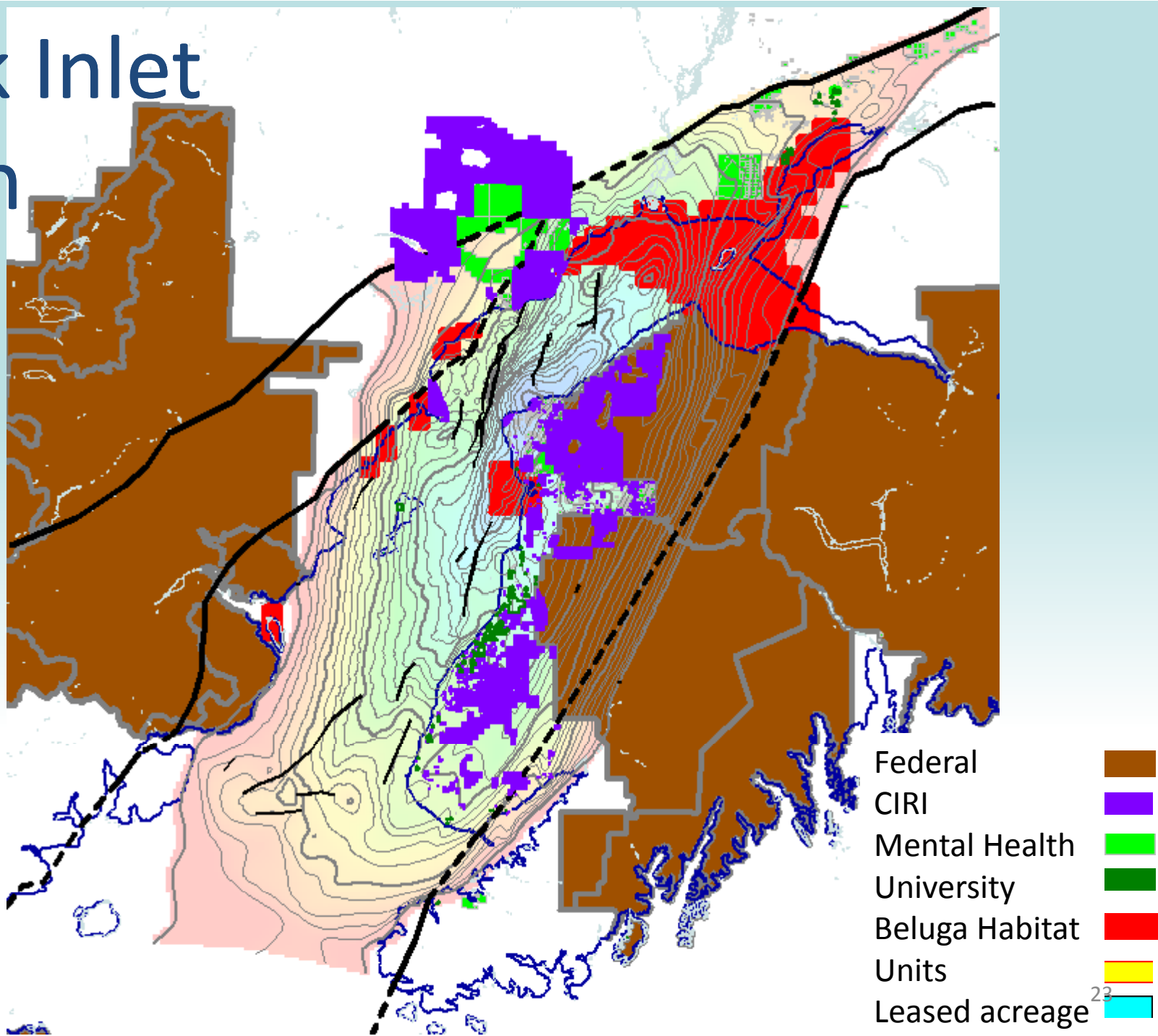
Cook Inlet Basin



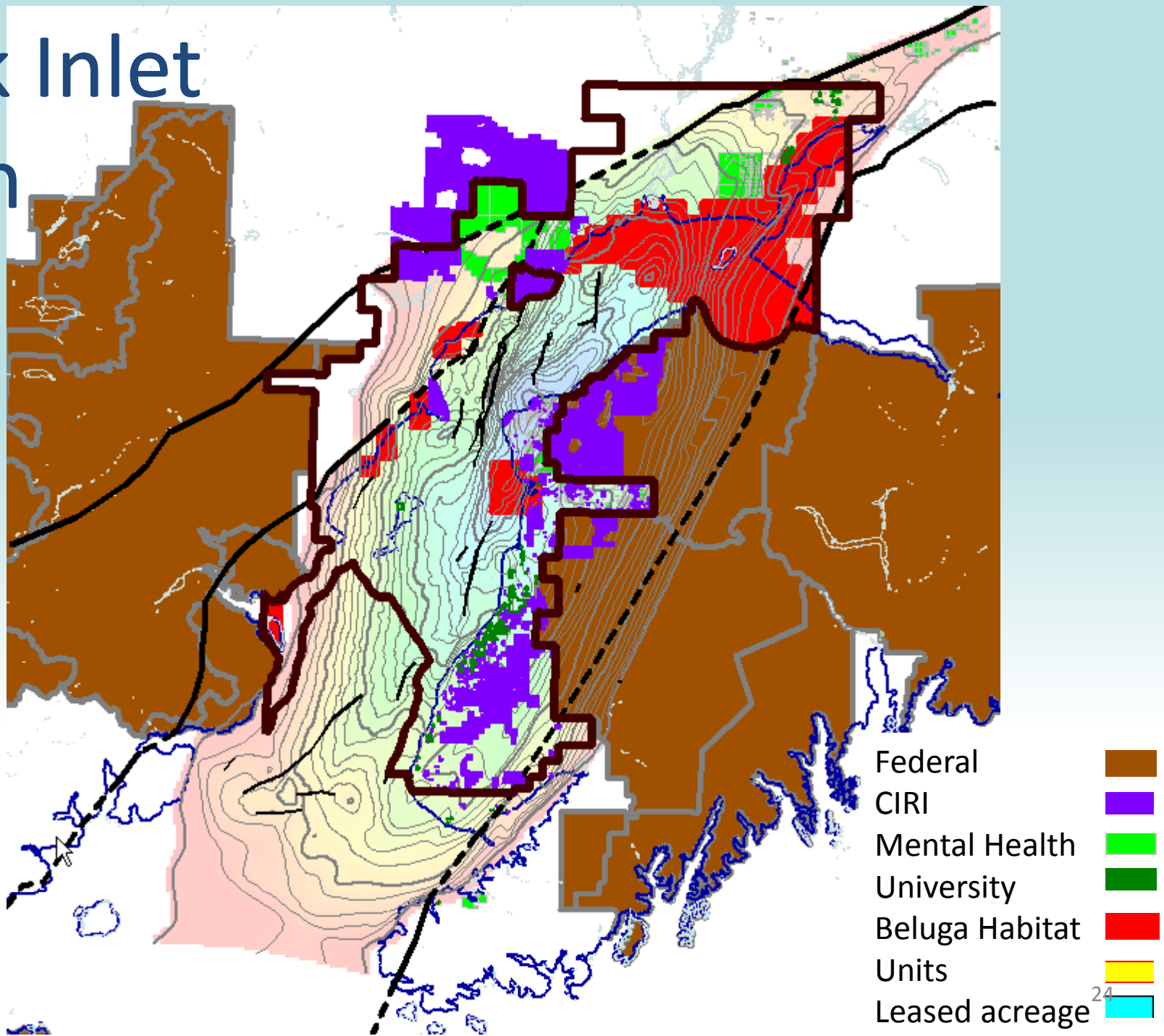
Cook Inlet Basin



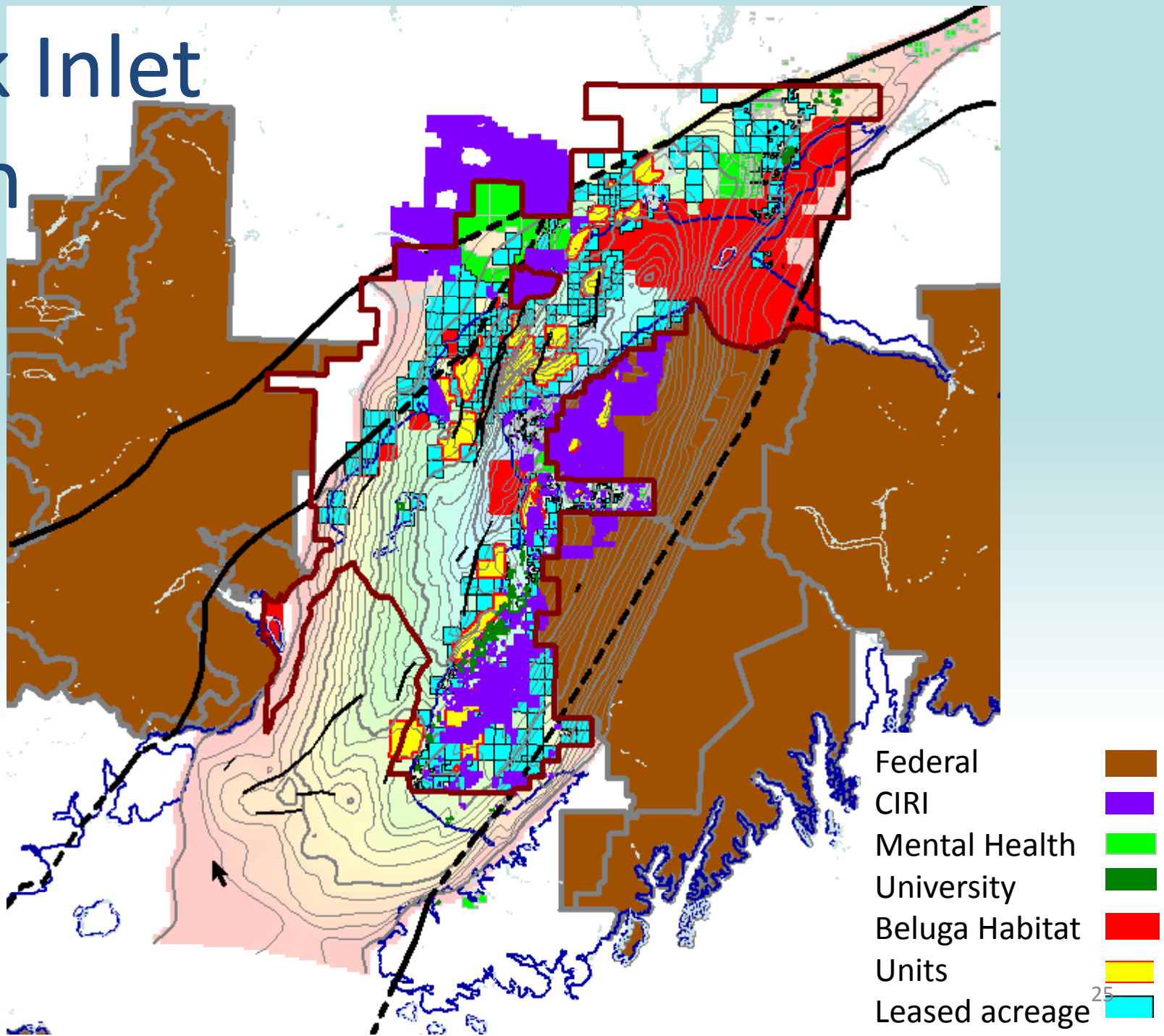
Cook Inlet Basin



Cook Inlet Basin



Cook Inlet Basin



History of Oil and Gas in Cook Inlet

Oil & Gas Cook Inlet Milestones: 1800s-1940s

1800s: Oil seeps documented along Gulf of Alaska

Early to Mid-1900s: The search for oil continues

1890s

- Oil claims staked on Iniskin Peninsula at Oil Bay

1896

- Oil claims staked at Katalla

1890s

1902

- Oil discovered Katalla
- Wells drilled on Iniskin Peninsula at Dry Bay

1902

1910

- Alaska lands withdrawn from leasing due to oil glut

1910

1920

- Shallow well drilled Anchorage
- Alaska lands reopened for leasing

1928

- Shallow well drilled Chickaloon

1920

1920s-1940s

- Further exploration on Alaska Peninsula, Iniskin Peninsula, Gulf of Alaska, with no commercial success

1930-1949

Katalla



The Early Years



APRIL- INISKIN WELL - 1941
FLOWING 47 GR OIL - 1800 #

Oil & Gas Cook Inlet Milestones:

