



# UPPER COOK INLET BASIN REVIEW

Cook Inlet Basin

Anchorage

Through July 2006:  
1.3 billion barrels of oil  
7.2 trillion cubic feet of gas

USGS

Modified from USGS National Map





# UPPER COOK INLET BASIN REVIEW



• Basin / Accumulation Origins

• Exploration History

• Future

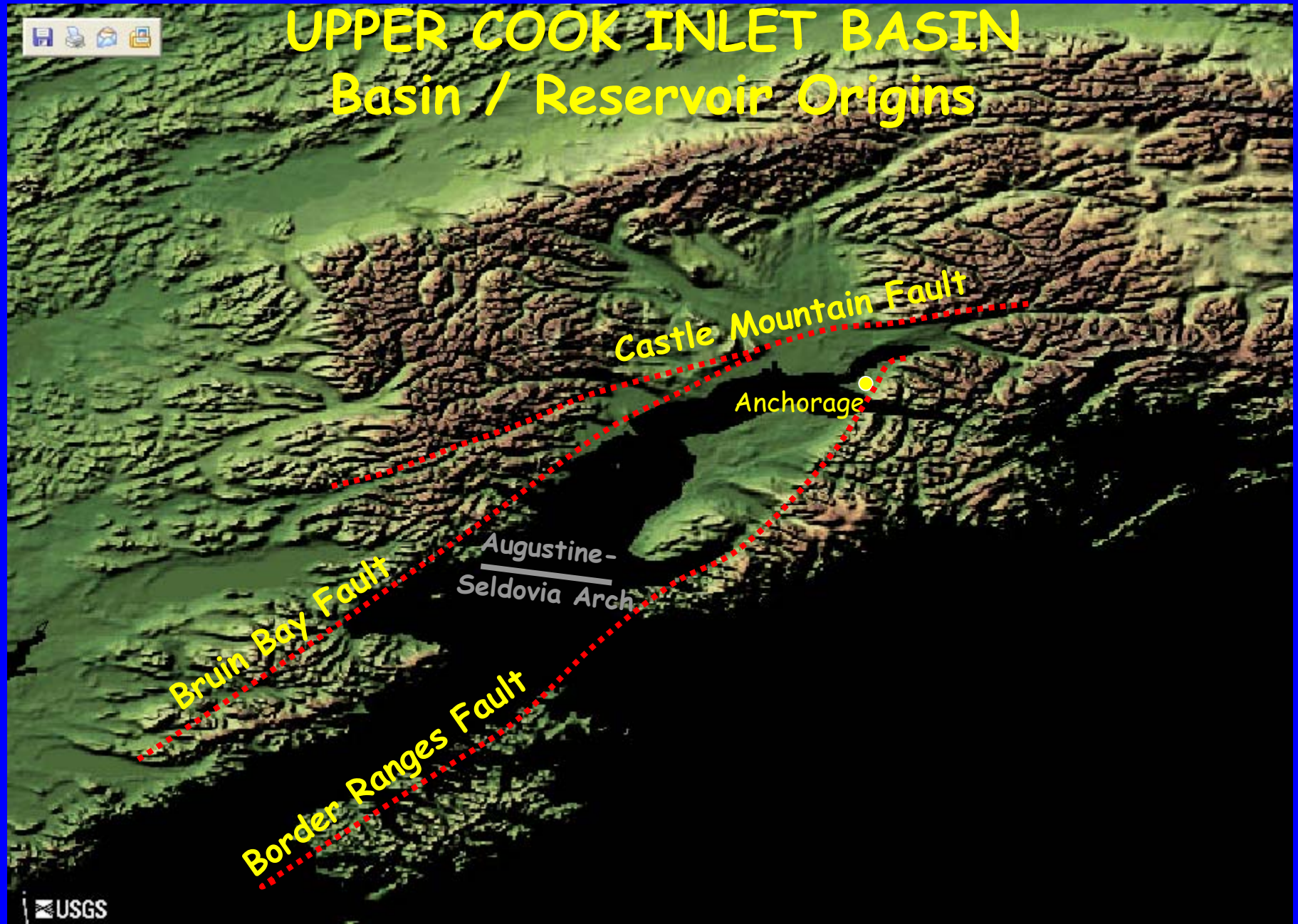
● Anchorage

USGS

Modified from USGS National Map



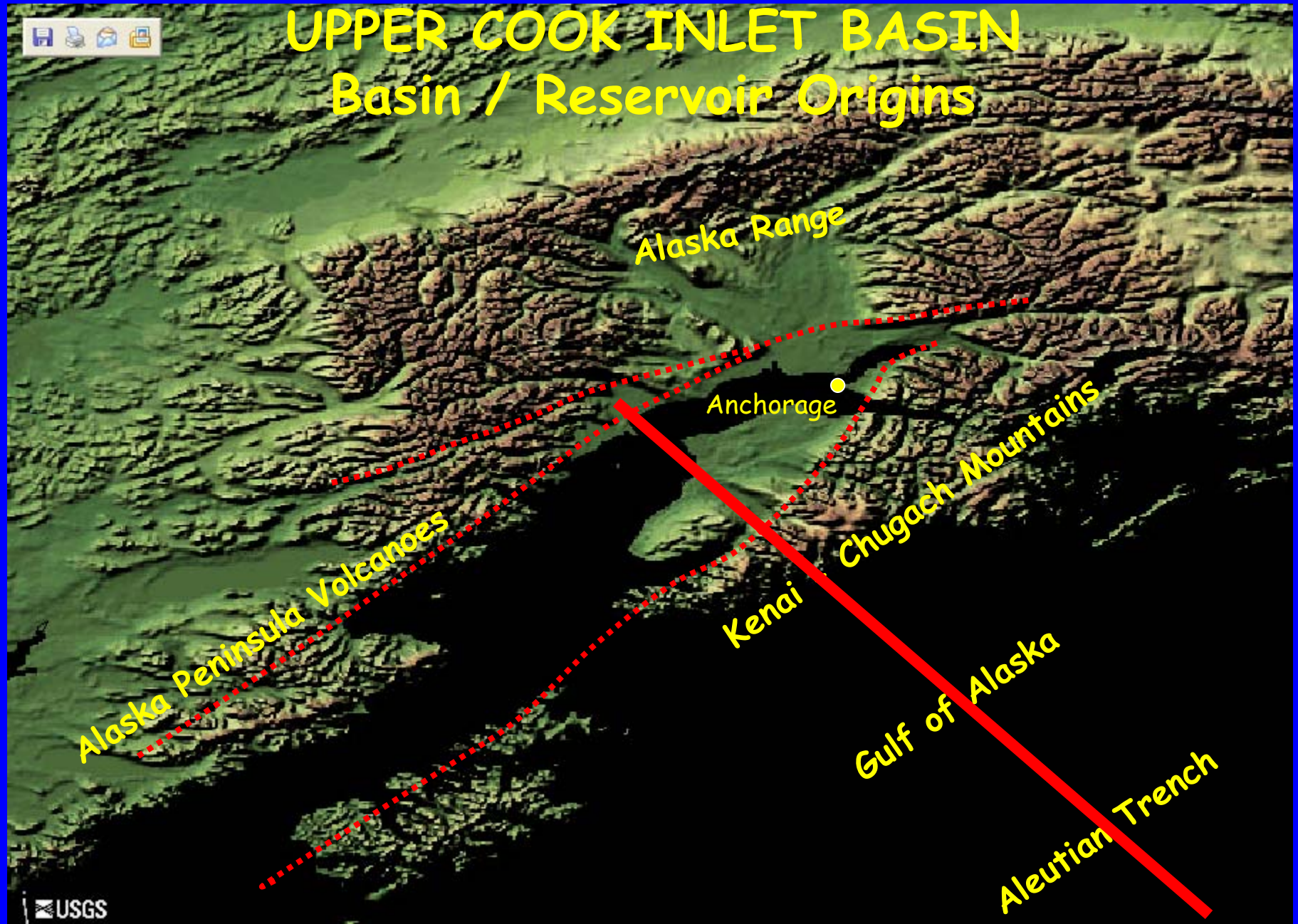
# UPPER COOK INLET BASIN Basin / Reservoir Origins



Modified from USGS National Map



# UPPER COOK INLET BASIN Basin / Reservoir Origins

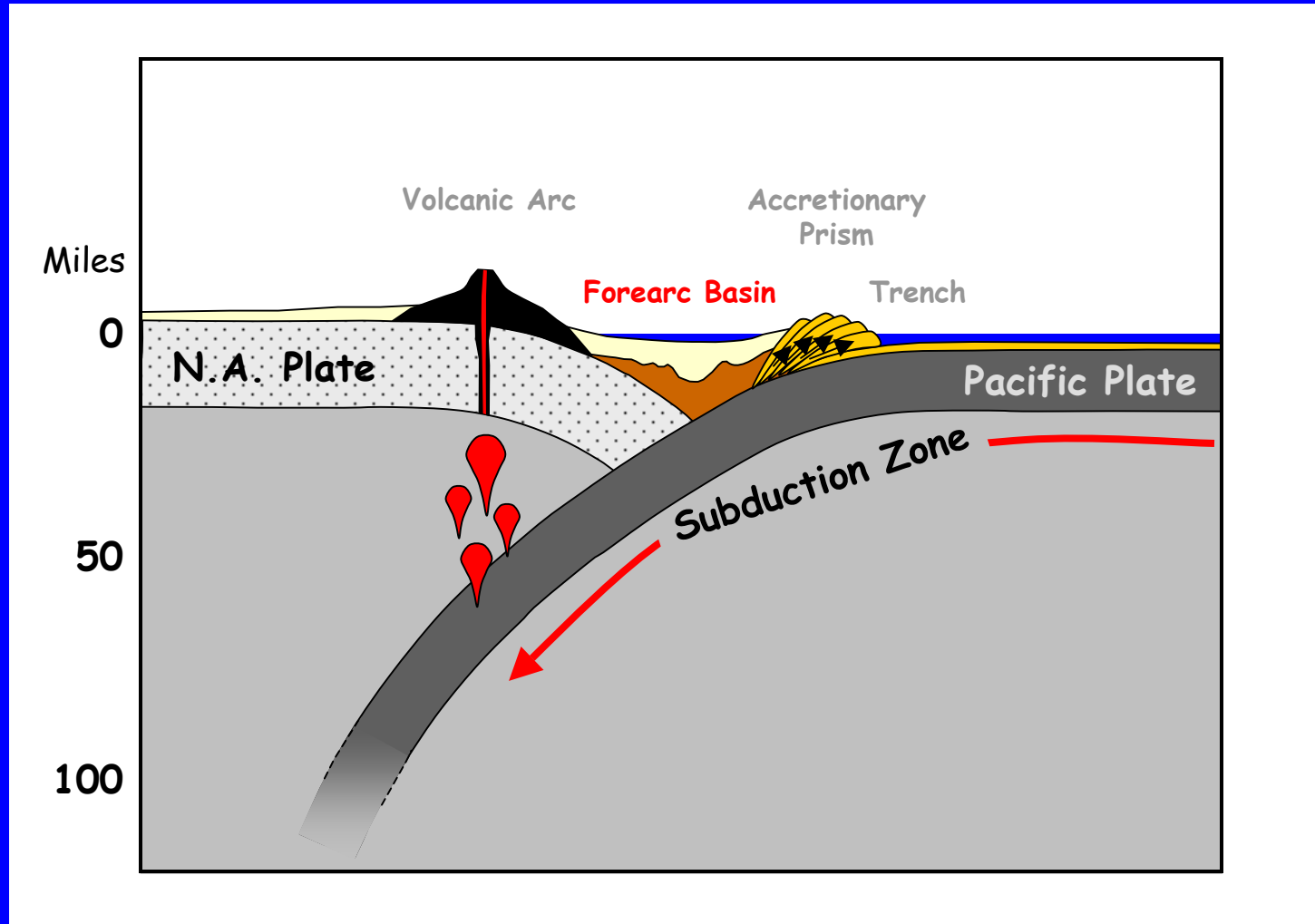


Modified from USGS National Map

# UPPER COOK INLET BASIN Basin / Reservoir Origins

NW

SE

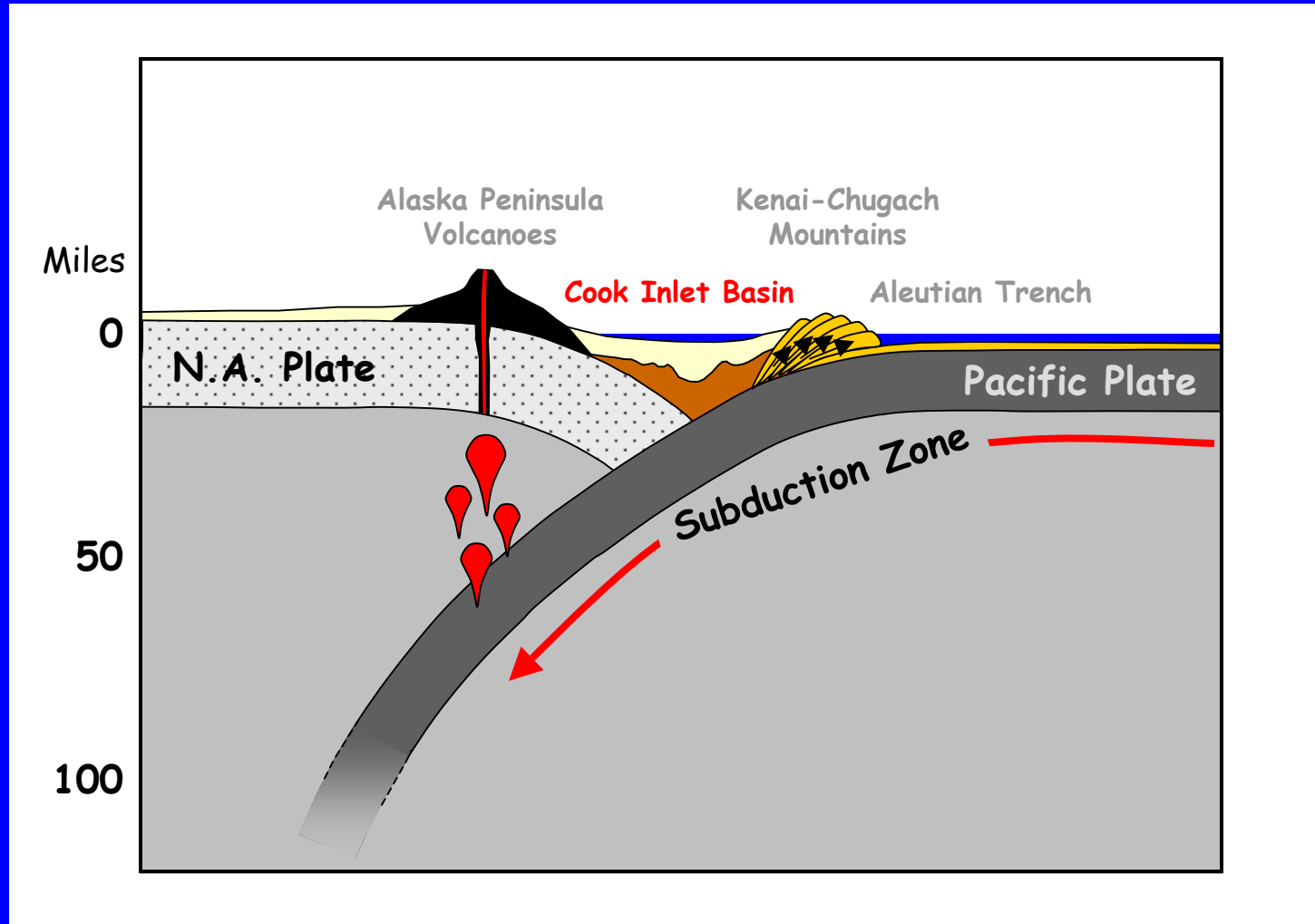


Modified from:  
Tornqvist, T., 2005, Principles of Sedimentology and Stratigraphy, University of Chicago,  
<http://www.uic.edu/classes/geol/eaes350/>

# UPPER COOK INLET BASIN Basin / Reservoir Origins

NW

SE

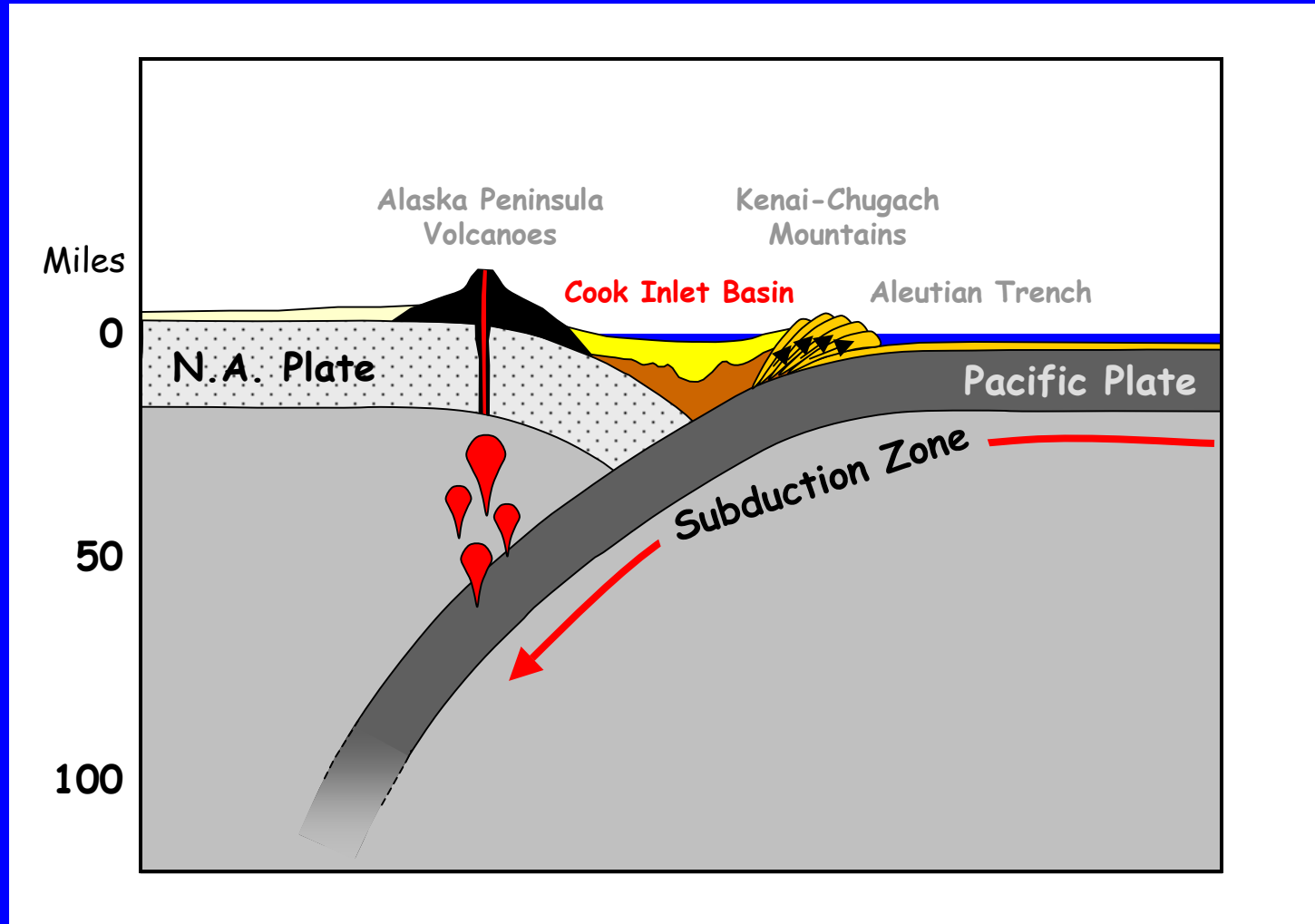


Modified from:  
Tornqvist, T., 2005, Principles of Sedimentology and Stratigraphy, University of Chicago,  
<http://www.uic.edu/classes/geol/eaes350/>

# UPPER COOK INLET BASIN Basin / Reservoir Origins

NW

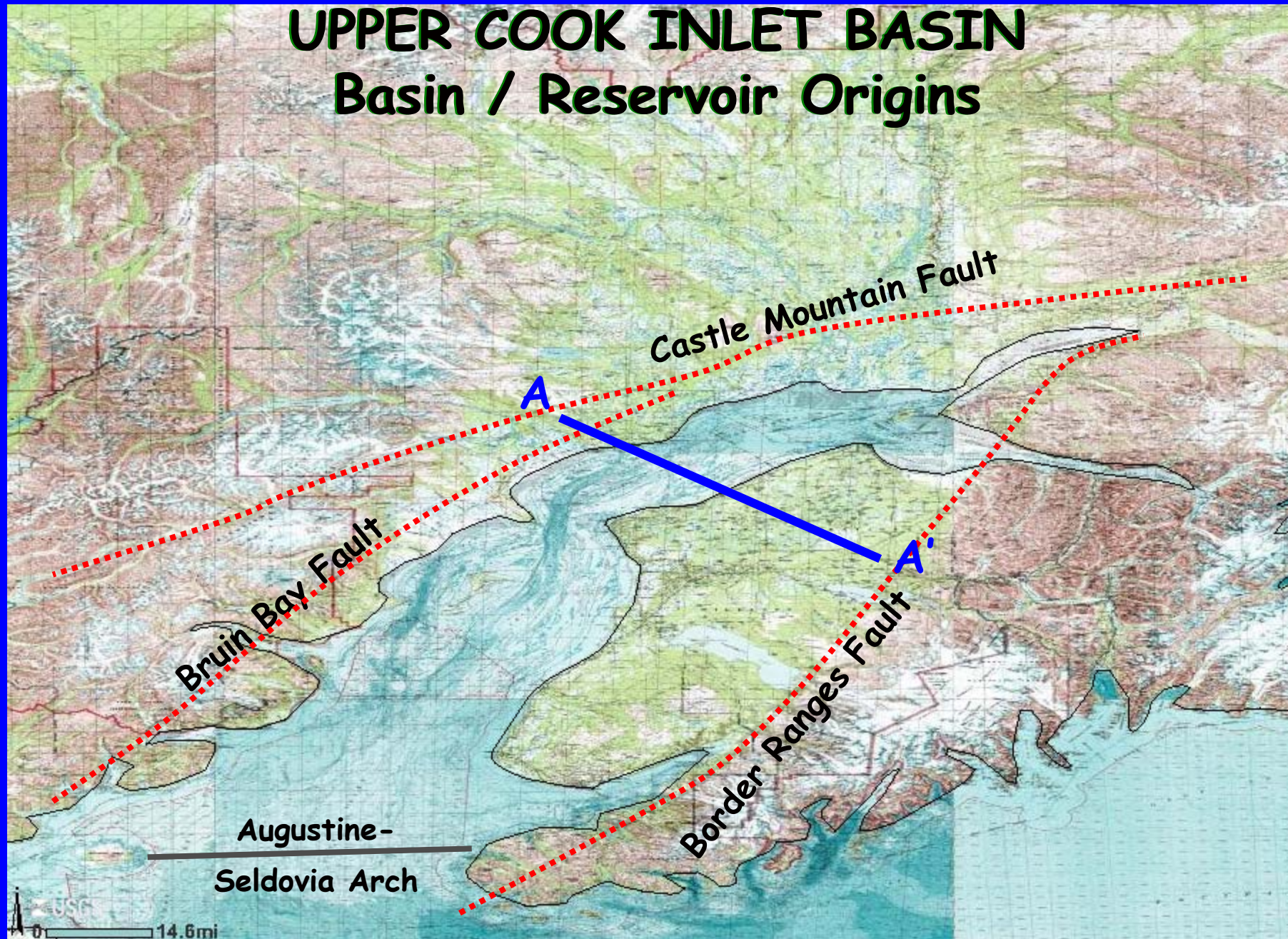
SE



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

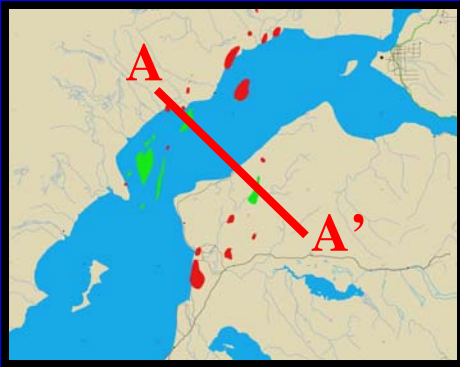


# UPPER COOK INLET BASIN Basin / Reservoir Origins



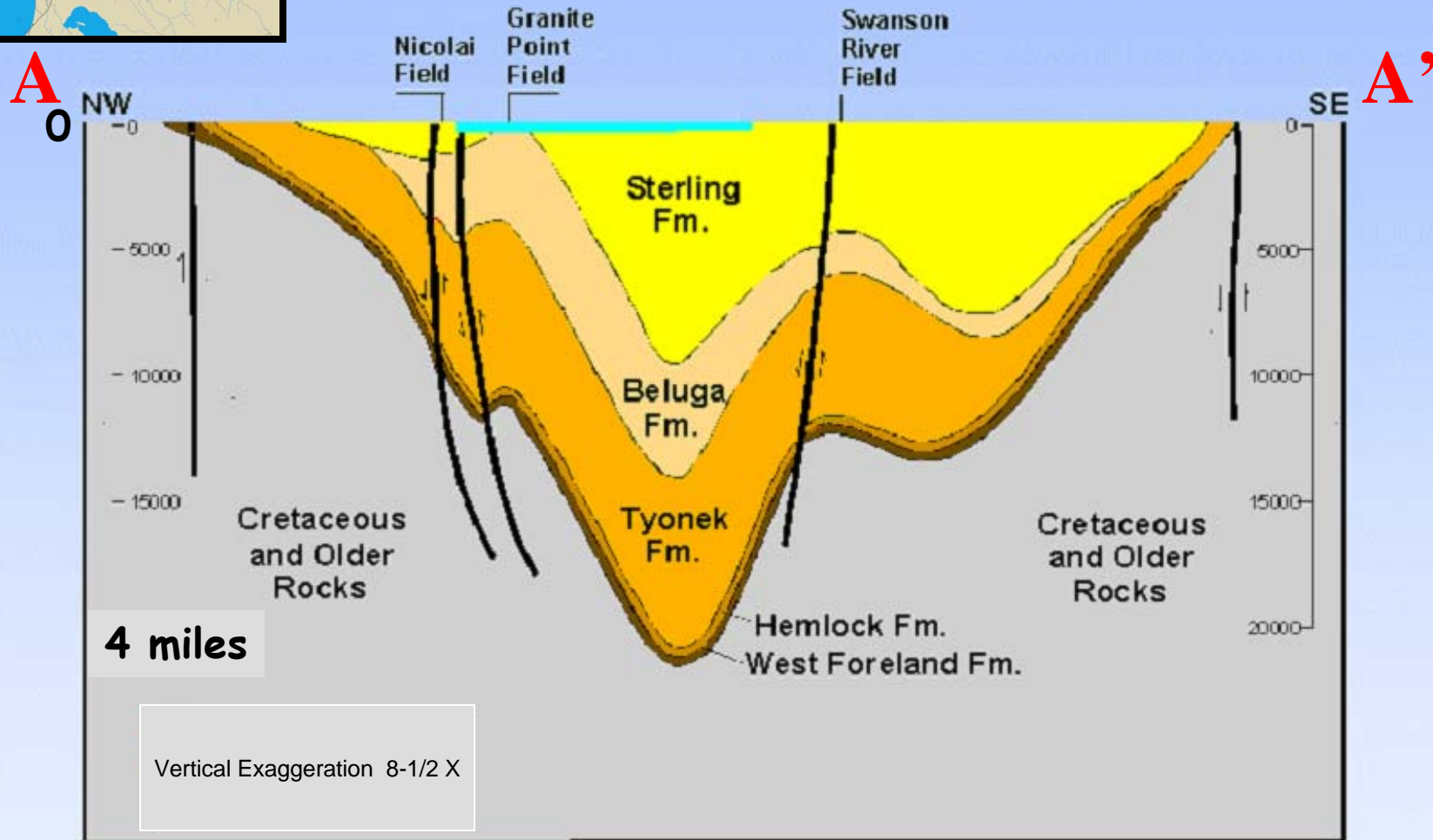
Modified from USGS National Map





# Cook Inlet Basin

## Generalized Geologic Cross Section



mep 98

# UPPER COOK INLET BASIN

## Basin / Reservoir Origins

### 5 Elements Essential to Formation of any Oil or Gas Field

1. Source Rock (organic-rich)
2. Hydrocarbon Generation Mechanism
3. Migration Pathway
4. Reservoir Rock
5. Trap / Seal
  - Structural (fault, fold, etc.)
  - Stratigraphic (encapsulated reservoir)



# UPPER COOK INLET BASIN

## Basin / Reservoir Origins

These essential elements constitute what is called a

### "Petroleum System"

That is, all of the elements necessary to generate, move and trap hydrocarbons

# UPPER COOK INLET BASIN

## Basin / Reservoir Origins

The Upper Cook Inlet Basin contains two Petroleum Systems:

### 1. Tuxedni - Hemlock

- Deeper, oil-bearing reservoirs
- Gas is associated with oil accumulations
- "Wet" gas - methane with heavier gases



# U. Cook Inlet Basin Stratigraphic Column

## Tuxedni - Hemlock Petroleum System

Oil & Associated Gas

### Principle Reservoir

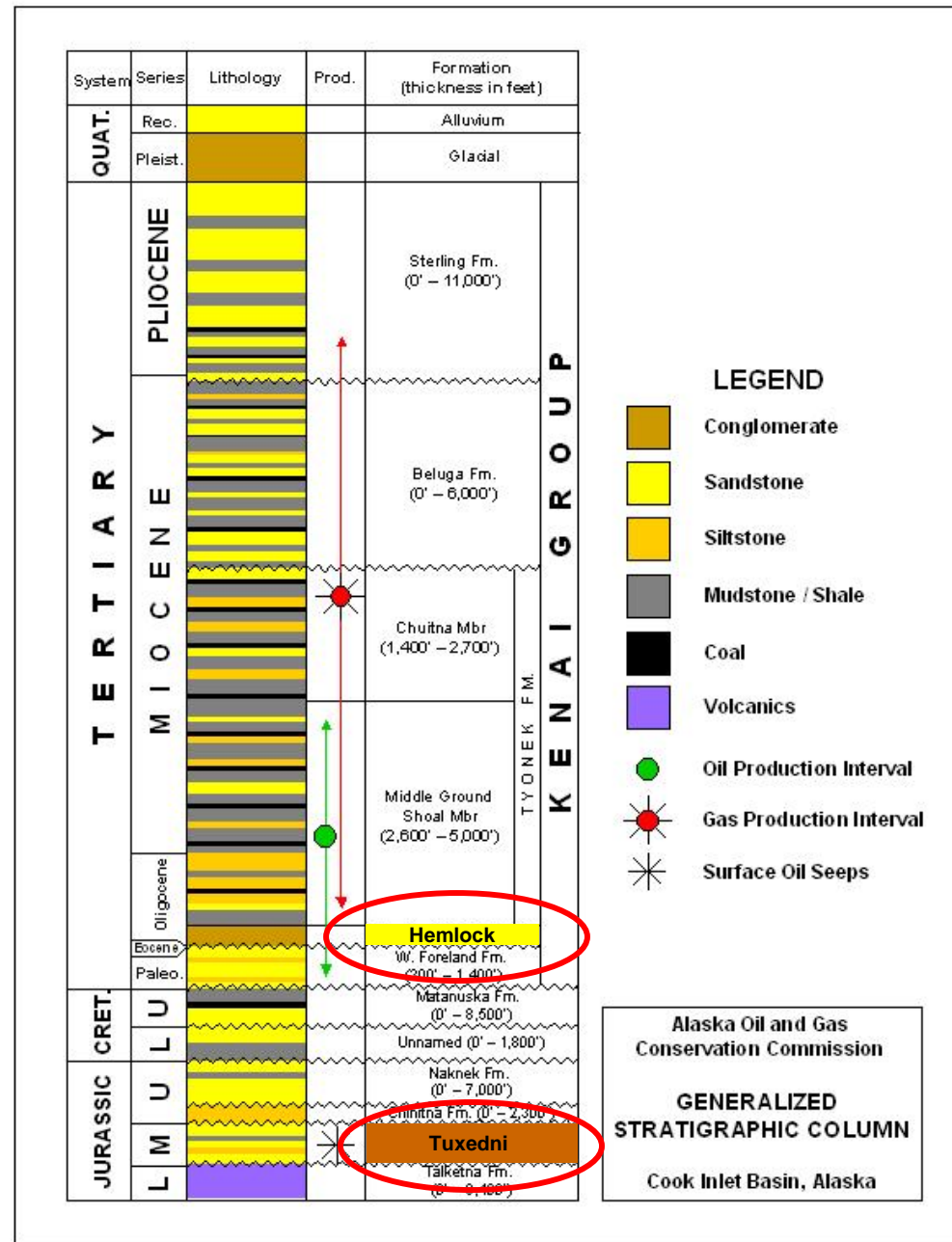
#### Hemlock

Sandstone, conglomeratic sandstone,  
conglomerates

### Source Rock

#### Tuxedni

Siltstone, dark gray, clay-rich,  
Averages ~1.7% organic material



Modified from Magoon, L.B., 1994

# U. Cook Inlet Basin Stratigraphic Column

## Tuxedni - Hemlock Petroleum System

Oil & Associated Gas

## Secondary Reservoirs

### Tyonek

Massively bedded sandstones with  
siltstone & thick, continuous coals

### Hemlock

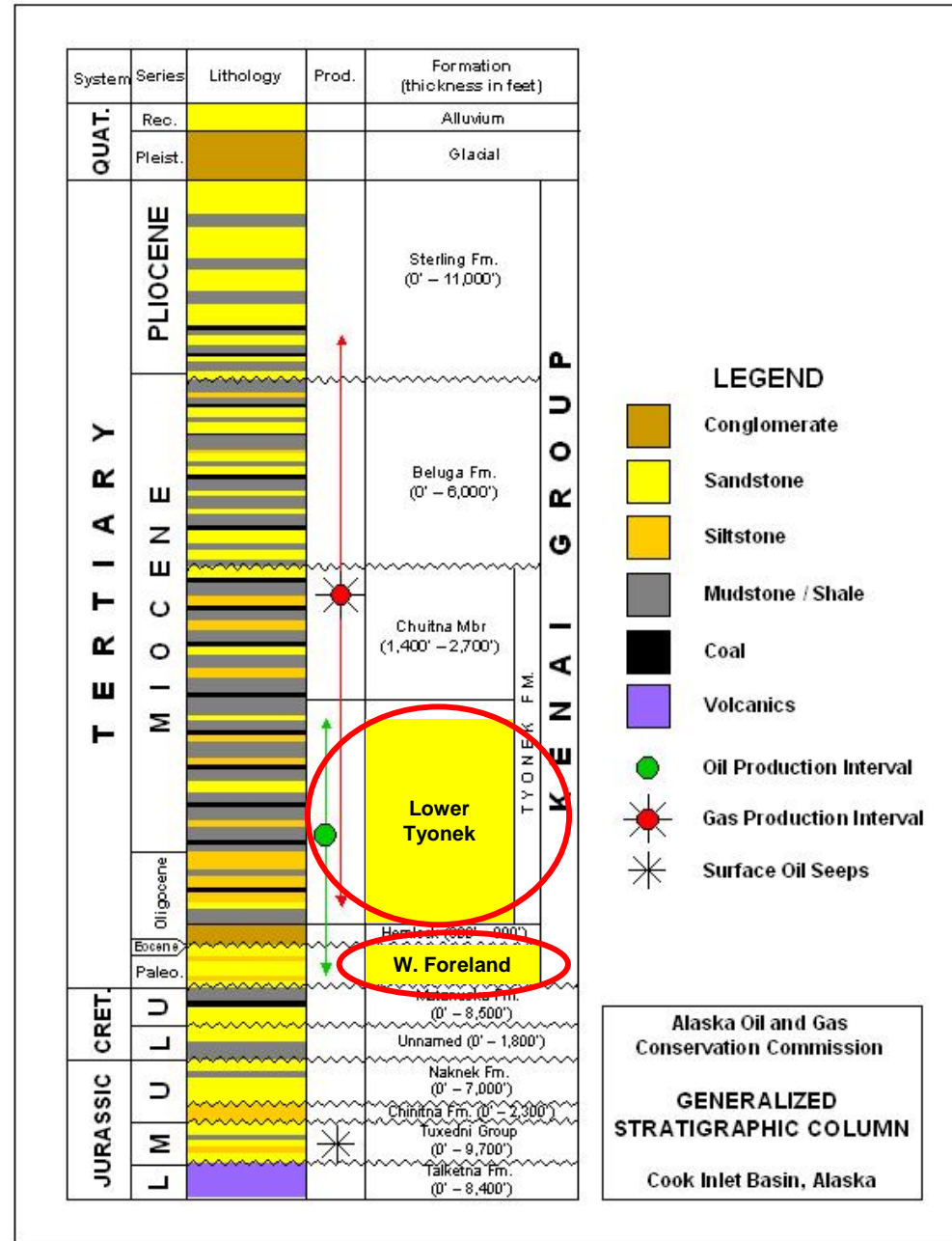
### West Foreland

Conglomerate, sandstone, siltstone

## Source Rock

### Tuxedni

Siltstone, dark gray, clay-rich,  
Averages ~1.7% organic material



Modified from Magoon, L.B., 1994



# UPPER COOK INLET BASIN

## Basin / Reservoir Origins



Overburden Rock

Sealing Rock

Reservoir Rock

Source Rock

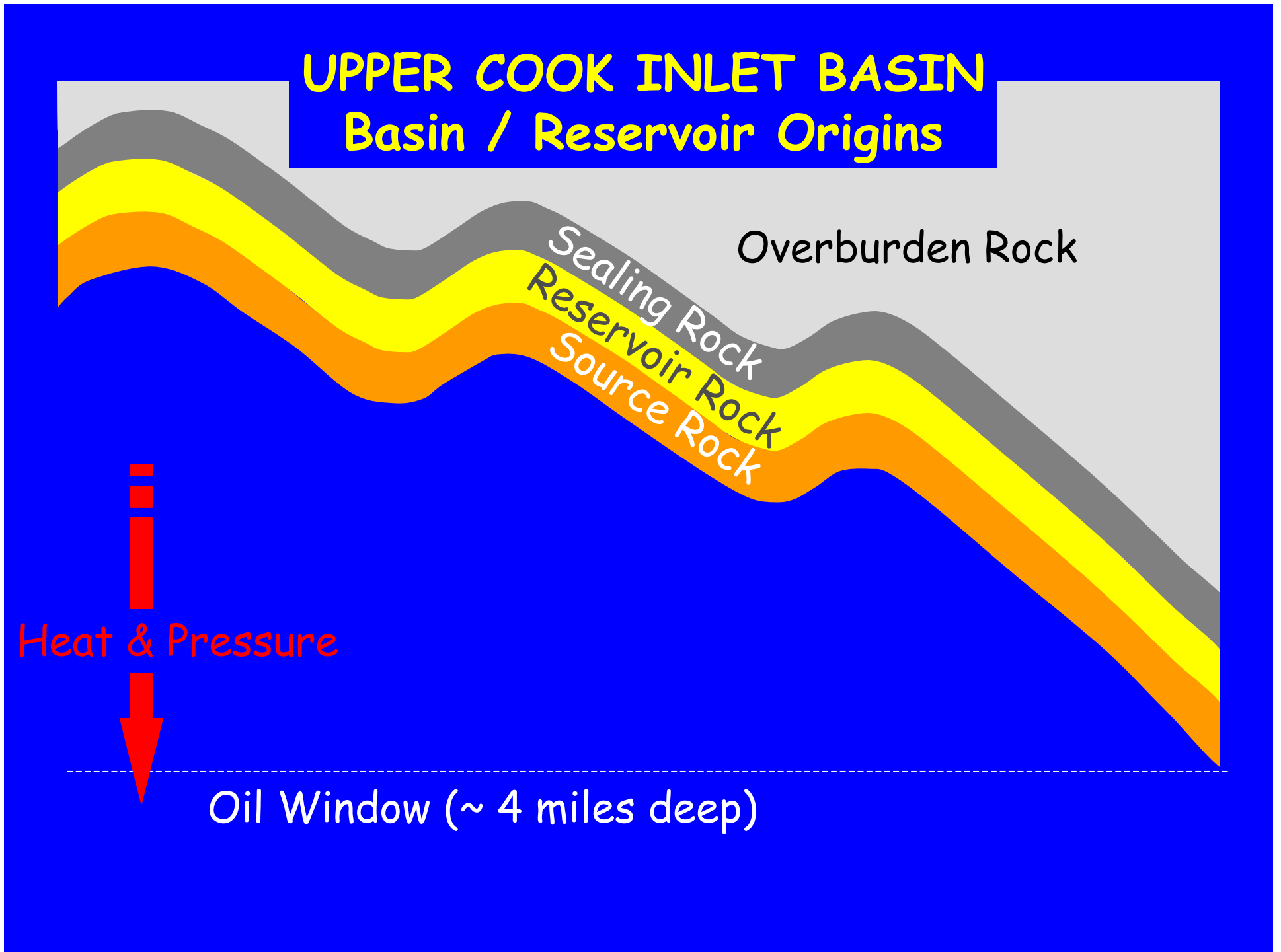
# UPPER COOK INLET BASIN Basin / Reservoir Origins