1950-1959

| | | |
|---|---|---|
| <p><u>Early 50s:</u> Federal acreage limit per company changes from 15,360 to 100,000 acres</p> <p>Focus shifts to the Kenai Peninsula</p> <p>1951</p> <ul style="list-style-type: none"> •Sterling Highway completed <p>1950</p> | <p><u>Mid-50s:</u> Promoting and brokering leases in Cook Inlet takes off</p> <p>1953-54</p> <ul style="list-style-type: none"> •Richfield & Marathon file for Swanson River leases (71,000 acres) & Unocal files for leases north of Kenai (200,000 acres) <p>1955</p> <ul style="list-style-type: none"> •AK Gulf Oil #1 near Knik & Rosetta #1 near Houston drilled •Richfield, Marathon & Unocal combine leases to form Swanson River <p>1953-1955</p> | <p><u>Late 50s:</u> Leasing rush in southern Alaska, 100 companies active & 18MM acres under lease</p> <p>1955</p> <ul style="list-style-type: none"> •Oil discovered Swanson River <p>1957</p> <ul style="list-style-type: none"> •Chevron buys 50% of ARCO's interest in Cook Inlet for \$30MM <p>1958</p> <ul style="list-style-type: none"> Swanson Oil Field production begins <p>1958</p> <ul style="list-style-type: none"> •Gas discovered Deep Creek <p>1959</p> <ul style="list-style-type: none"> •Gas discovered Kenai Gas Field •Alaska Statehood •First offshore lease sale Cook Inlet <p>1956-1959</p> |
|---|---|---|

Oil & Gas Cook Inlet Milestones:

1960-1969

Early 60s: Exploratory drilling activity explodes

1960

- Gas discovered West Fork
- Kenai Gas Field production begins

1961

- Gas discovered Sterling & Falls Creek (Ninilchik)
- 1962
- Gas discovered Beluga River & North CI
- Gas discovered Lone Creek & West Foreland
- Oil discovered Middle Ground Shoal

1960-1962

Mid-60s: Placement of offshore production platforms begins

Exploratory drilling peak: 1966

Development drilling peak: 1968

1964

- Gas discovered Kasilof & Cannery Loop
- Oil discovered Tyonek Deep

1965

- Gas discovered Birch Hill
- Oil & Gas discovered Granite Point & Trading Bay
- Oil discovered McArthur River

1966

- Gas discovered Ivan River & Nicolai Creek

1967

- Gas discovered Beaver Creek
- Gas discovered Moquawkie & North Fork
- Gas discovered 3 Mile Creek 1967
- Oil discovered North Trading Bay
- Oil discovered Starichkof (Cosmopolitan)

1964-1967

1968

- Oil discovered Prudhoe Bay
- Oil discovered Redoubt Shoal
- Gas discovered Albert Kaloa, Lewis River
- Unocal fertilizer plant starts operation

1968-1969

1969

- Moon Landing
- Gas discovered Pretty Creek
- Nikiski LNG begins exporting to Japan
- Tesoro Refinery begins operation

Baker Platform, Cook Inlet



CIRCAC

Monopod Platform, Cook Inlet



CIRCAC

Cook Inlet Oil & Gas Milestones:

1970 - 1989

| | | | |
|---|--|--|--|
| <p>Early 70s: Exploration in Gulf of Alaska, federal OCS</p> <p>1970</p> <ul style="list-style-type: none"> •CI Oil peaks at 225,000 b/d •Gas discovered Nikolaevsk <p>1971</p> <ul style="list-style-type: none"> •ANCSA gives AK Natives 44MM acres and \$962MM in cash <p>1976</p> <ul style="list-style-type: none"> •Tesoro pipeline from Nikiski refinery to Anchorage airport & port •Permanent Fund established <p>1970-1976</p> | <p>Late 70s: Gas exploration increases as new LNG and iron ore reduction projects are considered</p> <p>1977</p> <ul style="list-style-type: none"> •TAPS completed <p>1978</p> <ul style="list-style-type: none"> •Gas discovered Stump Lake •Unocal fertilizer plant at Nikiski expanded 1978 <p>1977-1979</p> | <p>Early 80s: Exploration in lower C.I., federal OCS, Upper C.I. at Kalgin Island, Fire Island, and S.R.S.</p> <p>1981</p> <ul style="list-style-type: none"> •Legislature decrees state to receive all seismic data shot on its lands <p>1983</p> <ul style="list-style-type: none"> •Gas discovered Wolf Lake <p>1985</p> <ul style="list-style-type: none"> •Marathon installs Steelhead platform <p>1989</p> <ul style="list-style-type: none"> •Valdez oil spill in Prince William Sound 1989 •Natural gas prices deregulated 1989 <p>1980-1984</p> | <p>Mid to Late 80s: Recession – oil price crash and state spending cut; 1 in 10 jobs disappear from Alaska workforce</p> <p>1985-1989</p> |
|---|--|--|--|

Cook Inlet Oil & Gas Milestones: 1990 - 1999

1990s: Anadarko partners with ARCO

Union Texas partners with CIRI

Forcenergy partners with Stewart, DANCO, Marathon and Unocal

1990

- Ocean Energy succeeds Unocal as operator of Pioneer Unit in MatSu Coalbed Methane project

1991

- Oil discovered West McArthur River

1992

- Petro Star builds Valdez refinery

1993

- ARCO continues SCI and Sunfish drilling campaign (science driven)

1994

- Union Texas explores CIRI land

1996

- Cook Inlet gas peaks at 223 bcf/year
- State starts areawide leasing

1998

- Cross Timbers (XTO) purchases Shell's interest in Middle Ground Shoal Field

1999

- Nikiski LNG plant export license extended 10 years

1990-1993

1994

1995-1999

Cook Inlet Oil & Gas Milestones: 2000-2006

Focus shifts to Lesser Known Players: Armstrong, Aurora, Stormcat, Pelican, Escopeta, Rutter & Wilbanks, Benchmark, Geopetro enter CI

2000

- Osprey platform set at Redoubt Shoal
- Agrium buys Unocal fertilizer plant at Nikiski

2001

- Seven natural gas exploration wells drilled in CI
- Evergreen succeeds Ocean
- BP's Gas to Liquids plant begins operating in Kenai

2000-2001

2002

- Production begins Redoubt Shoal
- Dillion & Baker platforms shut in
- Aurora buys last of Anadarko's CI Assets
- Swanson River gas storage

2003

- Alaska Stranded Gas Development Act reauthorized

2005

Pretty Creek Gas Storage project

2006

- RCA rejects APL-5 (Henry Hub)
- Kenai (2006) Gas Storage project

2002-2006

Cook Inlet Oil & Gas Milestones: 2007-2009

Focus shifts to Lesser Known Players: Armstrong, Aurora, Stormcat, Pelican, Escopeta, Rutter & Wilbanks, Benchmark, Geopetro enter CI

2007

- Pacific buys Forest assets
- Agrium closes fertilizer plant
- Corsair, Kitchen Units formed first offshore units in CI since Redoubt in 1997
- Pioneer at Cosmopolitan Hansen well sidetrack
- Chevron & Marathon continue to drill for/develop gas at Ninilchik, Kenai & Cannery Loop (ongoing)