Overburden Rock

Sealing Rock  
Reservoir Rock  
Source Rock

Heat & Pressure

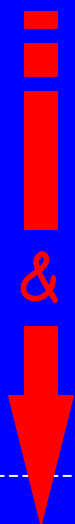
Oil Window (~ 4 miles deep)



# UPPER COOK INLET BASIN Basin / Reservoir Origins

Overburden Rock

Heat & Pressure

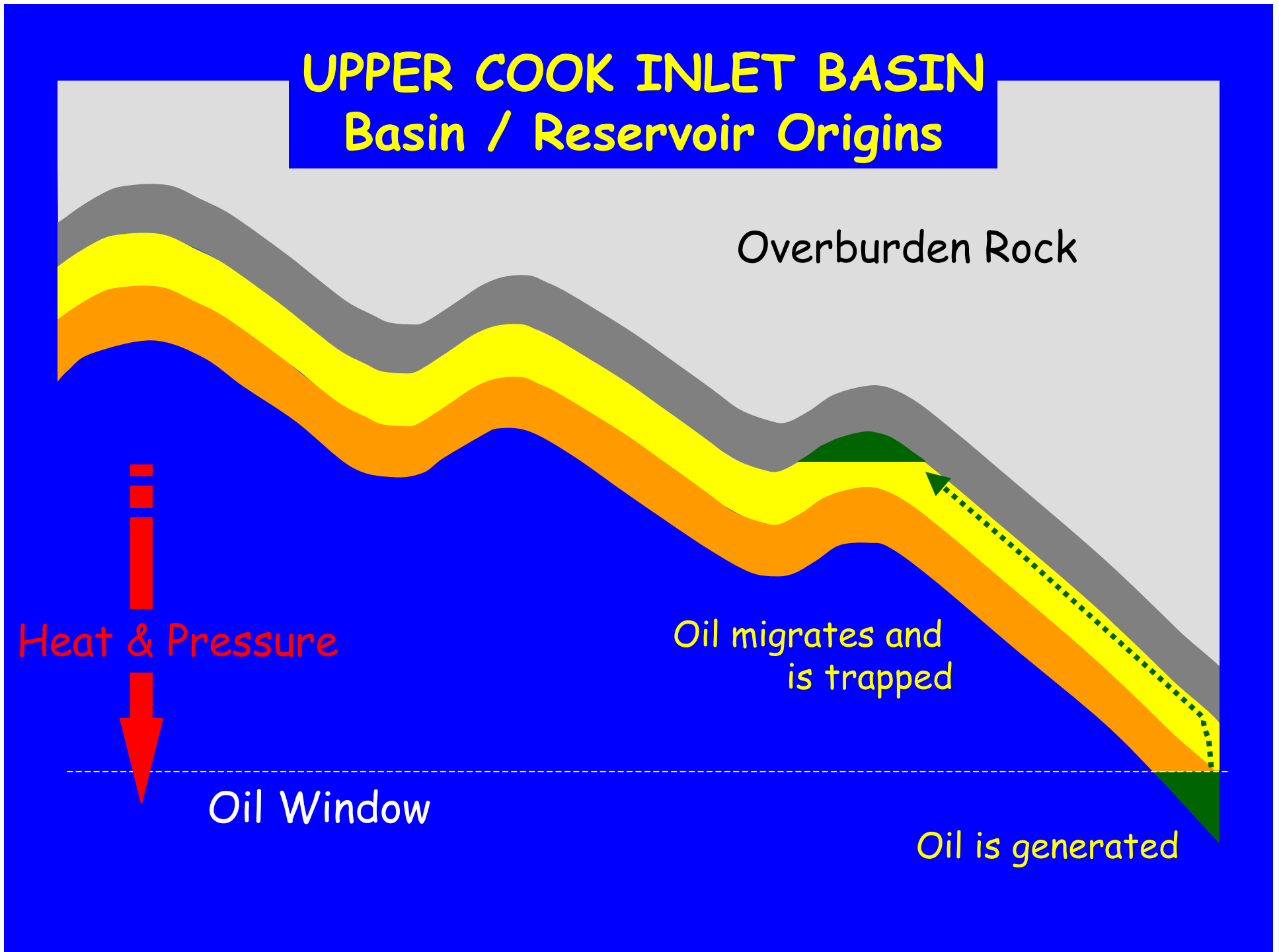


Oil Window

Oil migrates and  
is trapped

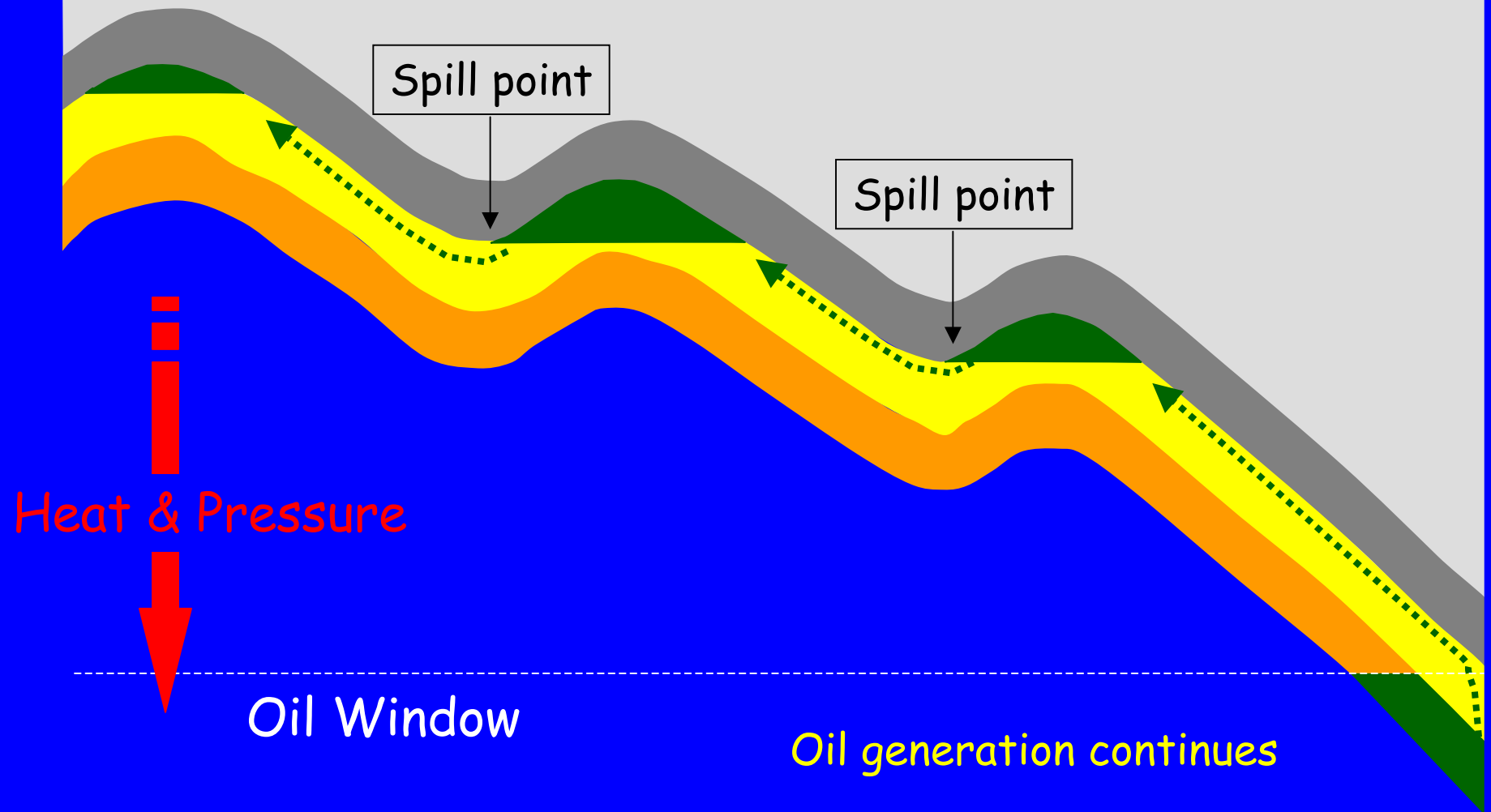


Oil is generated

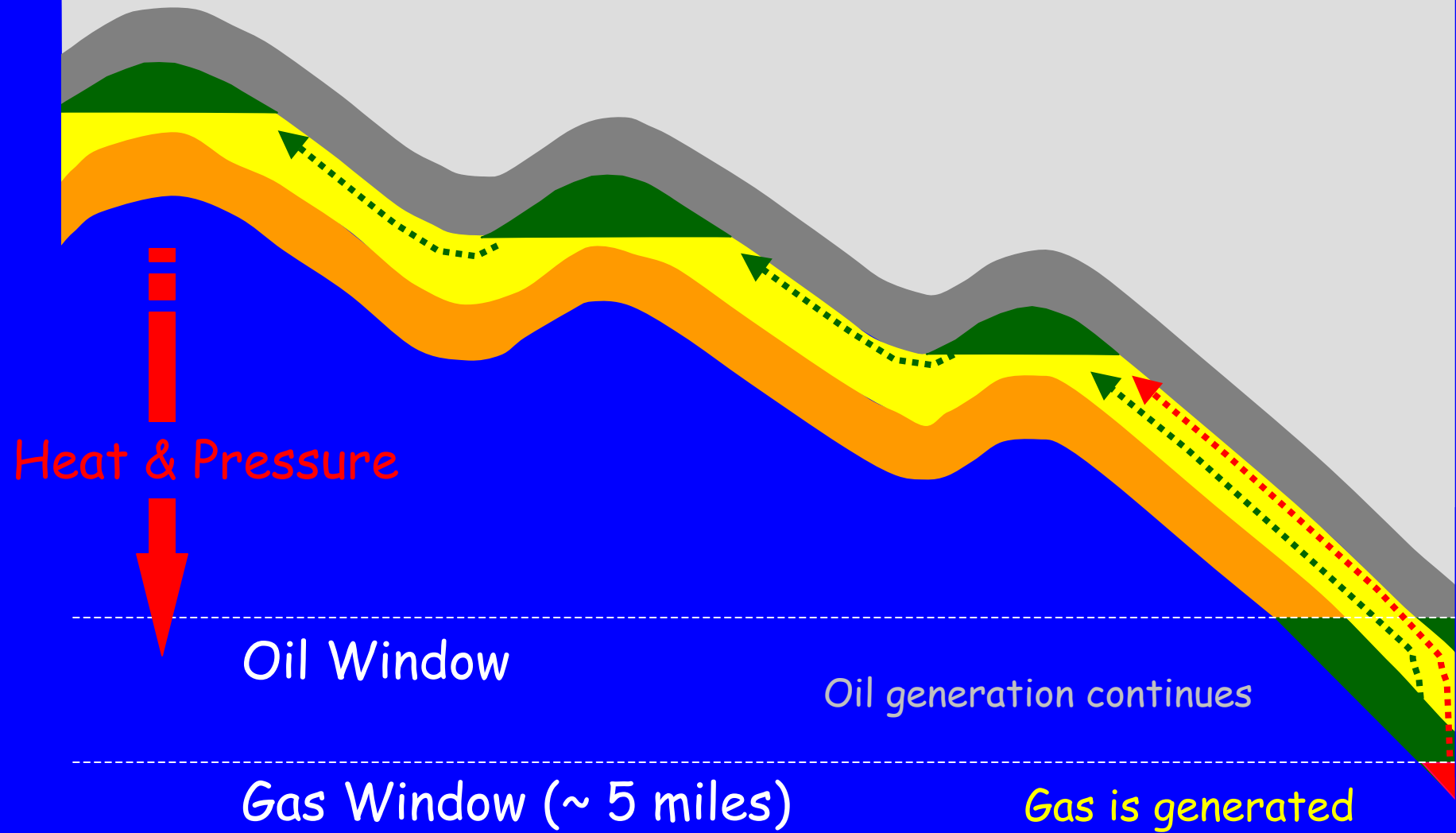




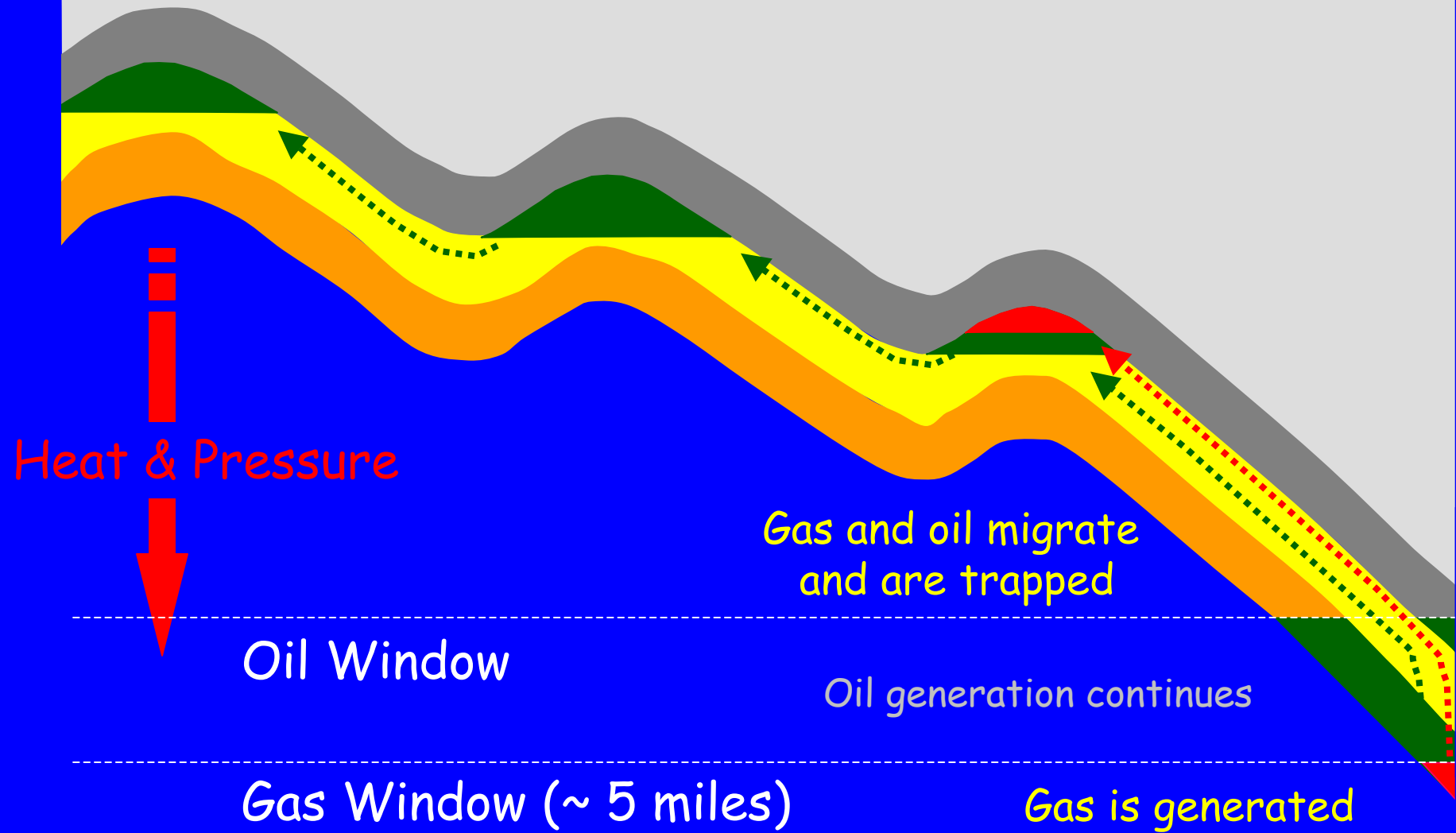
# UPPER COOK INLET BASIN Basin / Reservoir Origins