2008

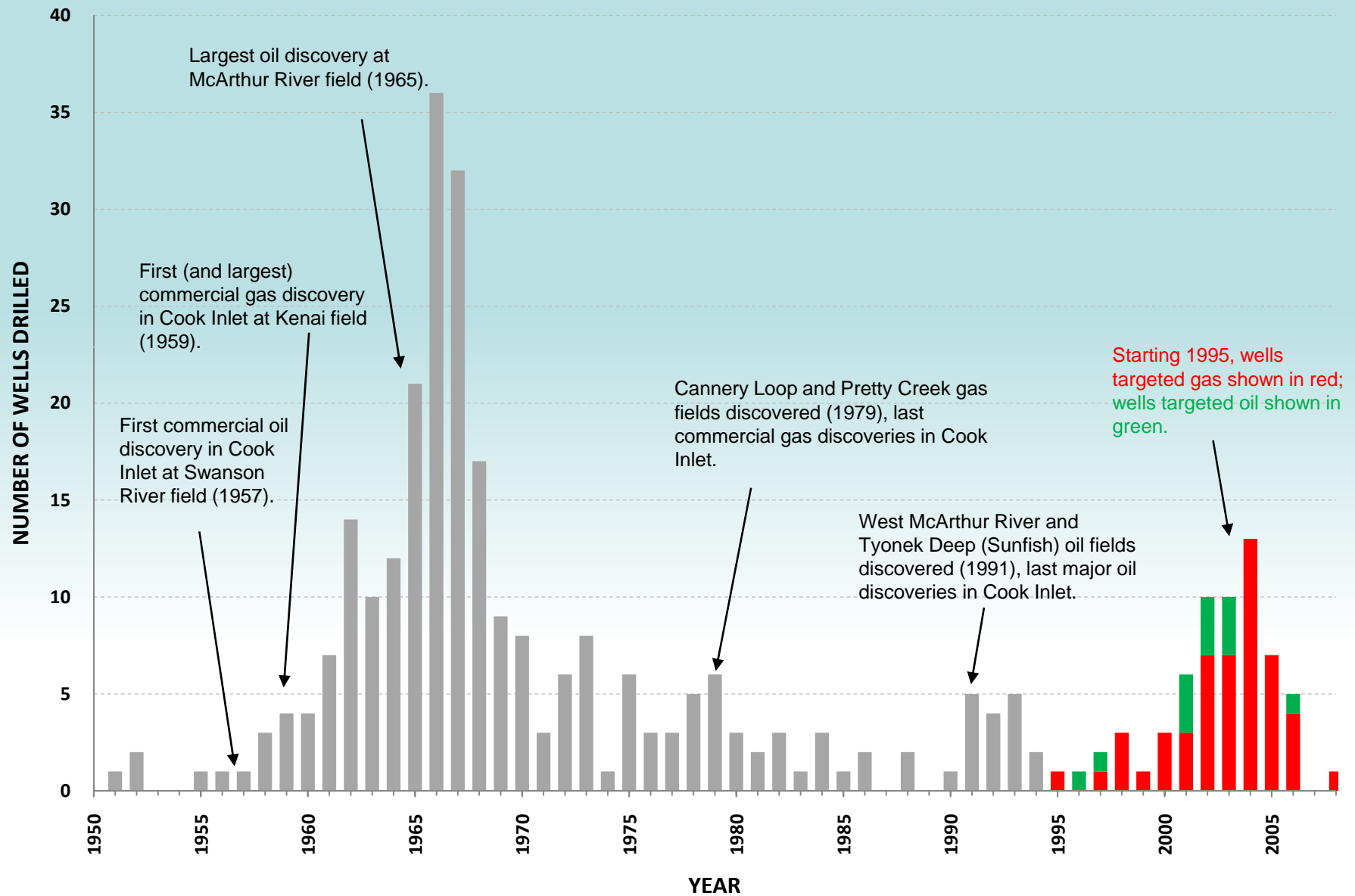
- Armstrong, North Fork Unit drills 2nd well – first well drilled 40 years ago, needs pipeline extension from Happy Valley to monetize gas
- RCA accepts APL-6 with stipulations
- Enstar rejects RCA stipulations
- Weighted Average Cost of Gas (WACOG) in effect
- Redevelopment work in Beluga, 2 wells drilled & NCI, 3 wells drilled (2008)
- LNG plant extension through 3/2011