# UPPER COOK INLET BASIN Basin / Reservoir Origins



# UPPER COOK INLET BASIN Basin / Reservoir Origins





# U. Cook Inlet Basin Stratigraphic Column

## Tuxedni - Hemlock Petroleum System

Oil & Associated Gas

### Reservoirs

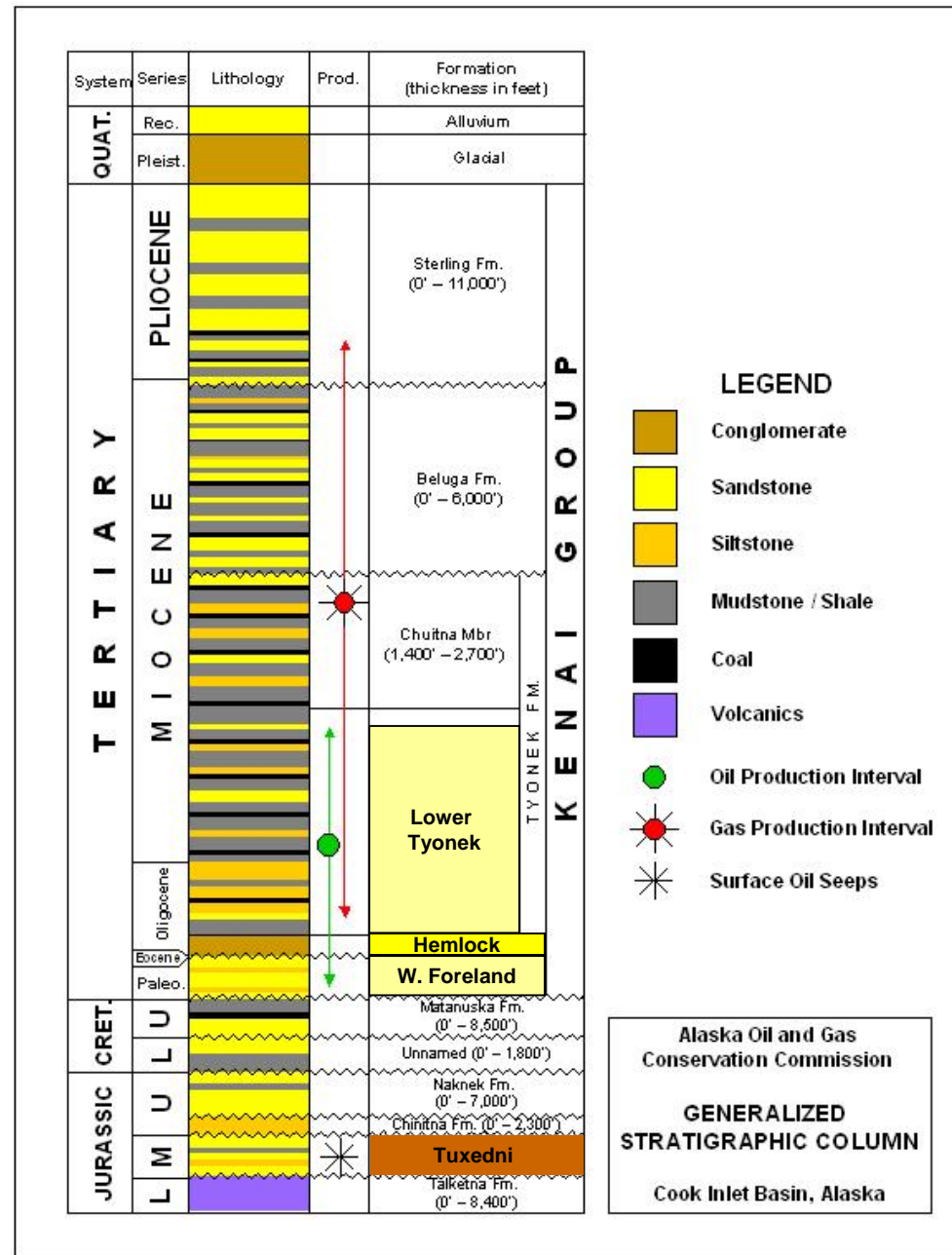
Lower Tyonek

Hemlock

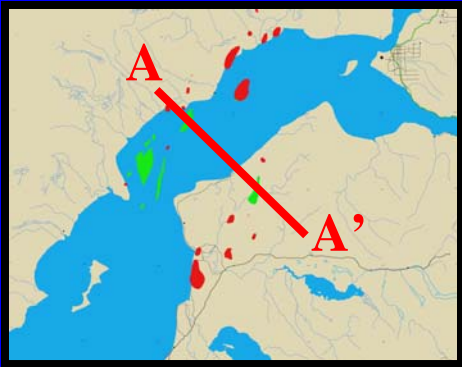
West Foreland

### Source Rock

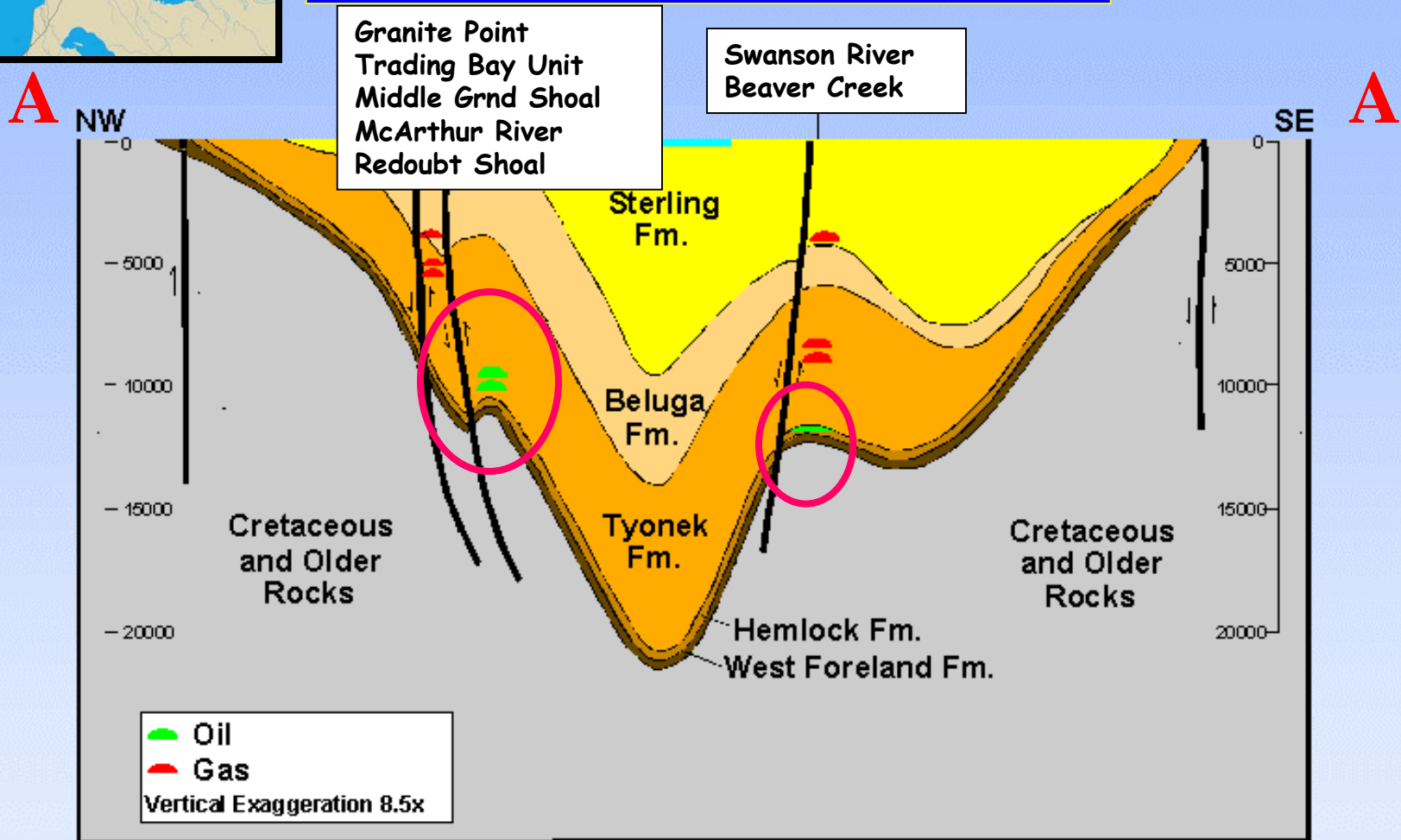
Tuxedni



Modified from Magoon, L.B., 1994



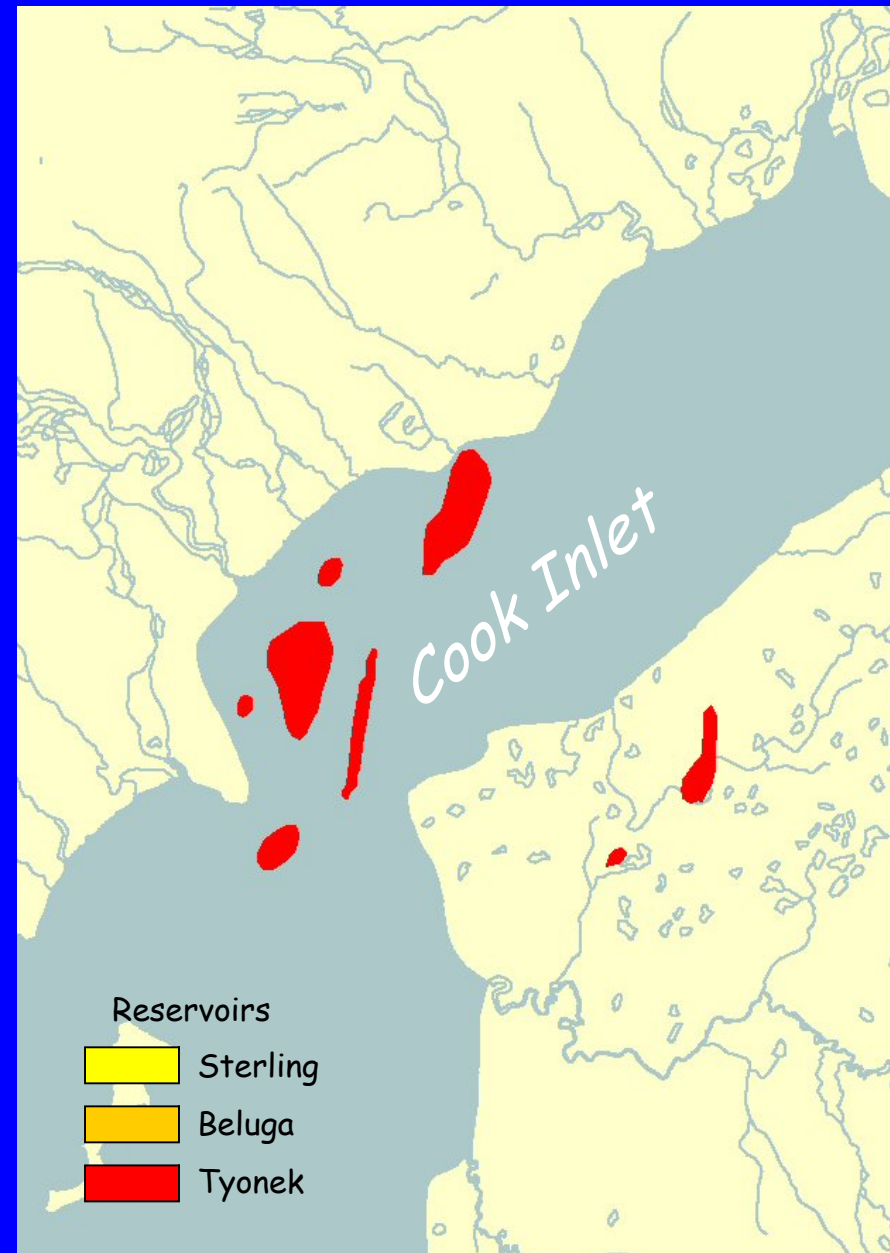
# U. COOK INLET BASIN Exploration History



mep 98

# Upper Cook Inlet Basin Field Distribution

## Tuxedni - Hemlock Petroleum System



Modified from Magoon, L.B., 1994  
Basemap from AK DNR, 2005



# UPPER COOK INLET BASIN

## Basin / Reservoir Origins

The Upper Cook Inlet Basin contains two Petroleum Systems:

### 1. Tuxedni - Hemlock

- Deeper, oil-bearing reservoirs
- Gas is associated with oil accumulations
- "Wet" gas - methane with heavier gases

### 2. Non-Associated Gas

- Shallow, gas only, not associated with oil
- "Dry" gas - almost entirely methane
- Biogenic origin

# U. Cook Inlet Basin Stratigraphic Column

## Non-Associated Petroleum System

### Biogenic Gas Reservoirs

#### L. Sterling Formation

Stacked fluvial channels: massive sandstone / conglomerate inter-bedded mudstones, siltstones and thin coals

#### Beluga Formation

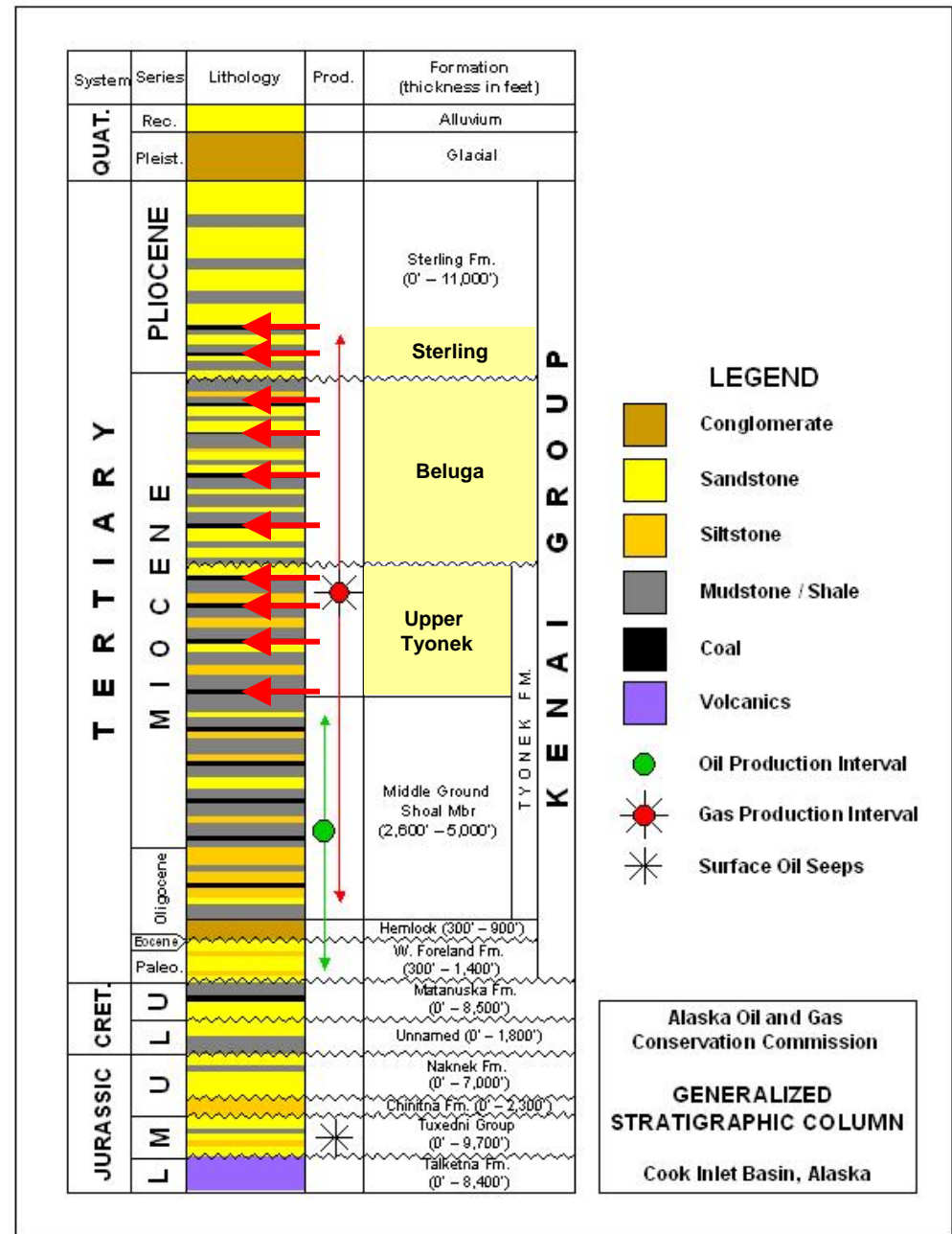
Siltstone with common fluvial sandstone, thin, discontinuous coals, and volcanic tuffs.

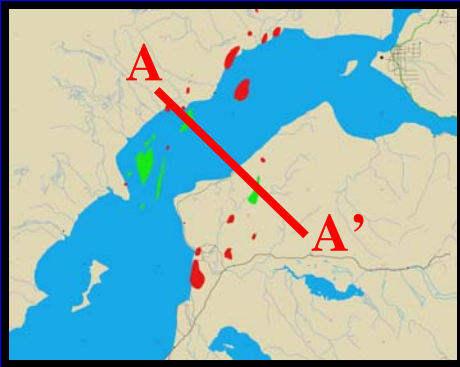
#### U. Tyonek Formation

Massively bedded sandstones with siltstone & thick, continuous coals

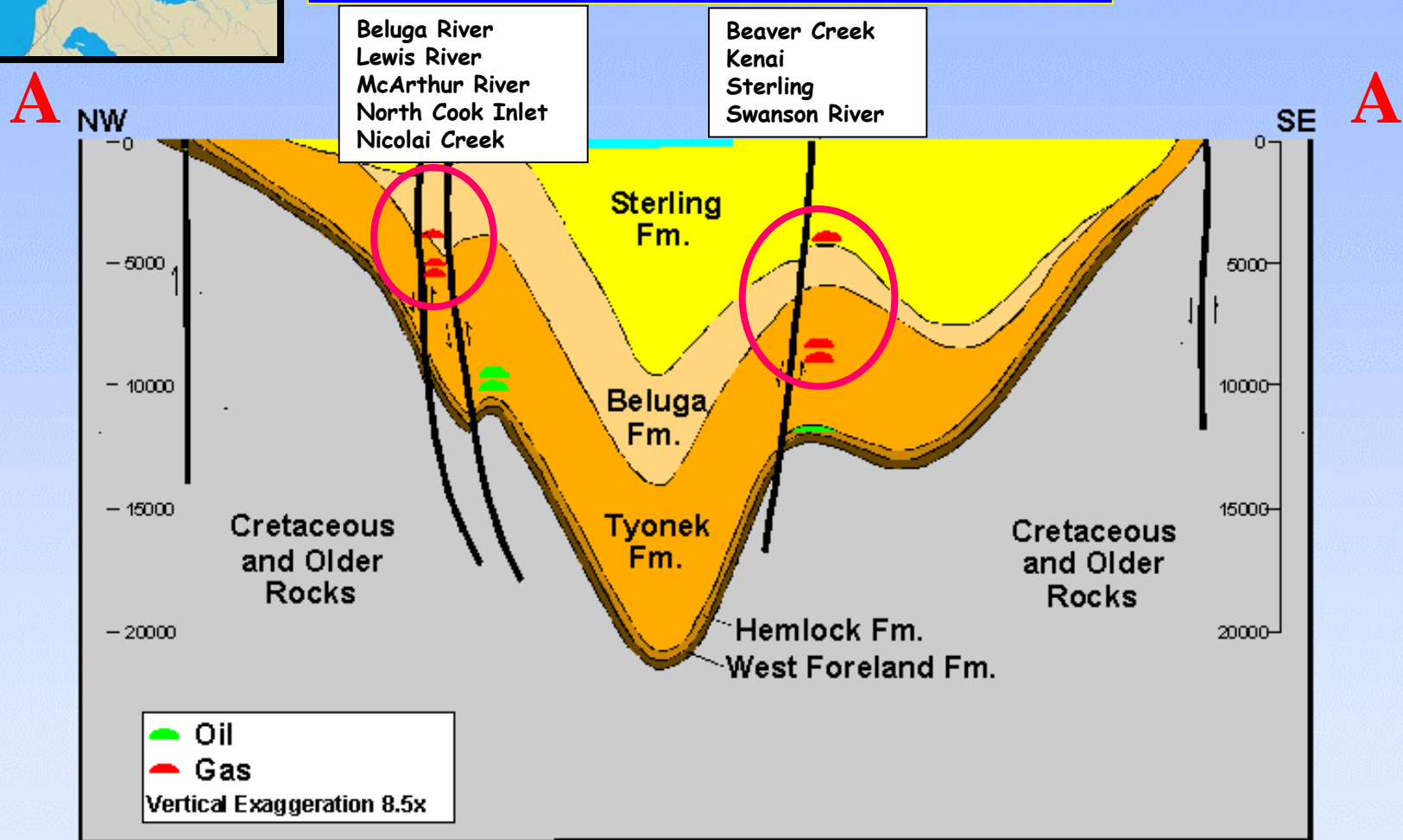
### Source Rock

Coal beds disbursed within the U. Tyonek, Beluga and L. Sterling





# U. COOK INLET BASIN Exploration History

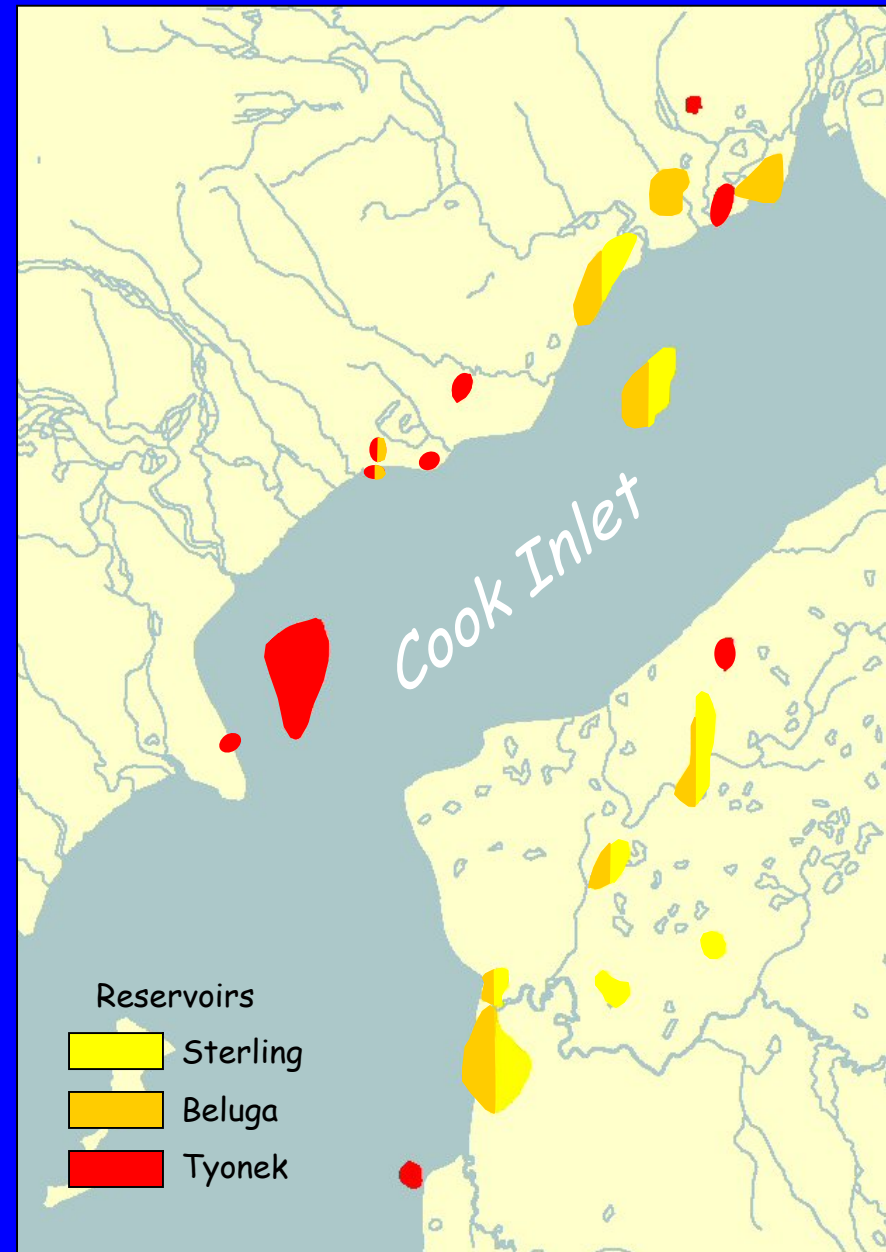


mep 98

# Upper Cook Inlet Basin Field Distribution

**Non-Associated  
Petroleum System**

**Dry Gas Field Distribution**



Modified from Magoon, L.B., 1994  
Basemap from AK DNR, 2005





# UPPER COOK INLET BASIN REVIEW

- Basin / Accumulation Origins
- Exploration History
- Future



● Anchorage

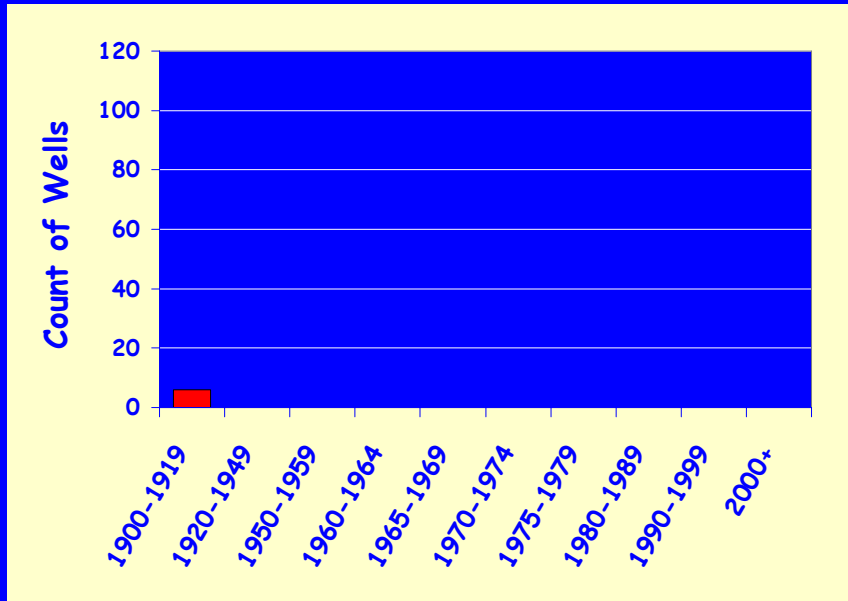
USGS

Modified from USGS National Map

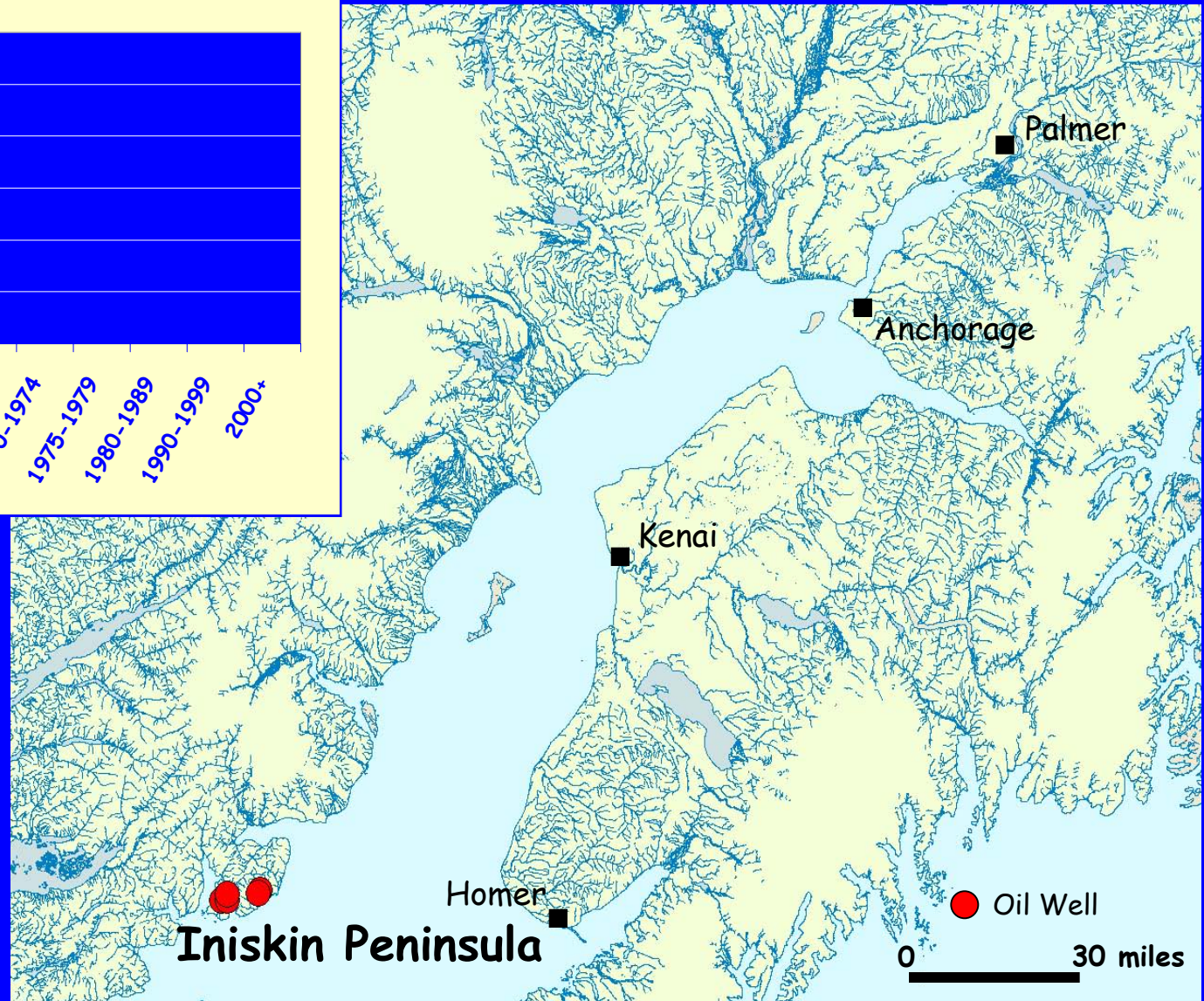


# UPPER COOK INLET BASIN

## 1900-1919 Earliest Exploration Wells

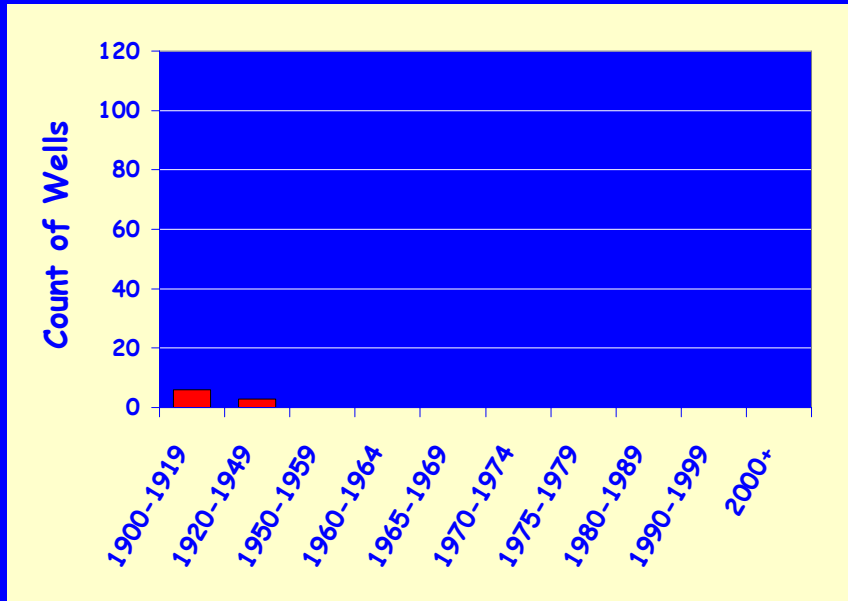


**Expl. Well Count**  
**6 Oil Wells**

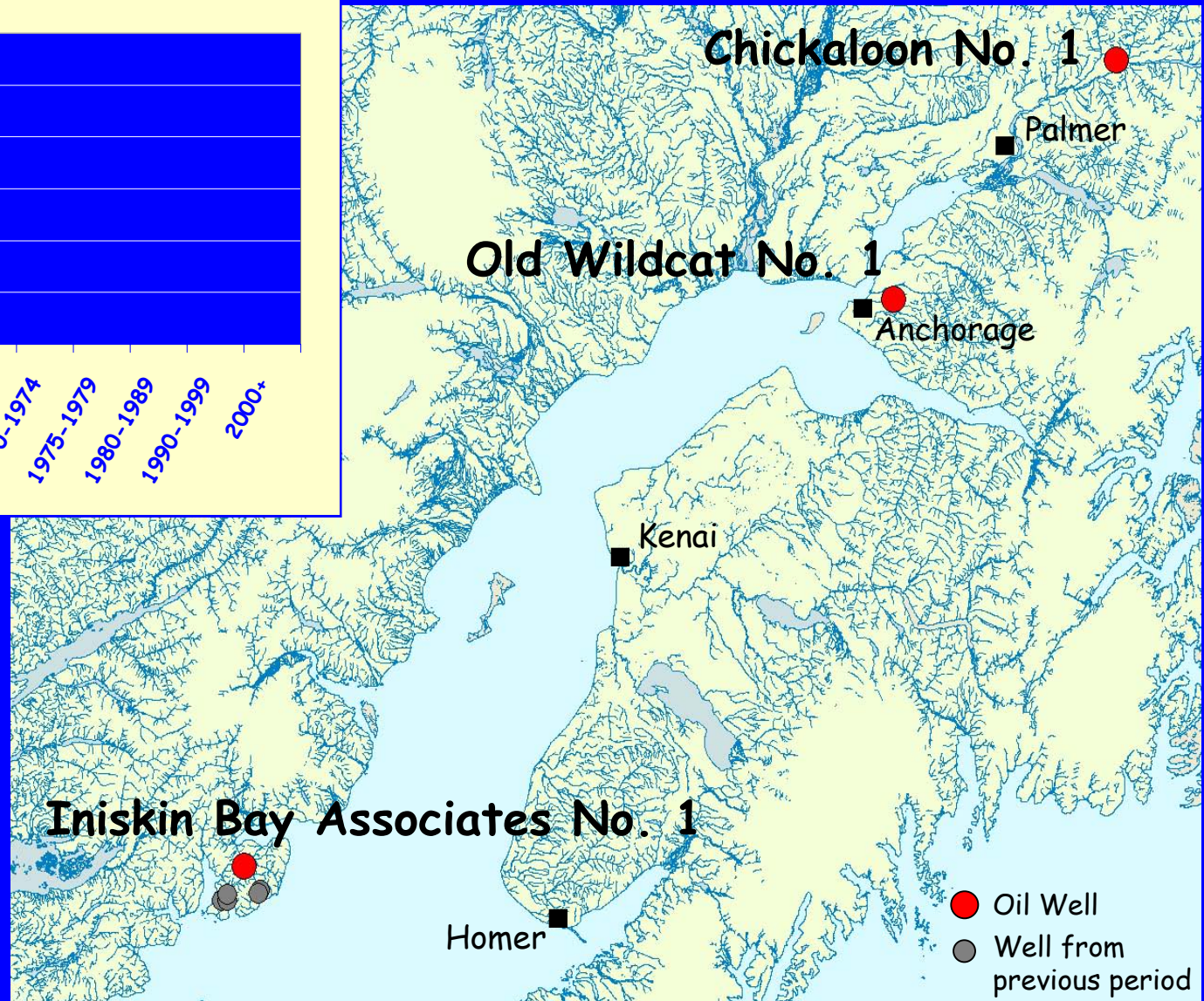




# UPPER COOK INLET BASIN 1920-1949 Sporadic Exploration



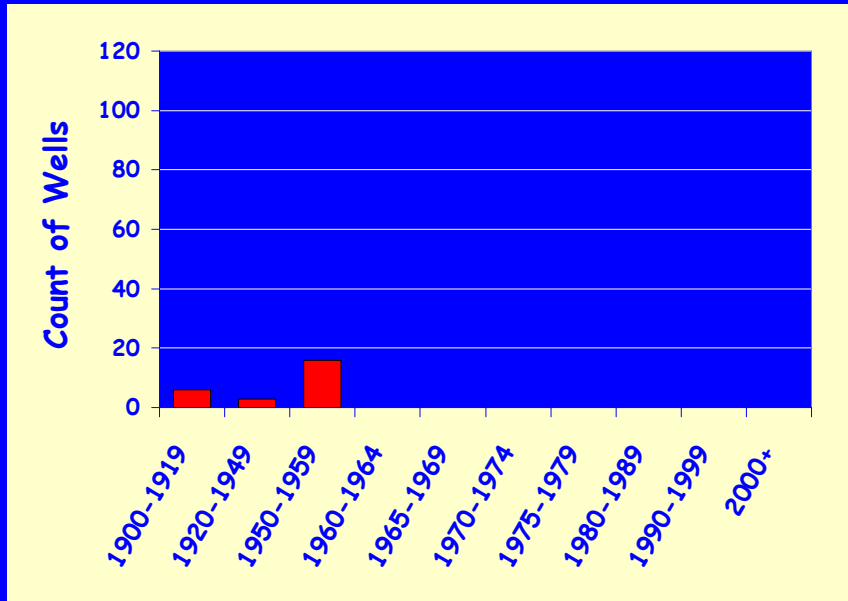
**Expl. Well Count**  
**3 Oil Wells**



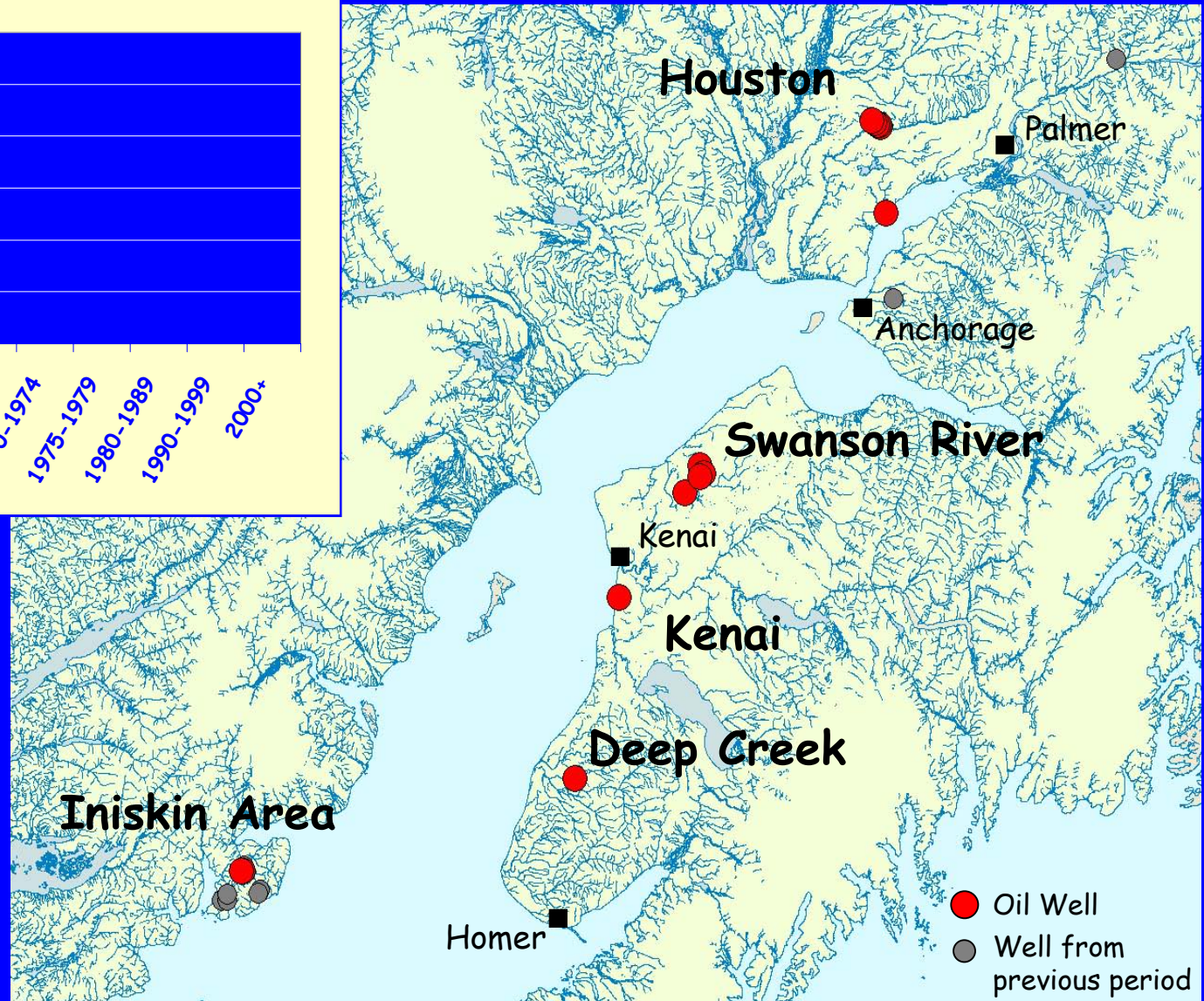


# UPPER COOK INLET BASIN

## 1950-1959 Increased Exploration



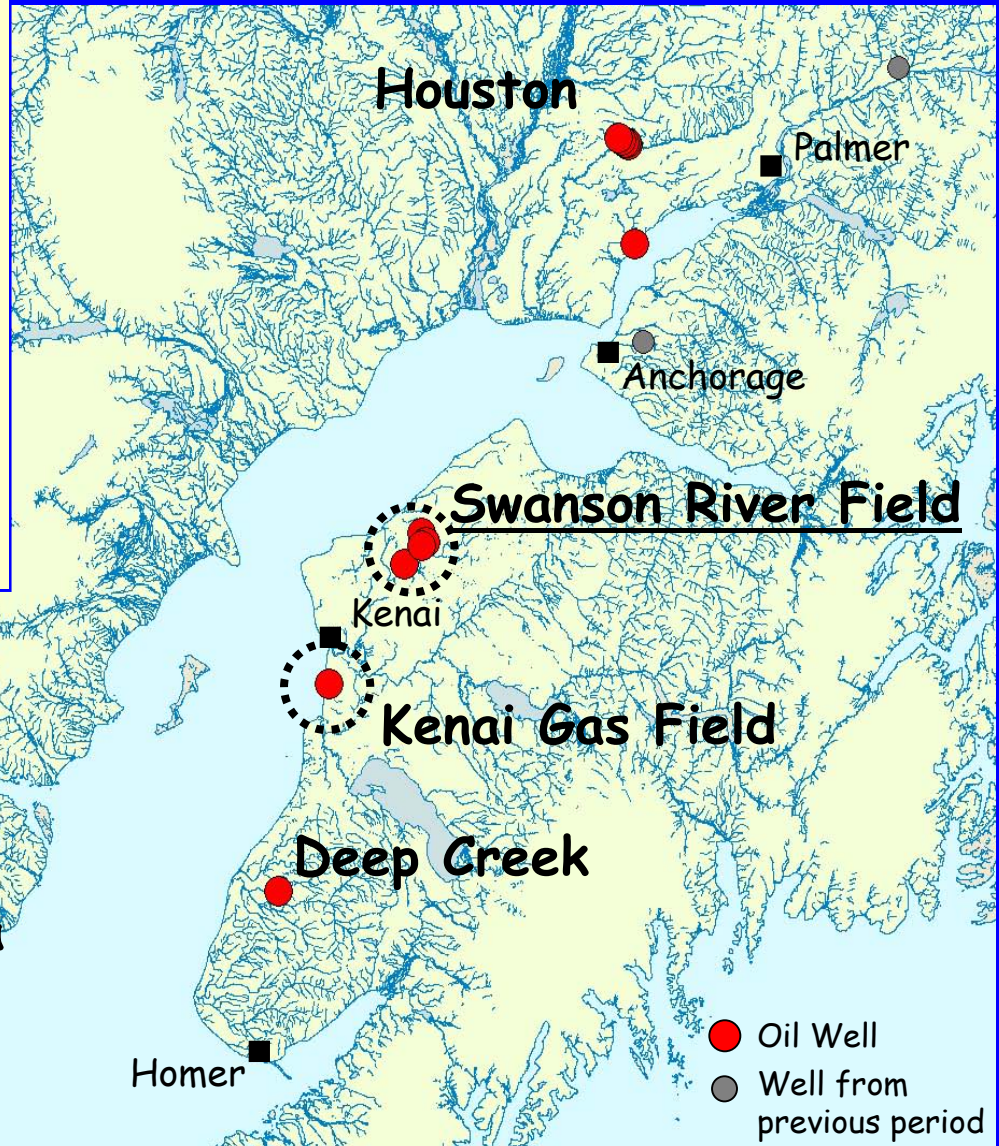
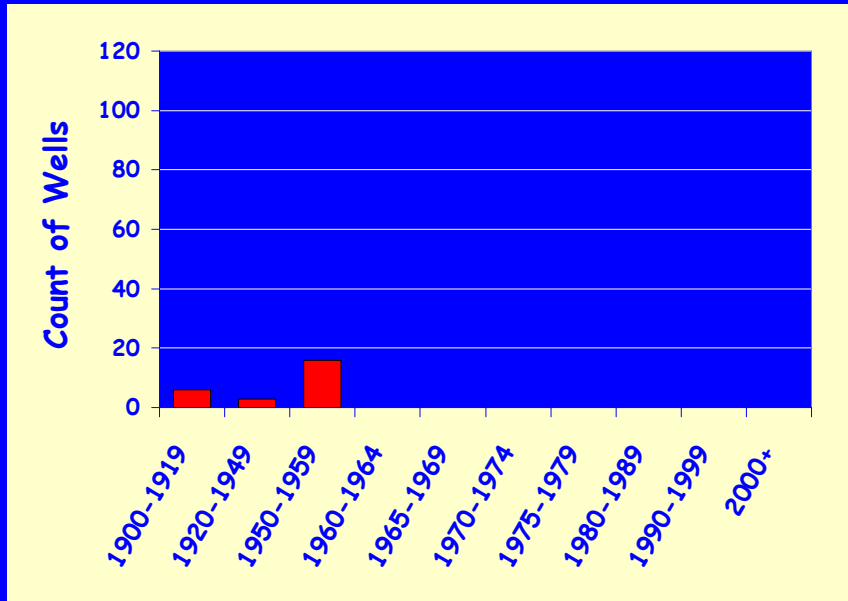
**Expl. Well Count**  
**16 Oil Wells**