2009

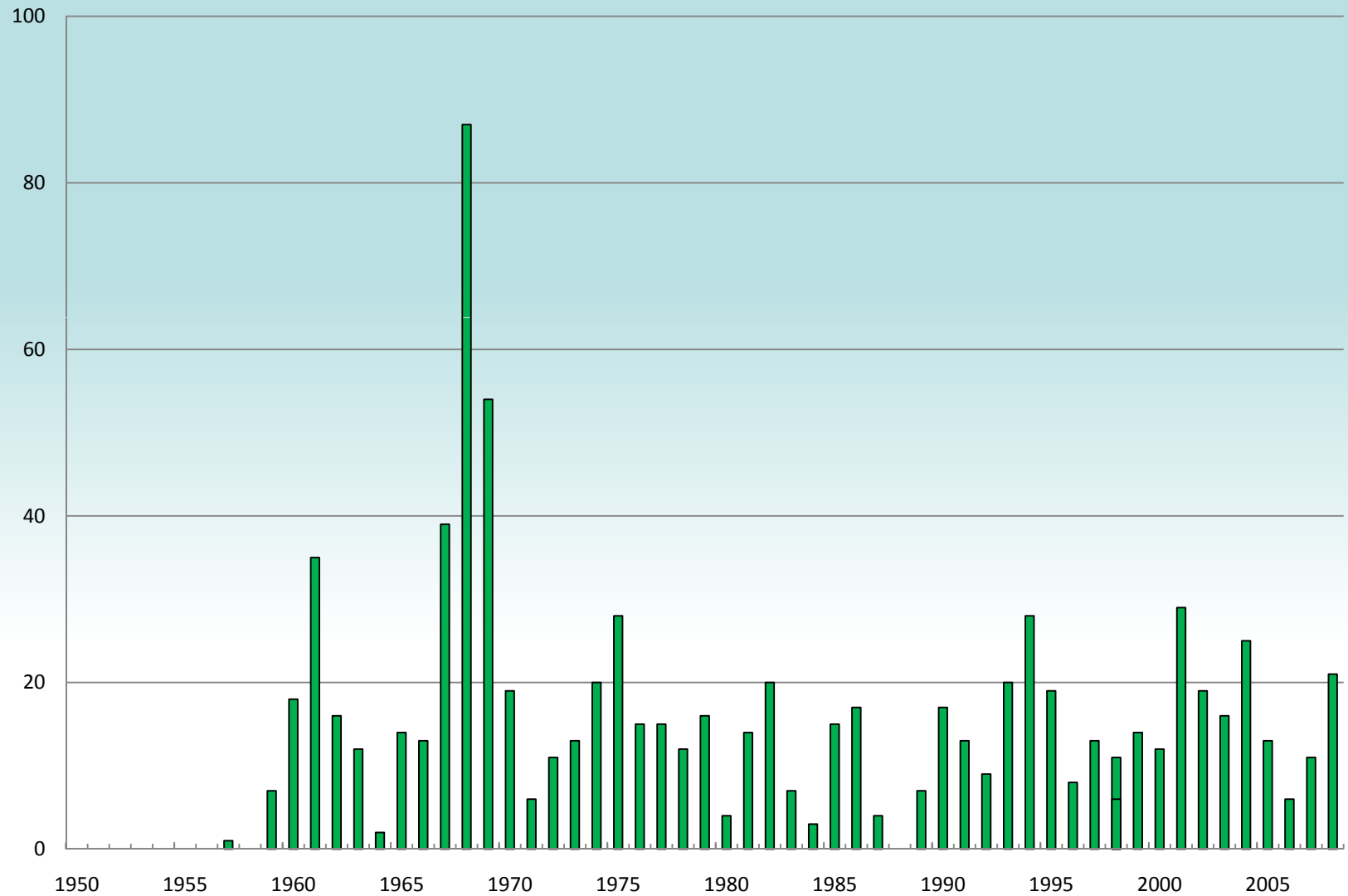
- Pacific files for bankruptcy

2007-2009

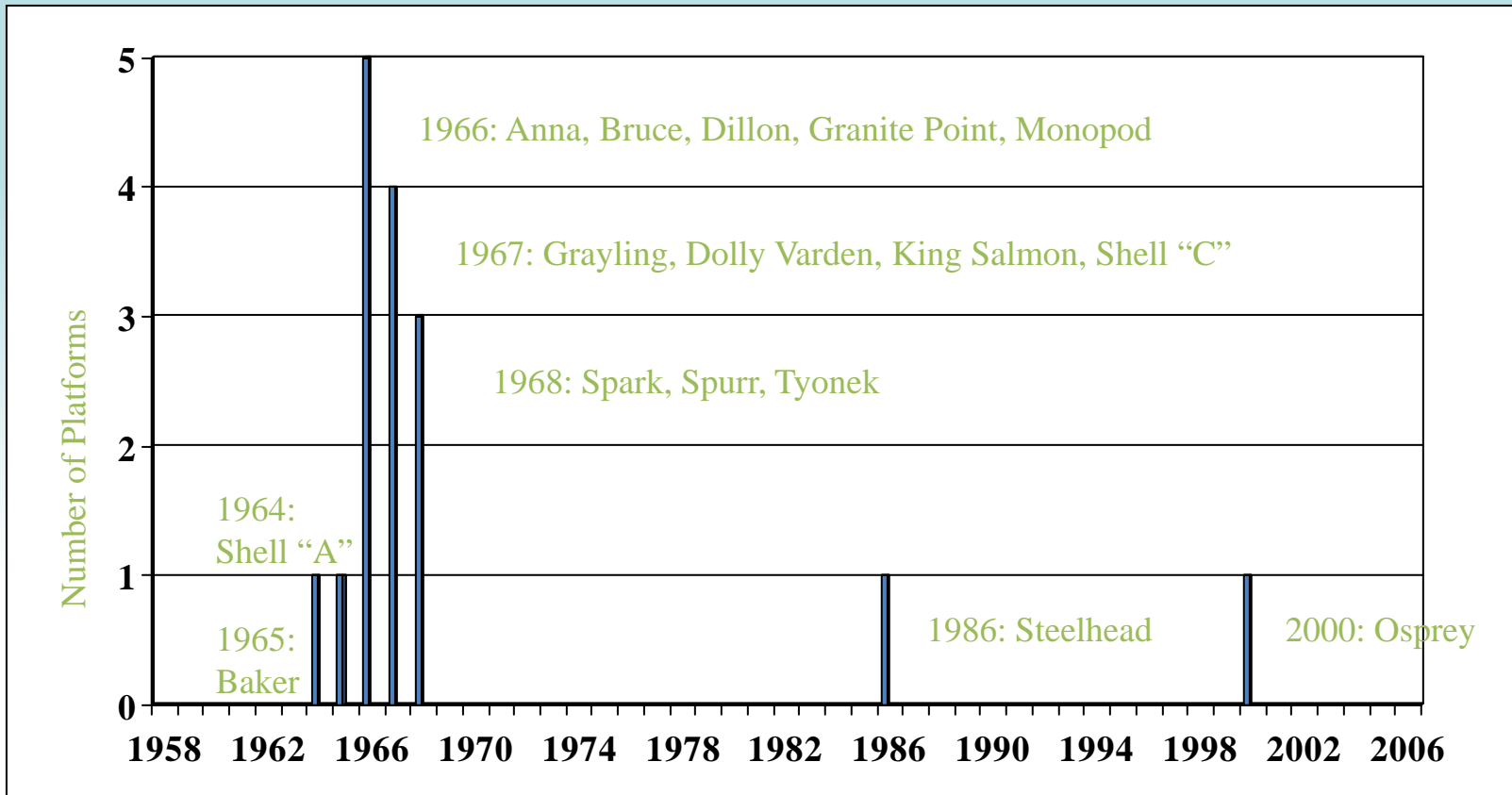
Cook Inlet Exploration Wells Drilled, 1950 - 2008