# UPPER COOK INLET BASIN

## 1950-1959 Renewed Interest



**Expl. Well Count**  
**16 Oil Wells**

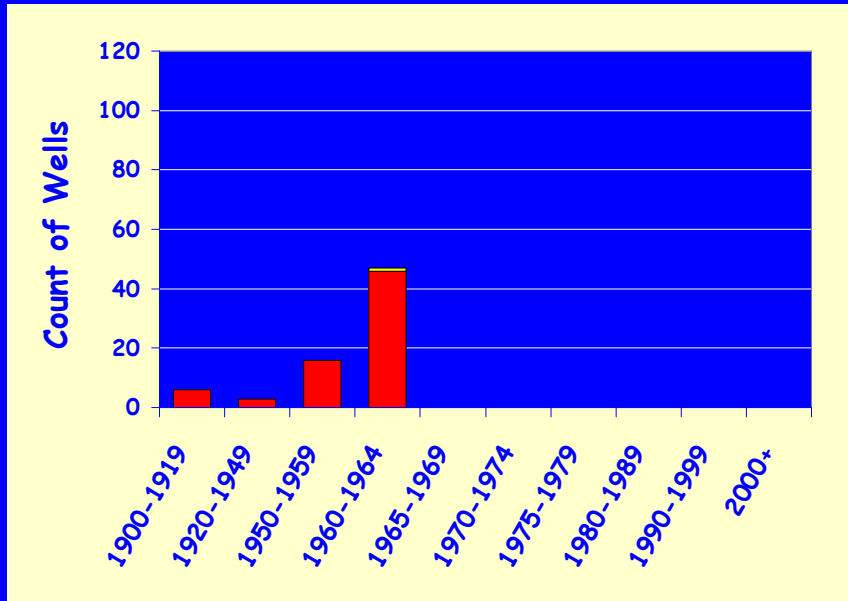
### Results

**1 Oil Field**  
**1 Gas Field**

**230 Million Bbls Oil**  
**2700 Billion CF Gas**

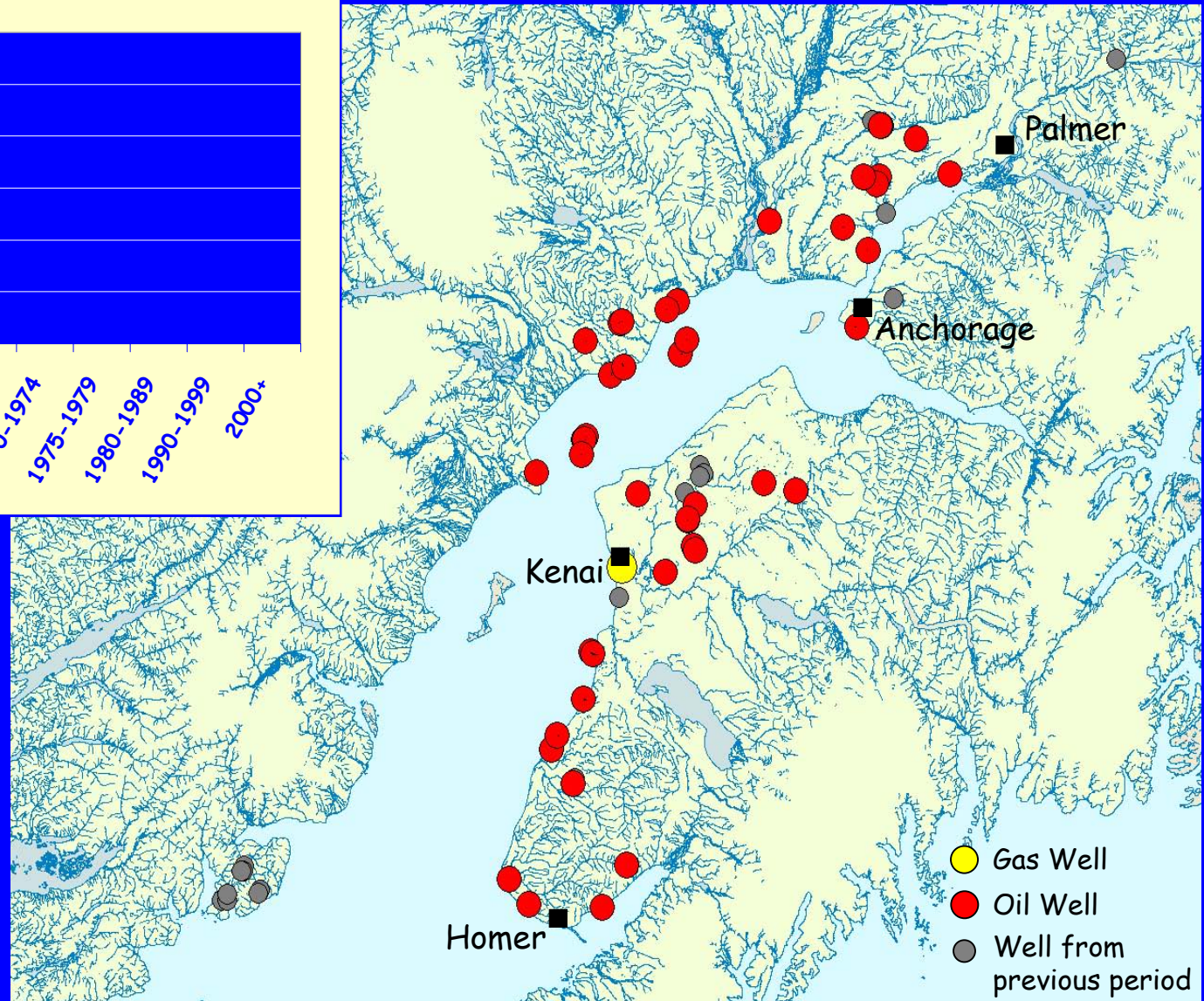


# UPPER COOK INLET BASIN 1960-1964 The Boom Begins



## Expl. Well Count

46 Oil Wells  
1 Gas Well





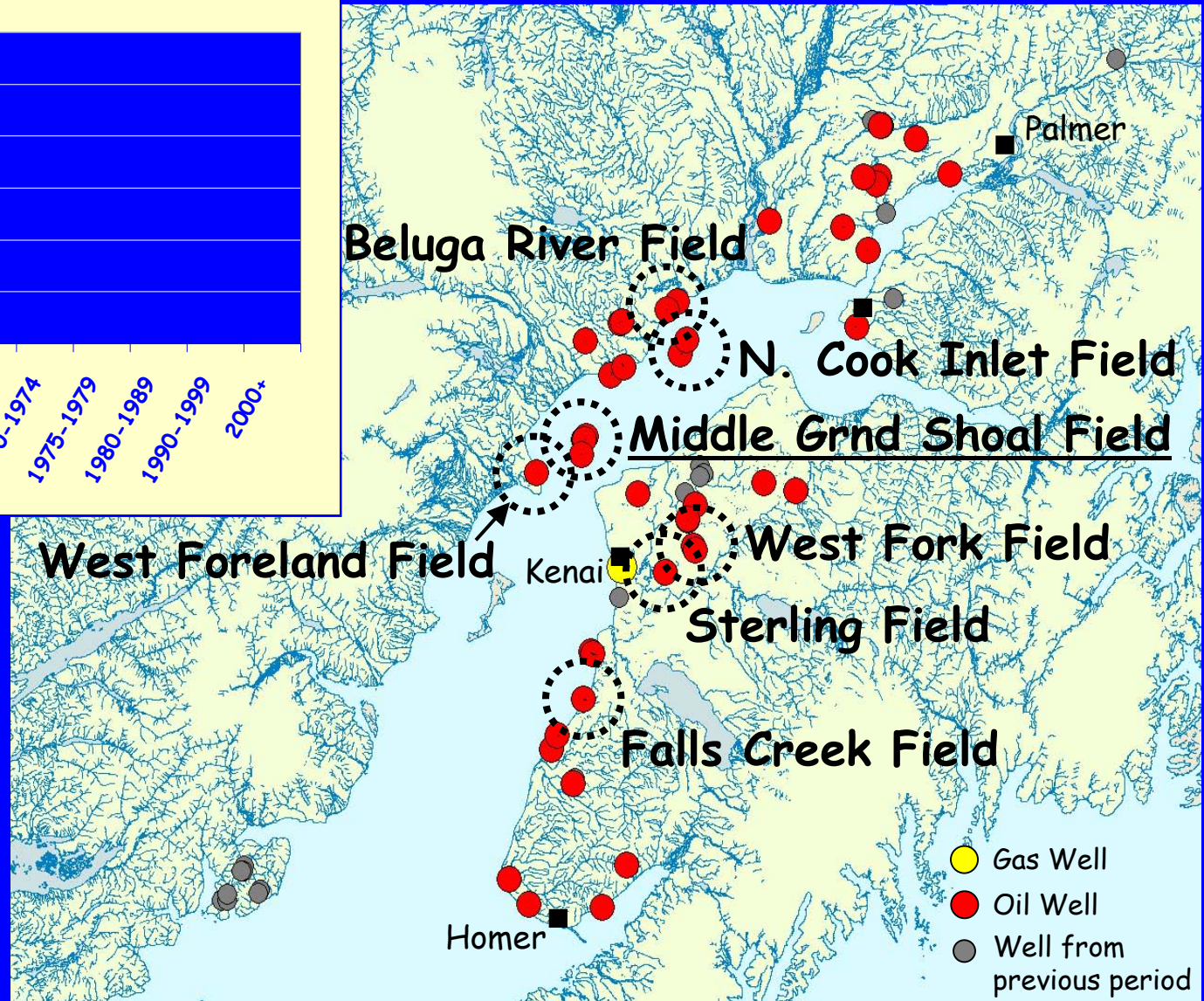
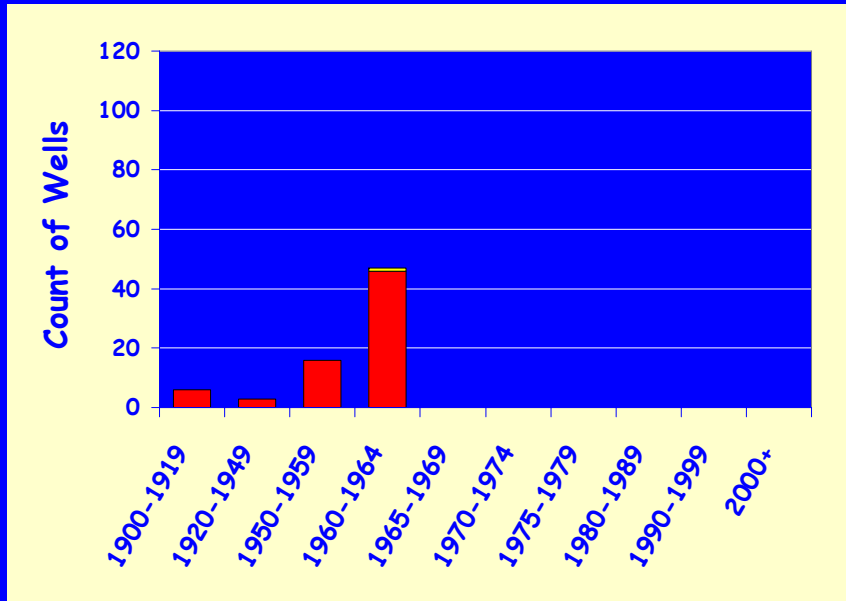
# PAN AMERICAN MGS ST 17595 No. 1

Middle Ground Shoal - 1962





# UPPER COOK INLET BASIN 1960-1964 The Boom Begins



## Expl. Well Count

46 Oil Wells  
1 Gas Well

## Results

1 Oil Field  
6 Gas Fields

210 Million Bbls Oil  
3700 Billion CF Gas



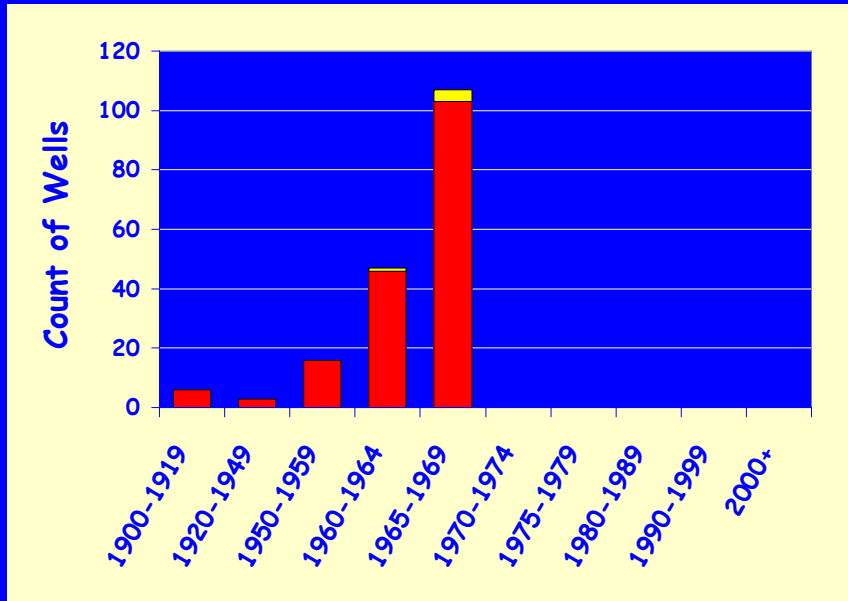
# Shell Platform A

Middle Ground Shoal Field - 1964

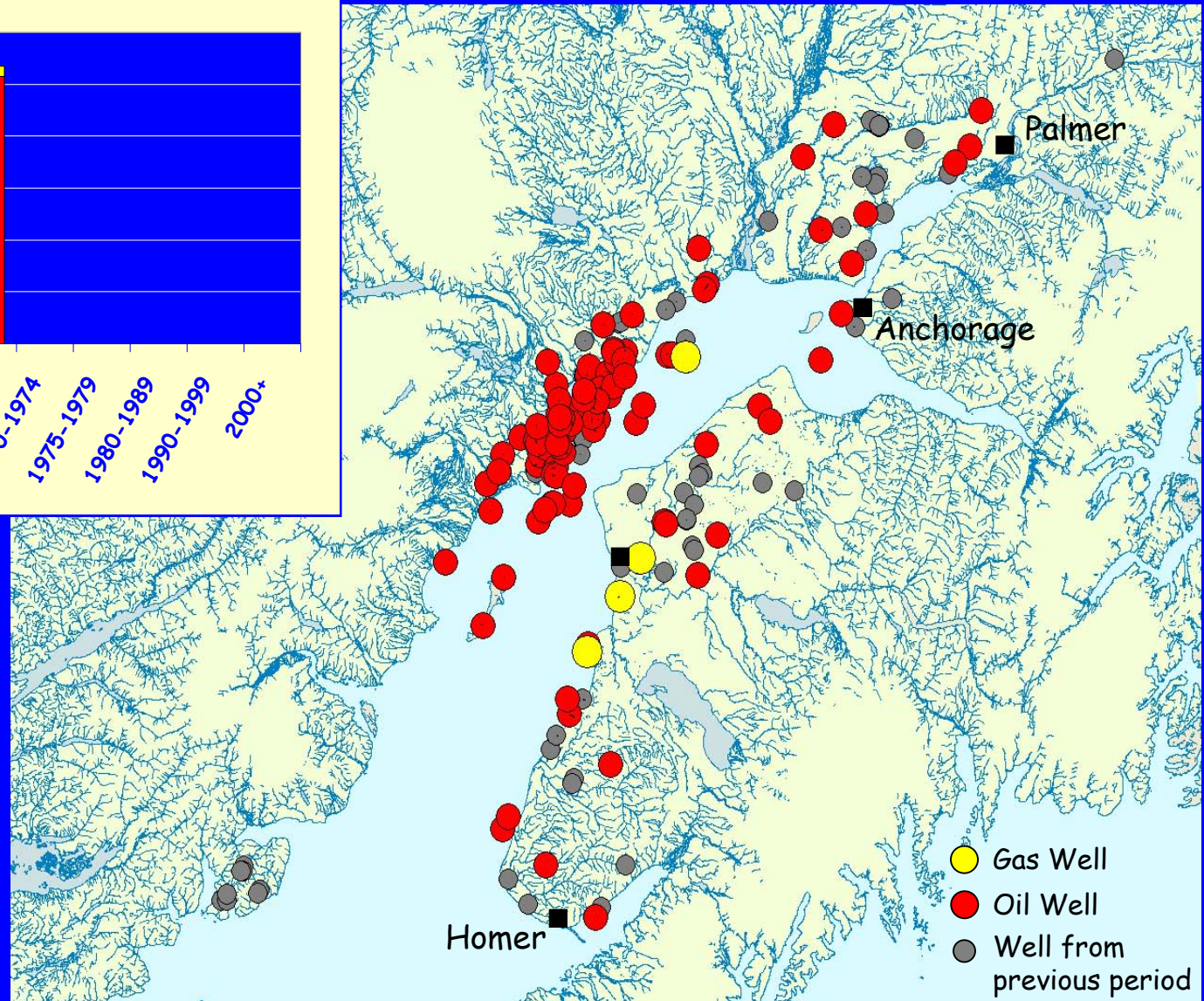


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# UPPER COOK INLET BASIN 1965-1969 Greatest Activity and Success



**Expl. Well Count**  
**103 Oil Wells**  
**4 Gas Wells**







## Polar Cub Jackup

Tyonek St. 18742 No. 1

Granite Point Field Area

July 1965

# ARCO King Salmon

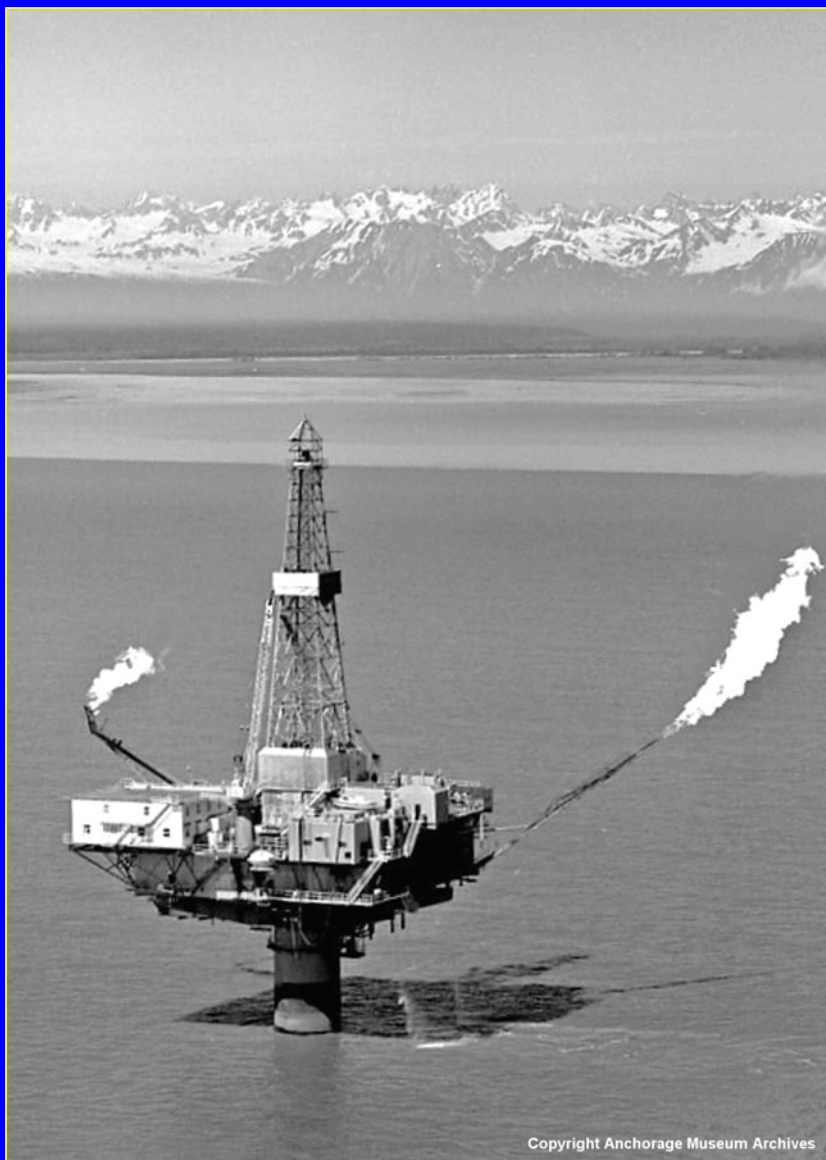
McArthur River Field - 1967





# Unocal Monopod

Trading Bay Field - 1966



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# Cook Inlet Platforms

1968

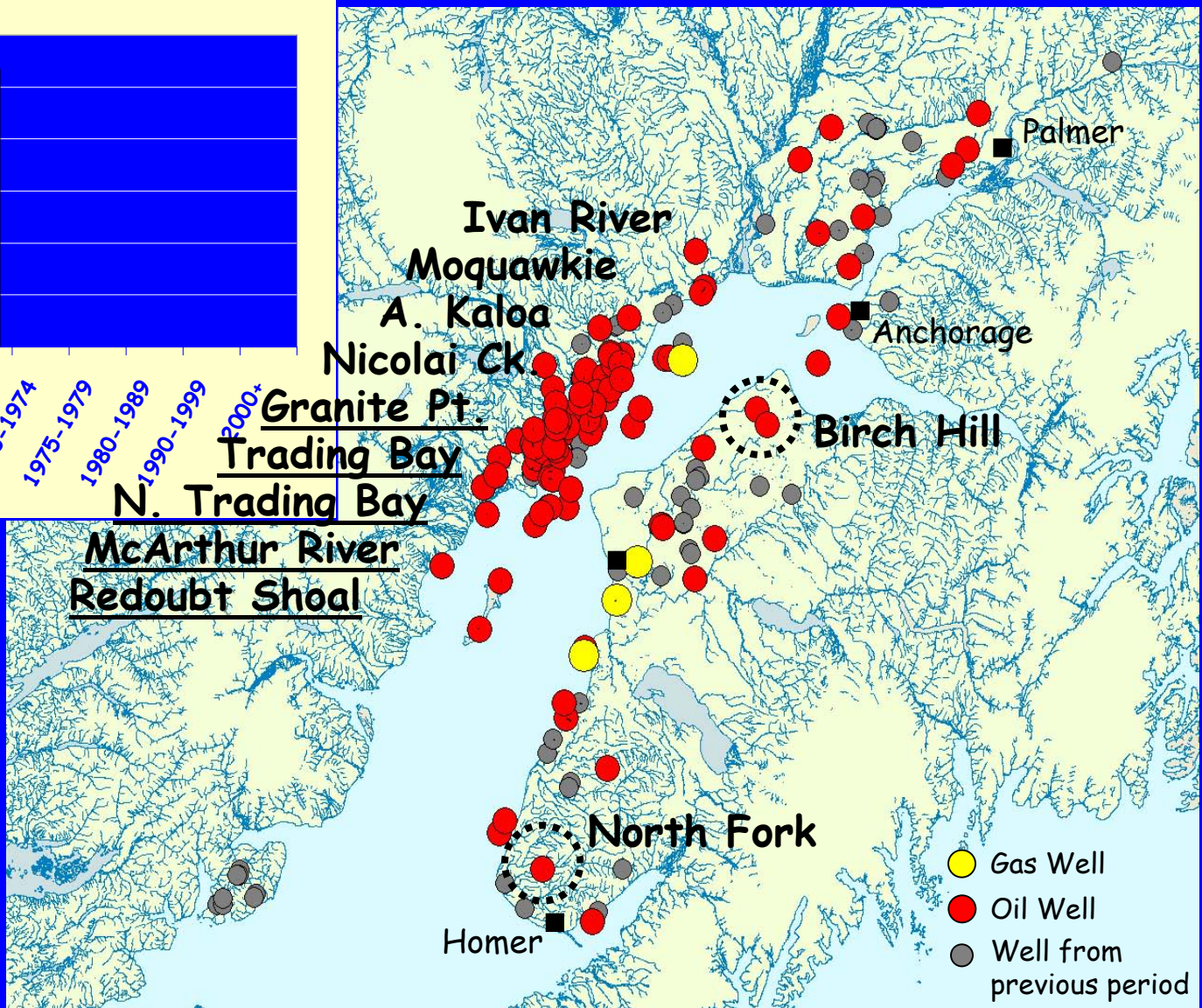
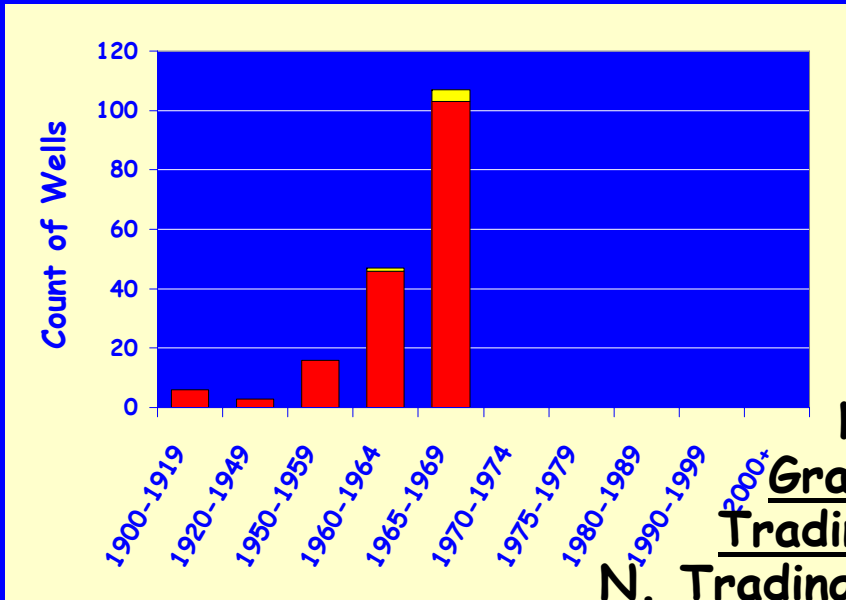


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# UPPER COOK INLET BASIN

## 1965-1969 Greatest Activity and Success



### Expl. Well Count

103 Oil Wells  
4 Gas Wells

### Results

5 Oil Fields  
6 Gas Fields

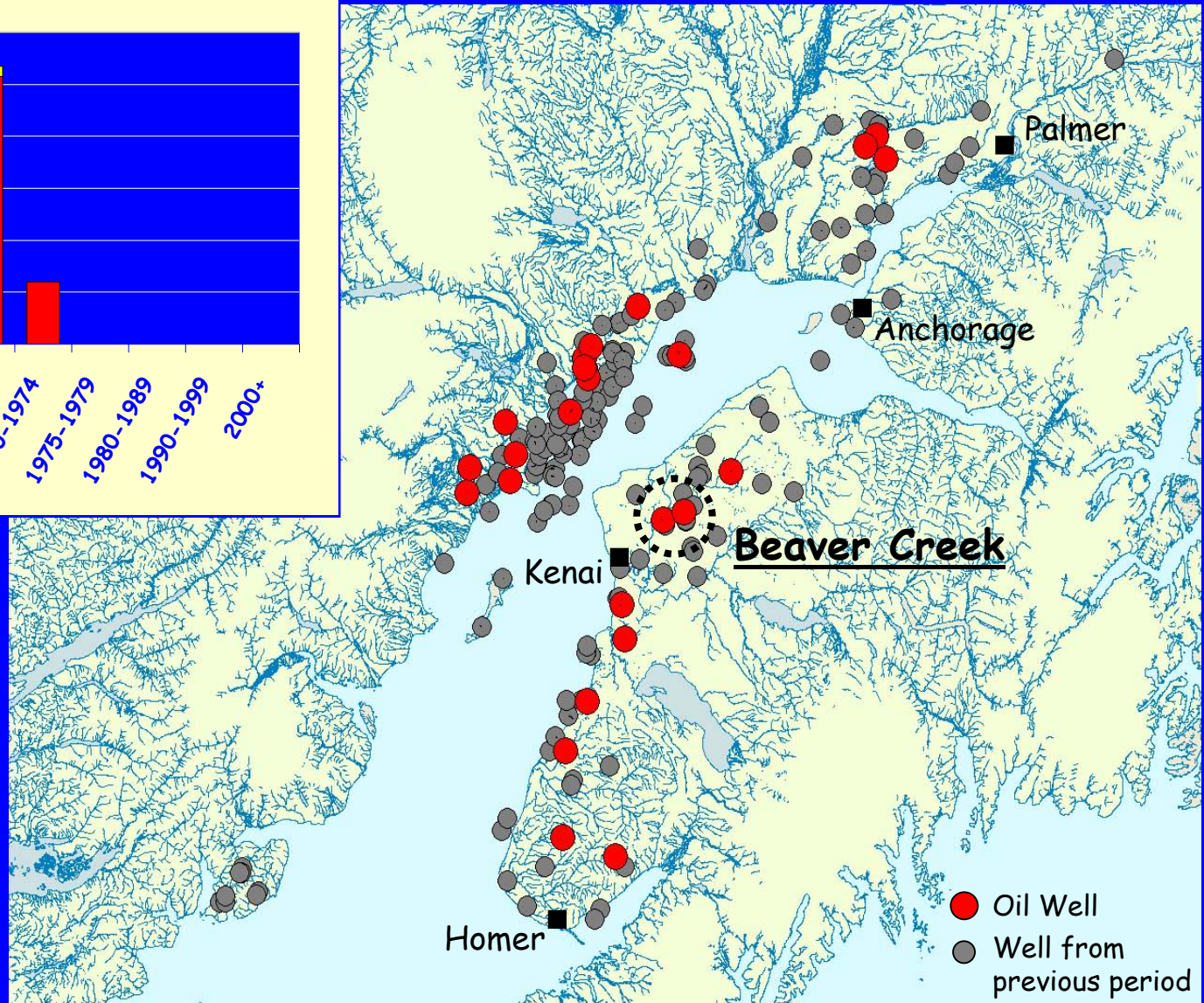
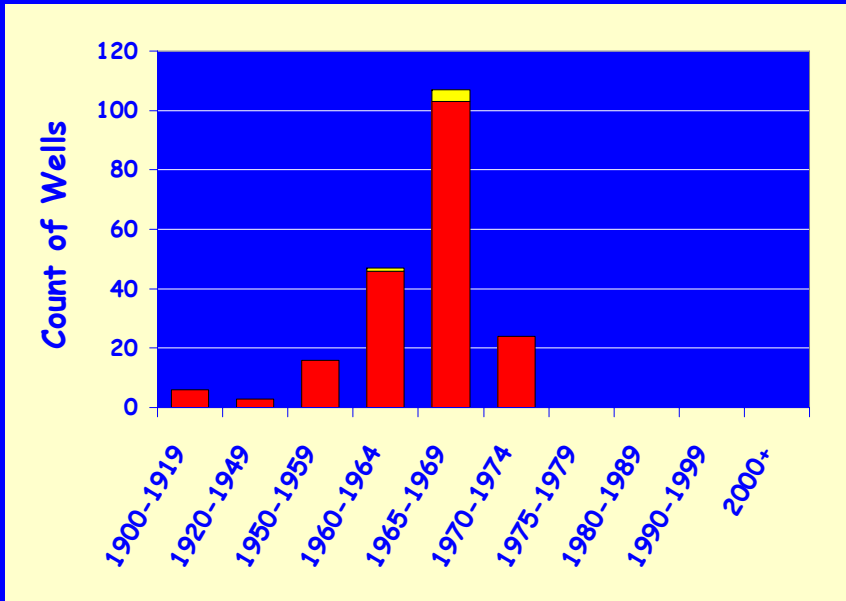
920 Million Bbls Oil  
1700 Billion CF Gas

● Gas Well  
● Oil Well  
● Well from previous period



# UPPER COOK INLET BASIN

## 1970-1974 Interest Shifts to North Slope



**Expl. Well Count**  
**24 Oil Wells**

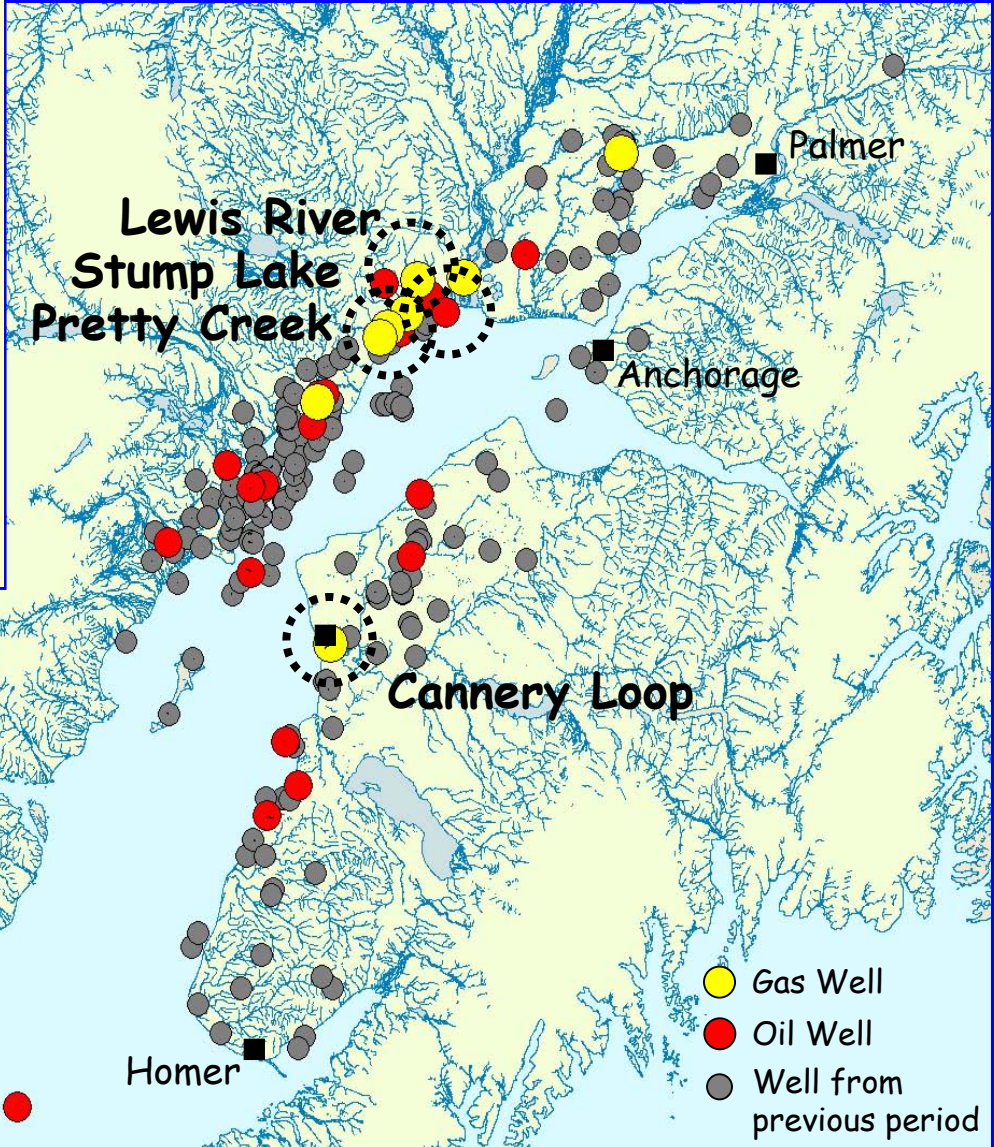
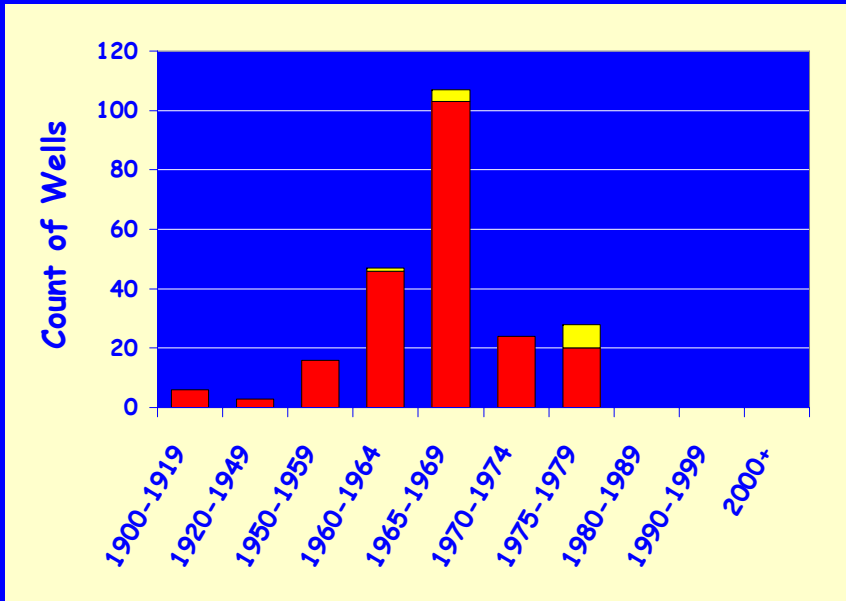
**Results**  
**1 Oil Field**

**7 Million Bbls Oil**  
**220 Billion CF Gas**



# UPPER COOK INLET BASIN

## 1975-1979 Activity Level Remains Flat



**Expl. Well Count**

20 Oil Wells  
8 Gas Wells

**Results**

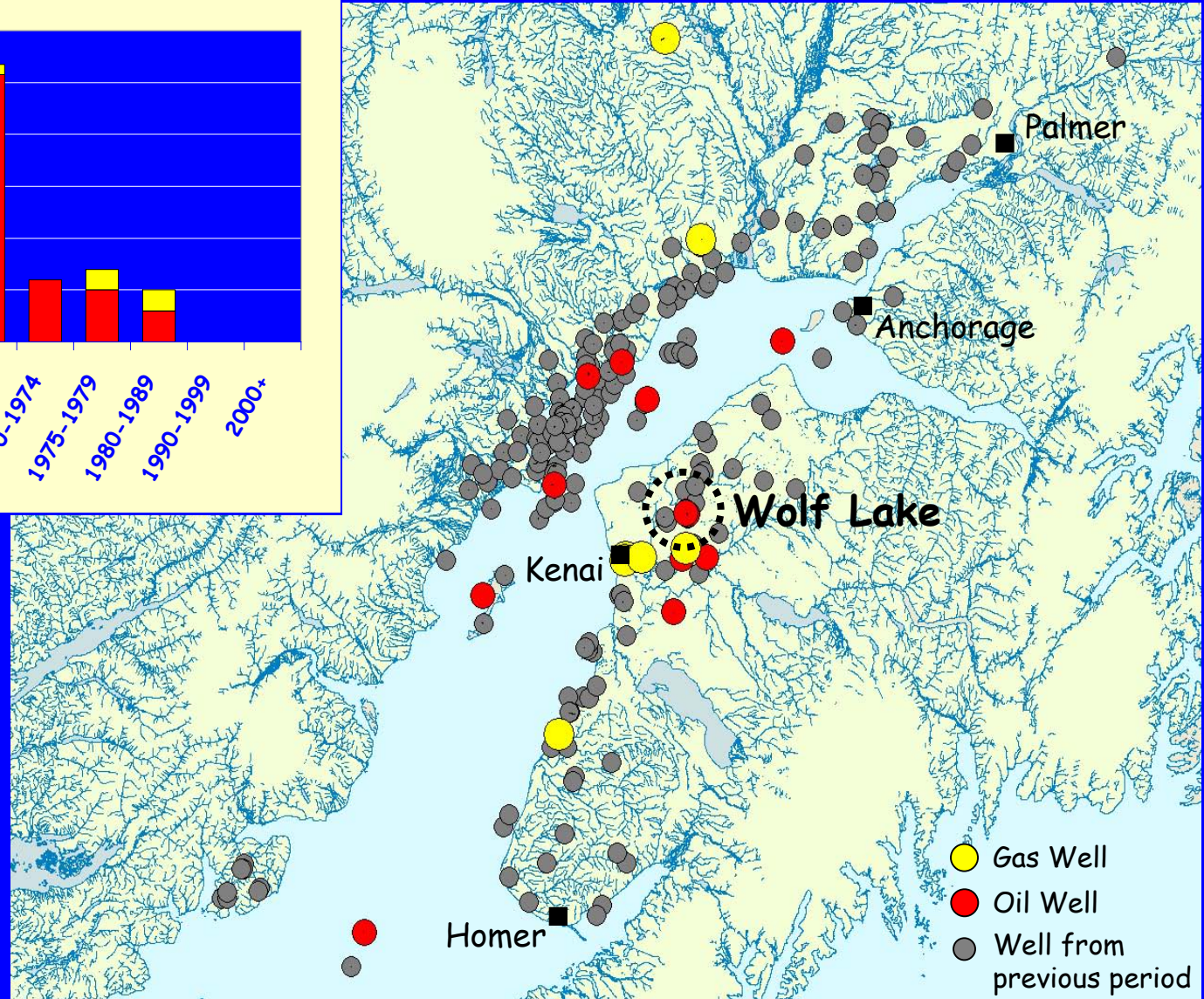
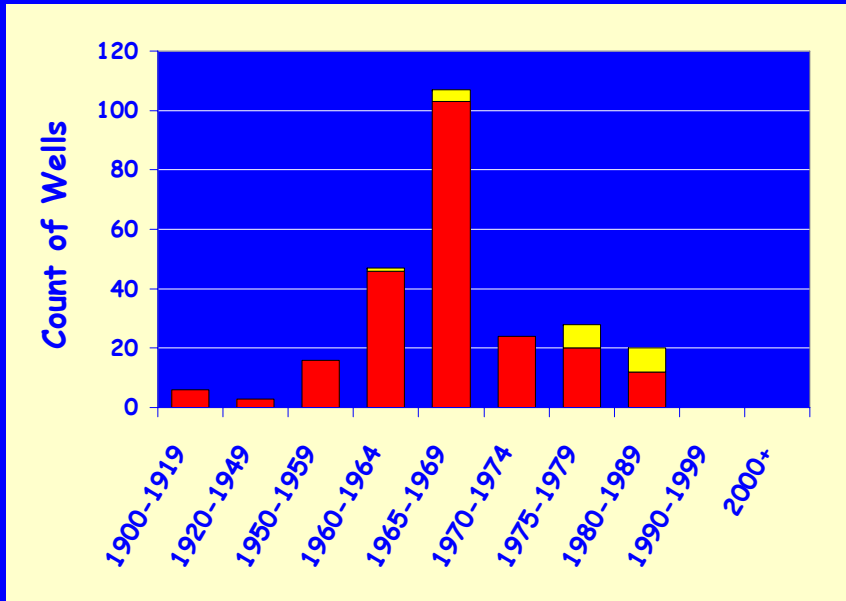
4 Gas Fields