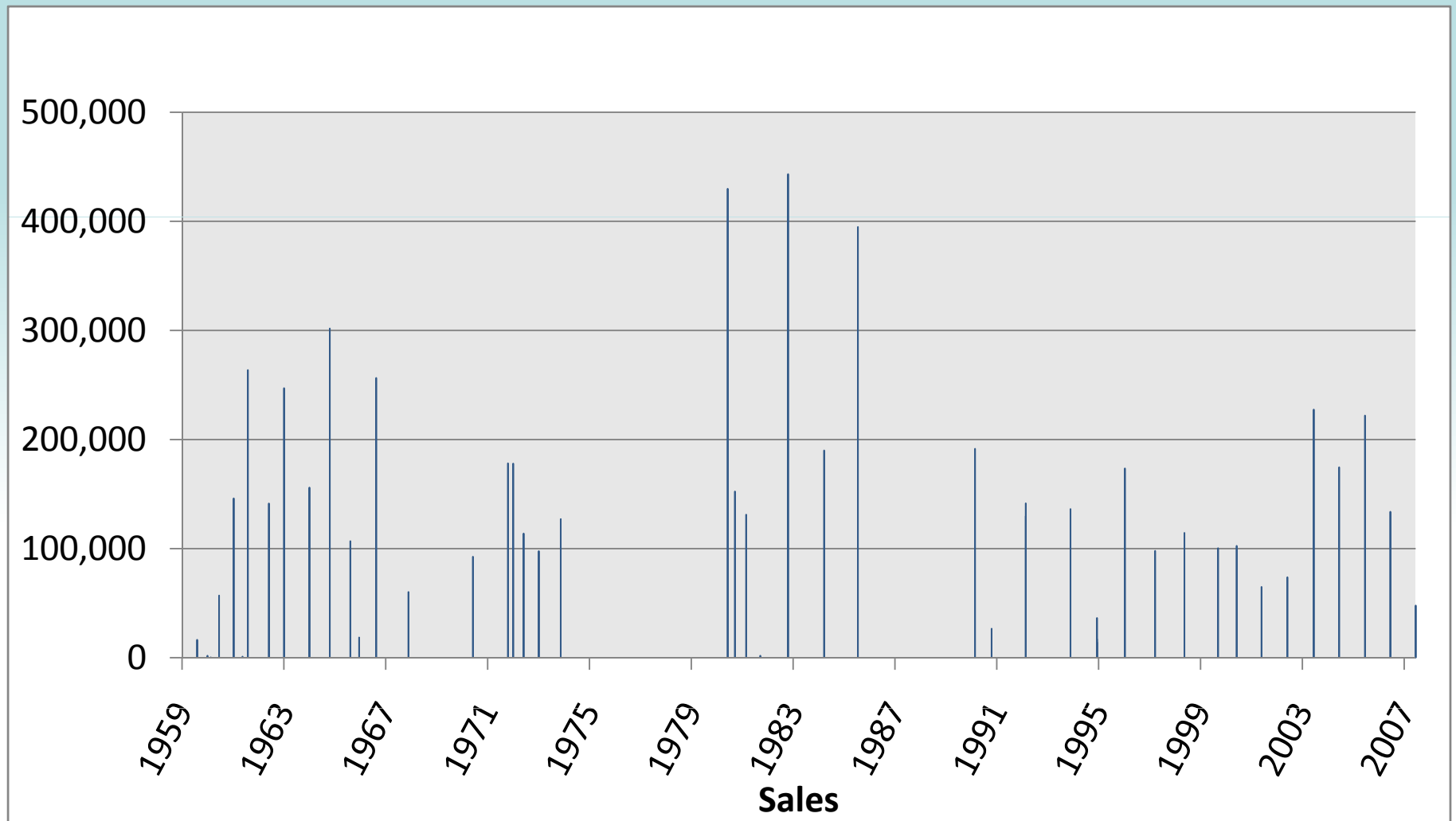
Cook Inlet Development Wells



Cook Inlet Oil & Gas Platforms



Cook Inlet - State Acres Leased



Cook Inlet Gas Exploration Statistics

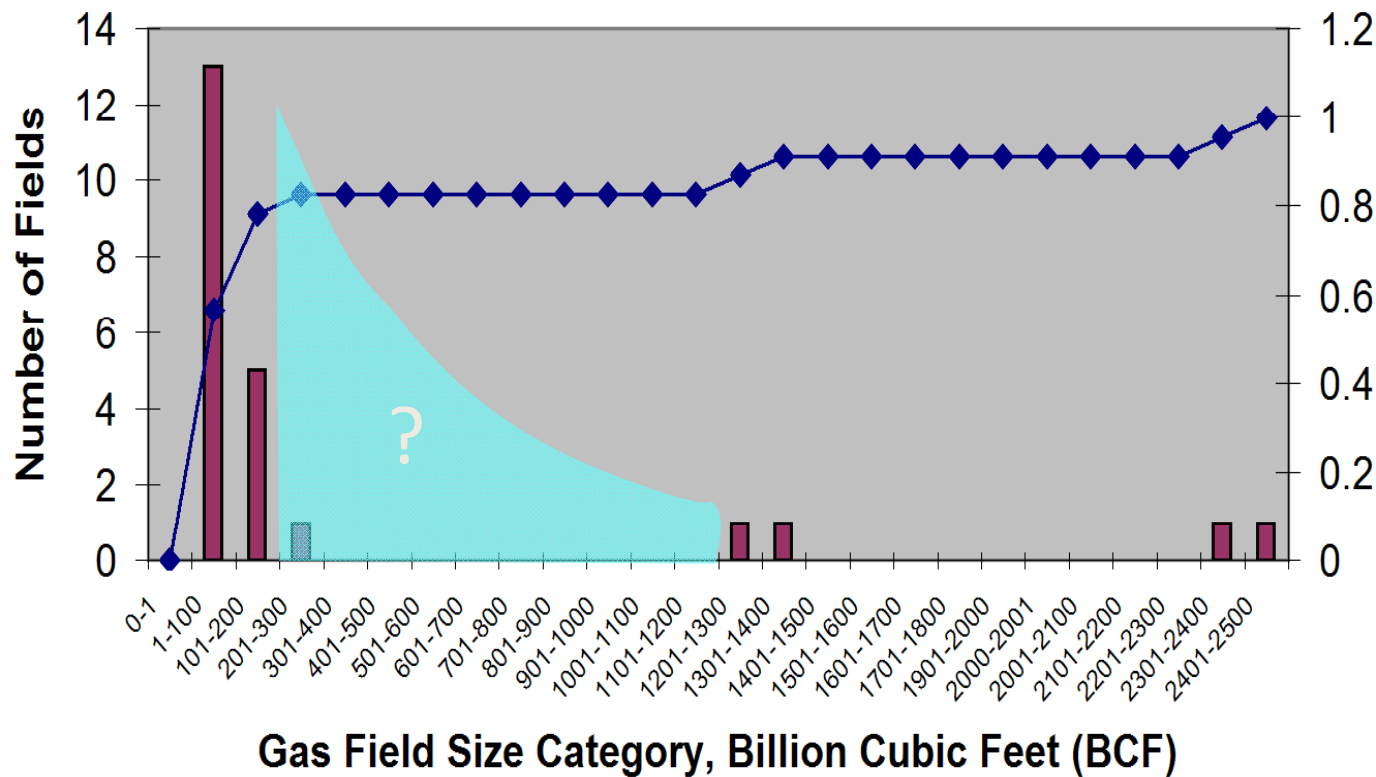
- 85% of gas discovered early in exploration cycle while drilling for oil
- Only structural traps had been explored for or developed — stratigraphic trap potential essentially untapped
- Nearly one in ten fields >2 tcf
- 4 largest fields have 86% of reserves
- Field-size distribution lacks discoveries in 300-1300 bcf range — yet to be discovered?

Gas Field Size Distribution

Cook Inlet

EUR-Field Size Distribution

Cumulative Frequency



| | |
|------------------|------|
| Nicoli Creek | 3 |
| Stump Lake | 6 |
| Pretty Creek | 6 |
| West Fork | 7 |
| Lewis River | 9 |
| North Fork | 12 |
| Falls Creek | 13 |
| Birch Hill | 22 |
| Sterling | 26 |
| N Trading Bay Ur | 30 |
| Moquakie | 43 |
| Wolf Lake | 50 |
| Trading Bay | 90 |
| Ivan River | 104 |
| M G S | 112 |
| Cannery Loop | 116 |
| Granite Point | 137 |
| Swanson River | 145 |
| Beaver Creek | 242 |
| BRU | 1266 |
| McAurthur River | 1384 |
| NCI | 2328 |
| Kenai | 2425 |

TOTAL= 8576 bcf

Mean = 373 tcf

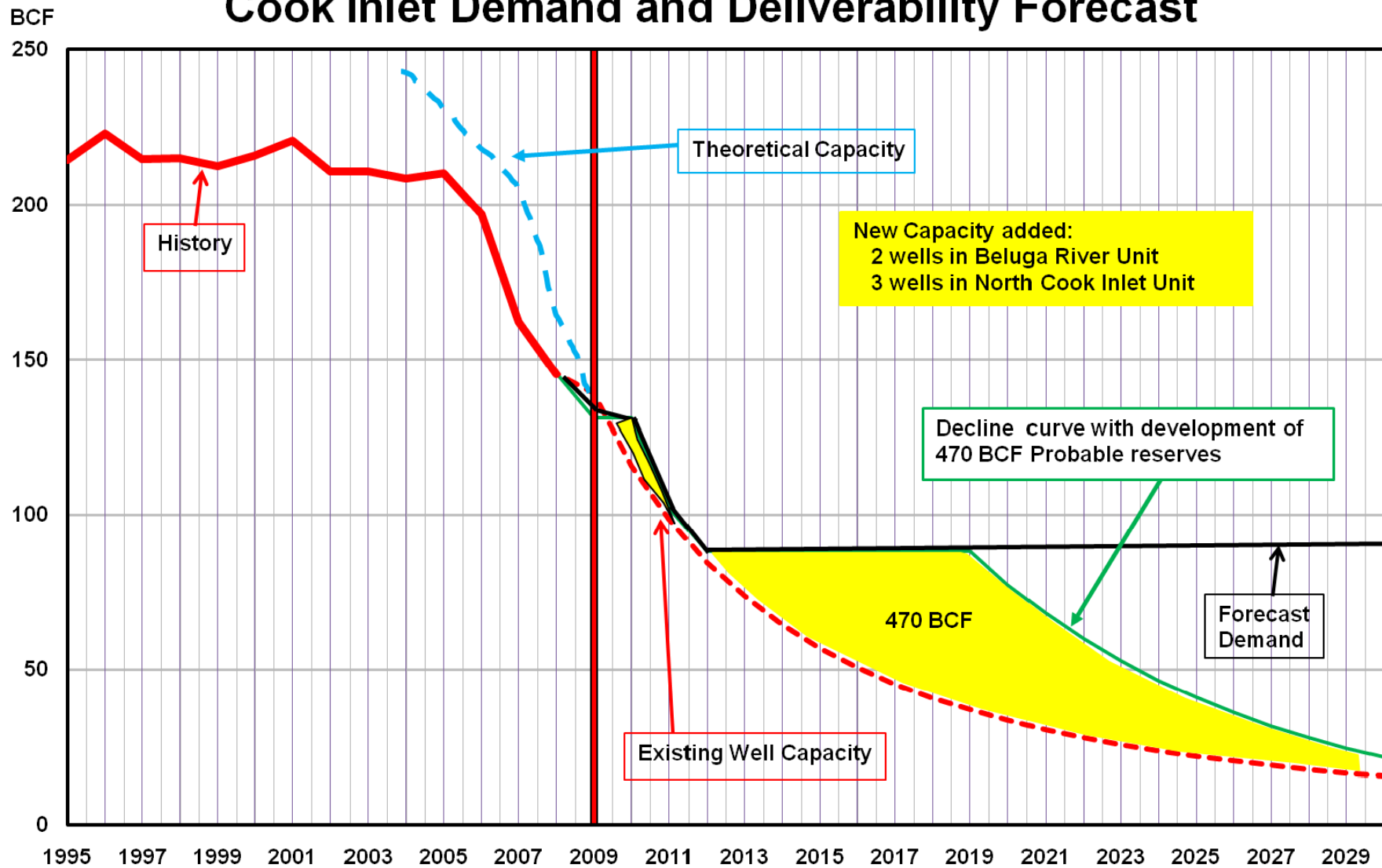
Cook Inlet Oil & Gas Exploration

- Minimal focused exploration for natural gas in the Cook Inlet until recent years
- Oil and gas exploration is inherently risky, with a low chance of economic success with long lead time
- Difficult data acquisition with thick coals and low velocity surface
- The best chance of success is achieved when numerous geologic concepts are tested, which requires access to entire sedimentary basin, numerous exploration wells
- Market certainty, modern high resolution geologic data, and non-volatile pricing are key to meeting economic risk thresholds
- In the Cook Inlet, most of the “easy” (inexpensive) gas has been found and delineated

What does the future hold?

- Is there more gas to be found?
 - Yes
- Where will it be found?
 - In existing fields
 - In new exploration play types
- What are the hurdles?
 - Land access over all basin
 - Expensive data gathering and drilling costs
 - Complicated limited market

Cook Inlet Demand and Deliverability Forecast



Historic Deliverability

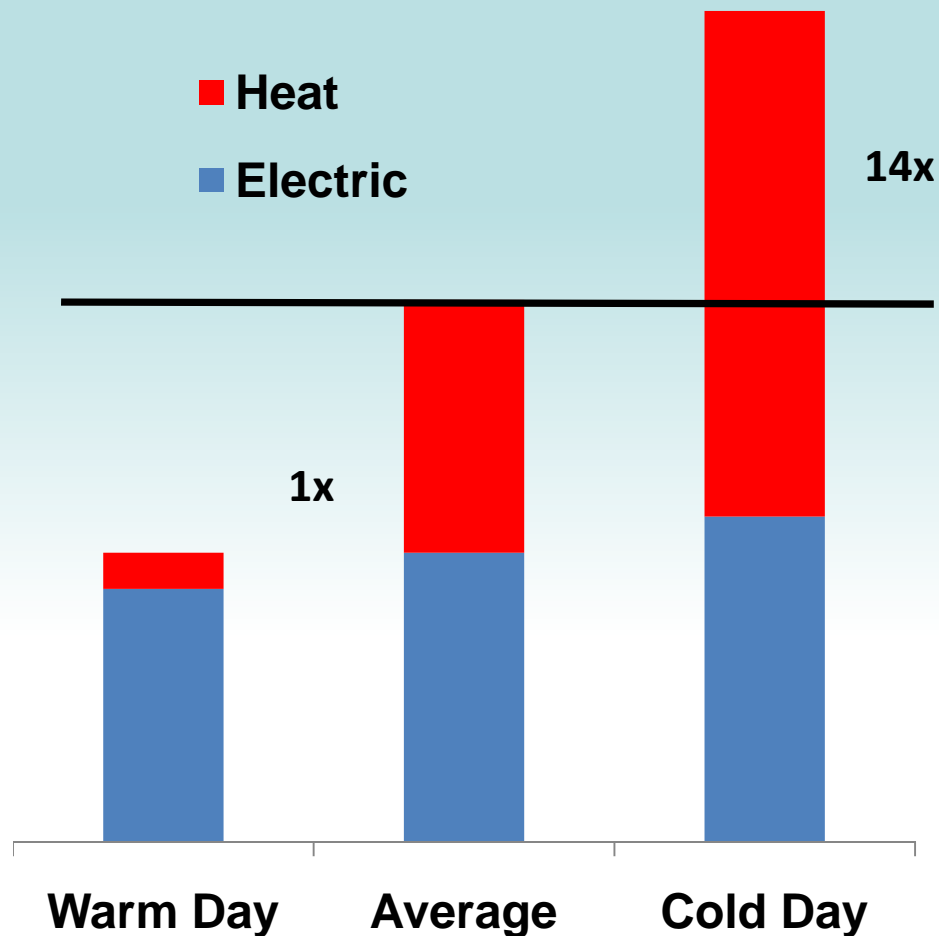
| | 2/3/1999 | 1/9/2007 | 1/3/2009 |
|-----------------------------|--------------------------|--------------------------|--------------------------|
| Average Temperature | -19⁰ F | -10⁰ F | -11⁰ F |
| On Enstar System | 272 | 292 | 314 |
| CEA Beluga | 83 | 83 | 60 |
| CEA/HEA Nikiski | 14 | 12 | 12 |
| LNG | 224 | 150 | 40 |
| Agrium | 157 | 0 | 0 |
| Other Industrials | 13 | 6 | 14 |
| Total Deliverability | 763 | 543 | 440 |
| less Storage Volumes | 0 | ~43 | ~60 |
| Well Supply | 763 | 500 | 380 |

Cook Inlet Daily Gas Demand

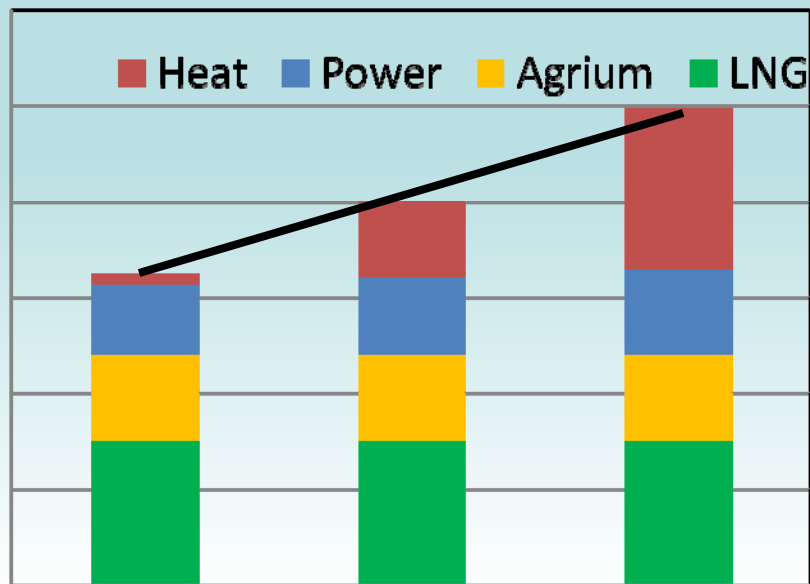
Deliverability

Seasonal
Needle Peak
Intra-day

Wells
Pipelines
Compression
Connectivity
LNG, Agrium
Gas Storage
Line Pack

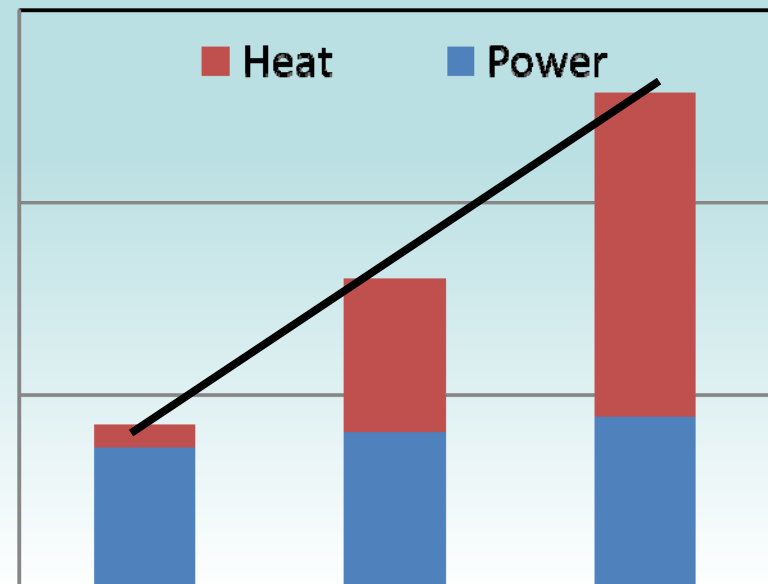


Industrial Base Load



Warm Day Average Cold Day

Peak Swing 50%



Warm Day Average Cold Day

Peak Swing 200%

Kenai LNG Export Agreement

- COP – 2 wells in Beluga
- MRO – 2 wells in Ninilchik, 3 wells in Kenai
- Catalog well and seismic data for sale
- RFP to buy gas for LNG plant
- Enstar contract reasonably approvable by RCA
- Fill unmet need of Chugach 5.2 BCF in 2010 through good faith negotiation approvable by RCA

Projects for 2009

- Gas Storage Expansion Plans
- Exploration and Development
- Lease Sales
- Coordination with Federal Government

Gas Storage Expansion Plans

- Continue to develop Cook Inlet storage capacity
- Engaging producers and utilities on storage
- Actively working one potential storage lease
- Potential for storage in winter 09/10

Lease Sales

- Final Best Interest Finding for Cook Inlet issued January 20, 2009
- Areawide Sale tentatively scheduled for May 2009

Coordination with Federal Government

- Encouraging exploration and development of federal lands.
- Continue partnering with Minerals Management Service and Bureau of Land Management in managing and oversight of jointly-owned lands (Beluga River and Cosmopolitan Units).