230 Billion CF Gas



# UPPER COOK INLET BASIN

## 1980-1989 The Drilling Boom is Elsewhere



### Expl. Well Count

12 Oil Wells  
8 Gas Wells

### Results

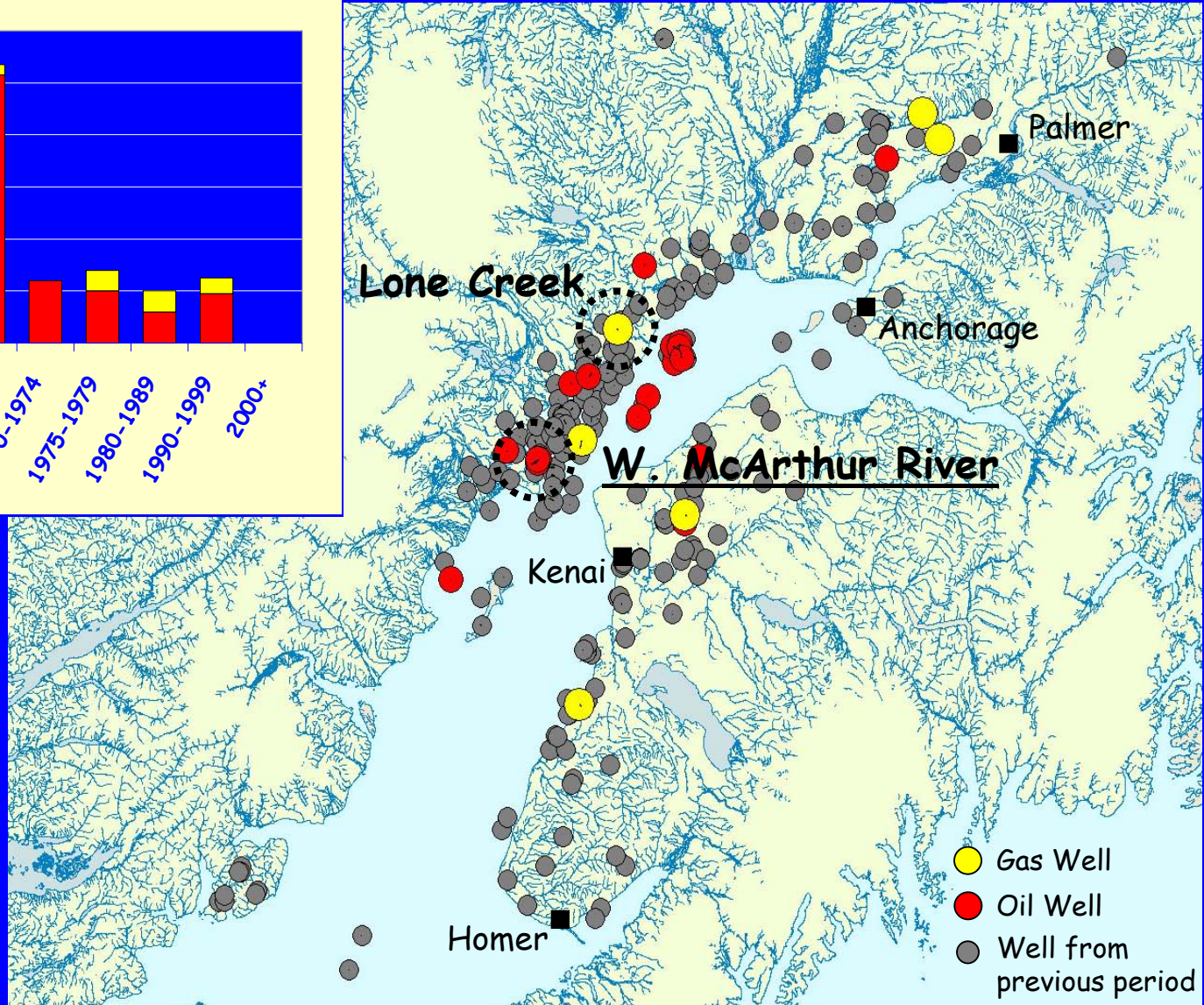
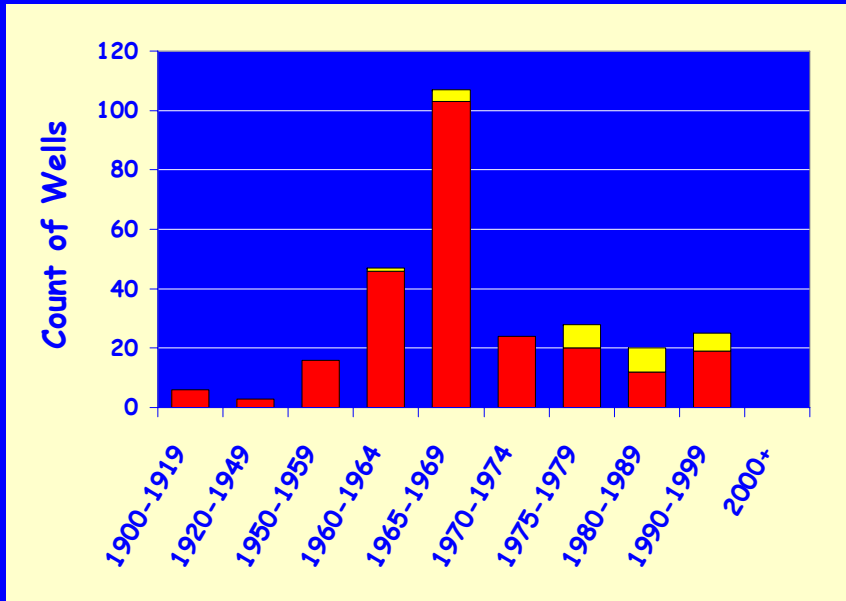
1 Gas Field

1 Billion CF Gas



# UPPER COOK INLET BASIN

## 1990-1999 Slightly Increased Activity



### Expl. Well Count

19 Oil Wells  
6 Gas Wells

### Results

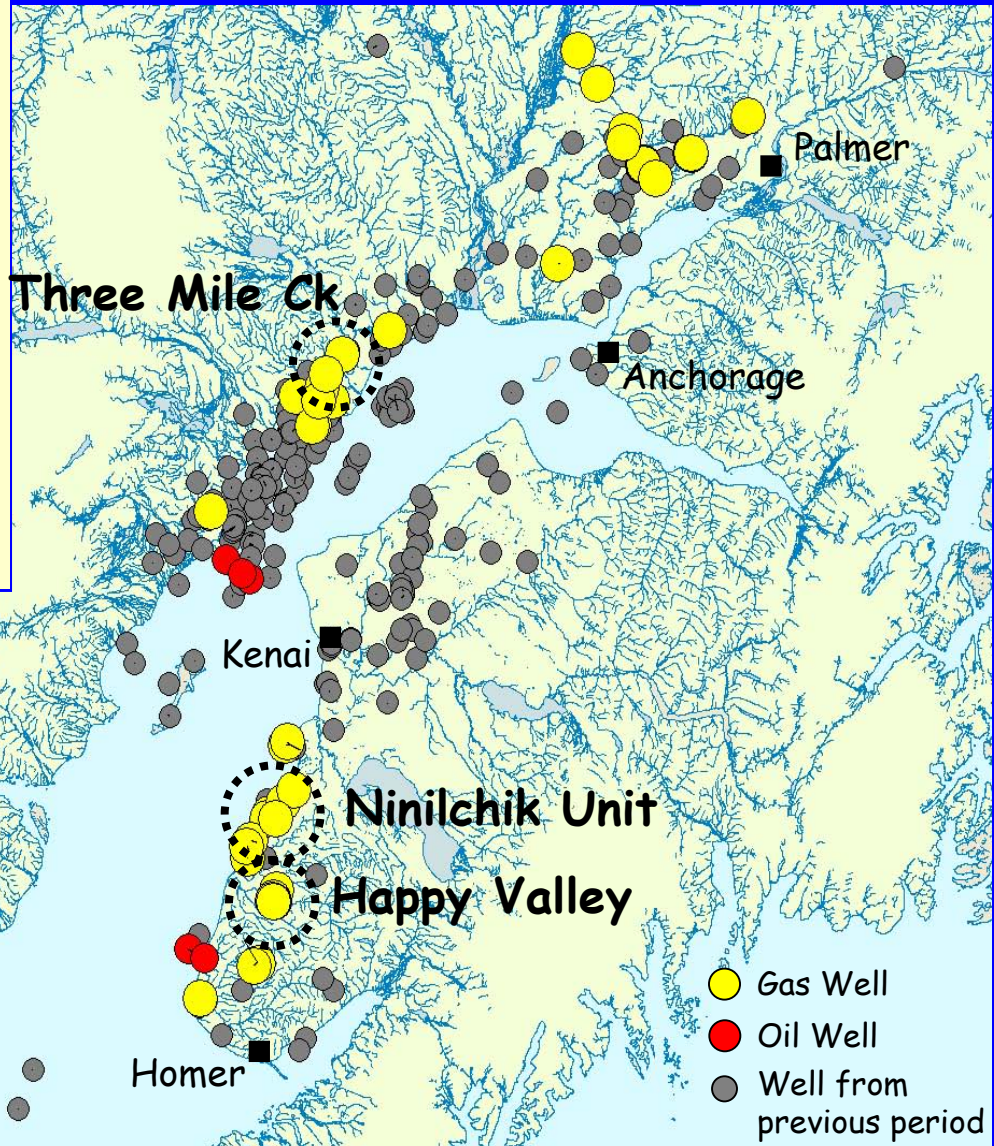
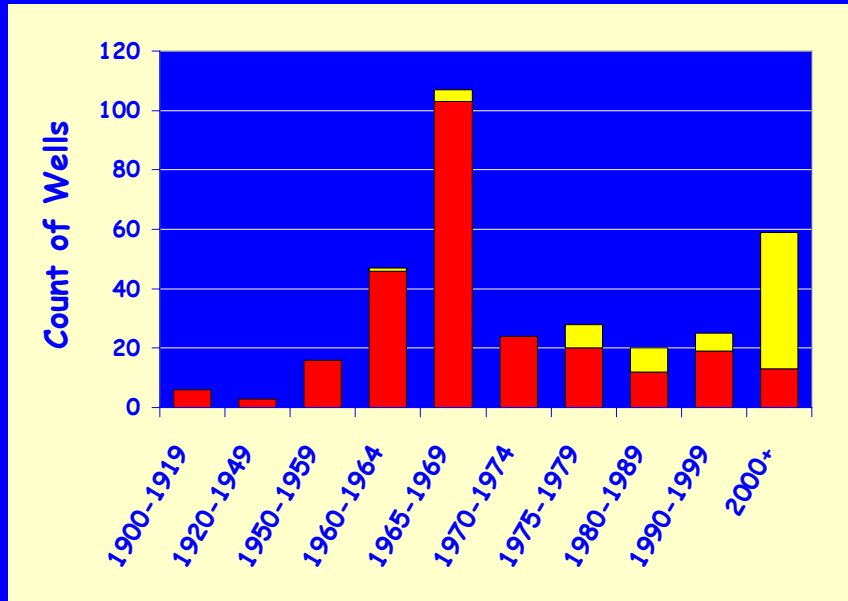
1 Oil Field  
1 Gas Field

14 Million Bbls Oil  
14 Billion CF Gas



# UPPER COOK INLET BASIN

## 2000+ Renewed Interest in the Cook Inlet



### Expl. Well Count

13 Oil Wells  
46 Gas Wells

### Results

3 Gas Fields

170+/- (?) BCF Gas



# UPPER COOK INLET BASIN

## Exploration Wells 1900-2006

### Expl. Well Count

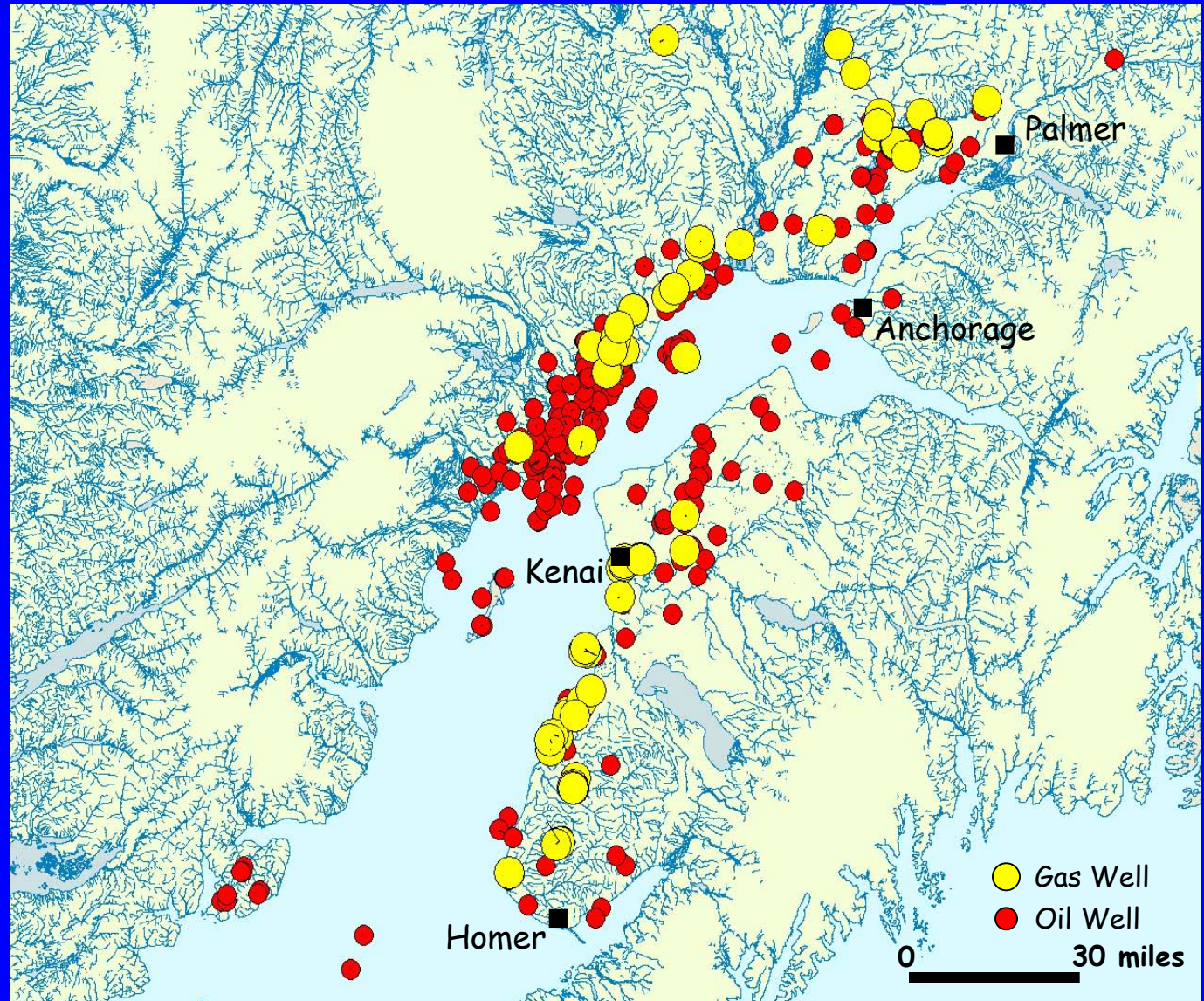
262 Oil Wells  
+ 73 Gas Wells

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335 Total Wells

### Results

9 Oil Fields  
22 Gas Fields  
1.4 Billion Bbls Oil  
8.9 Trillion CF Gas

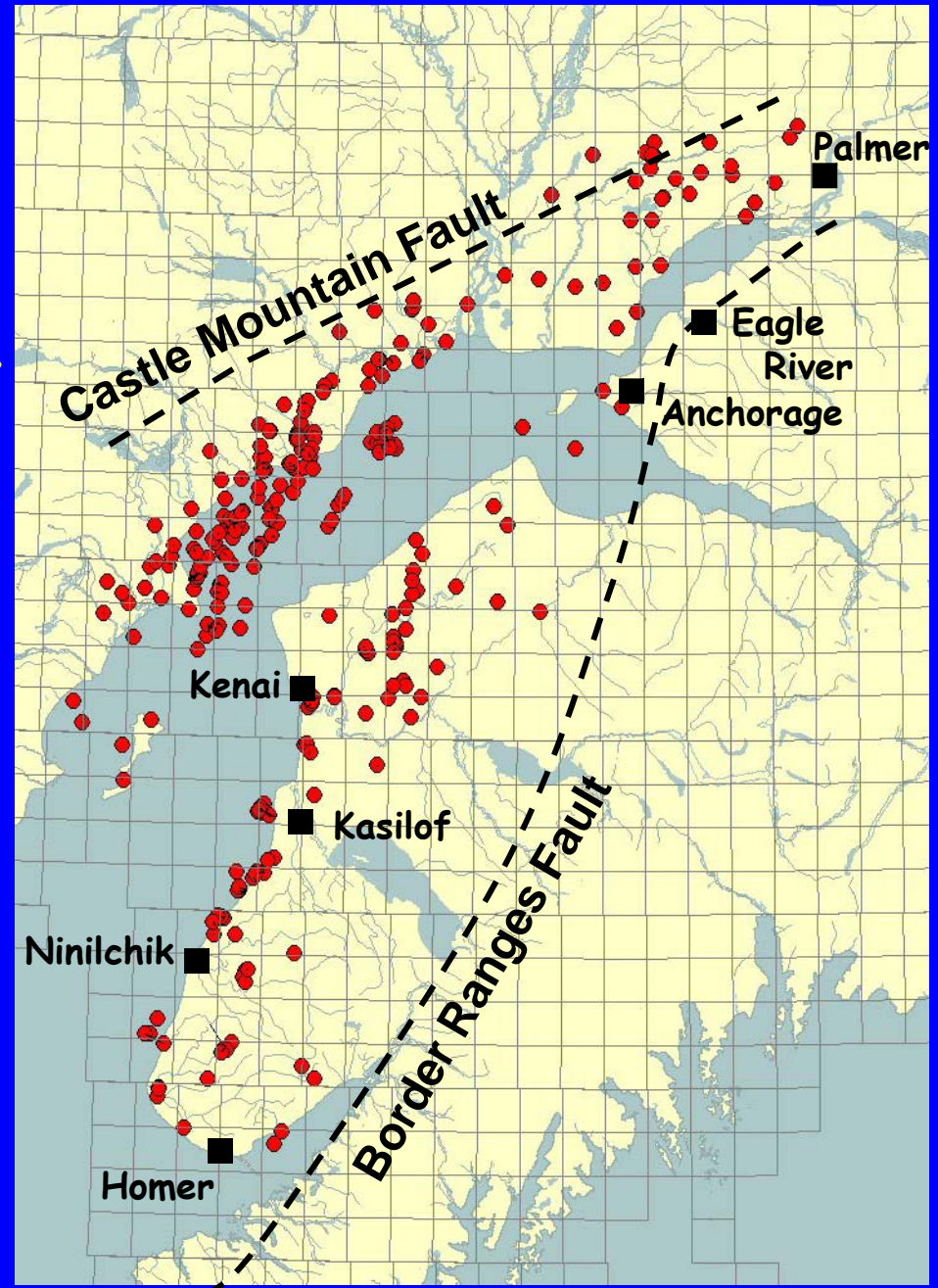




# U. COOK INLET BASIN Exploration History

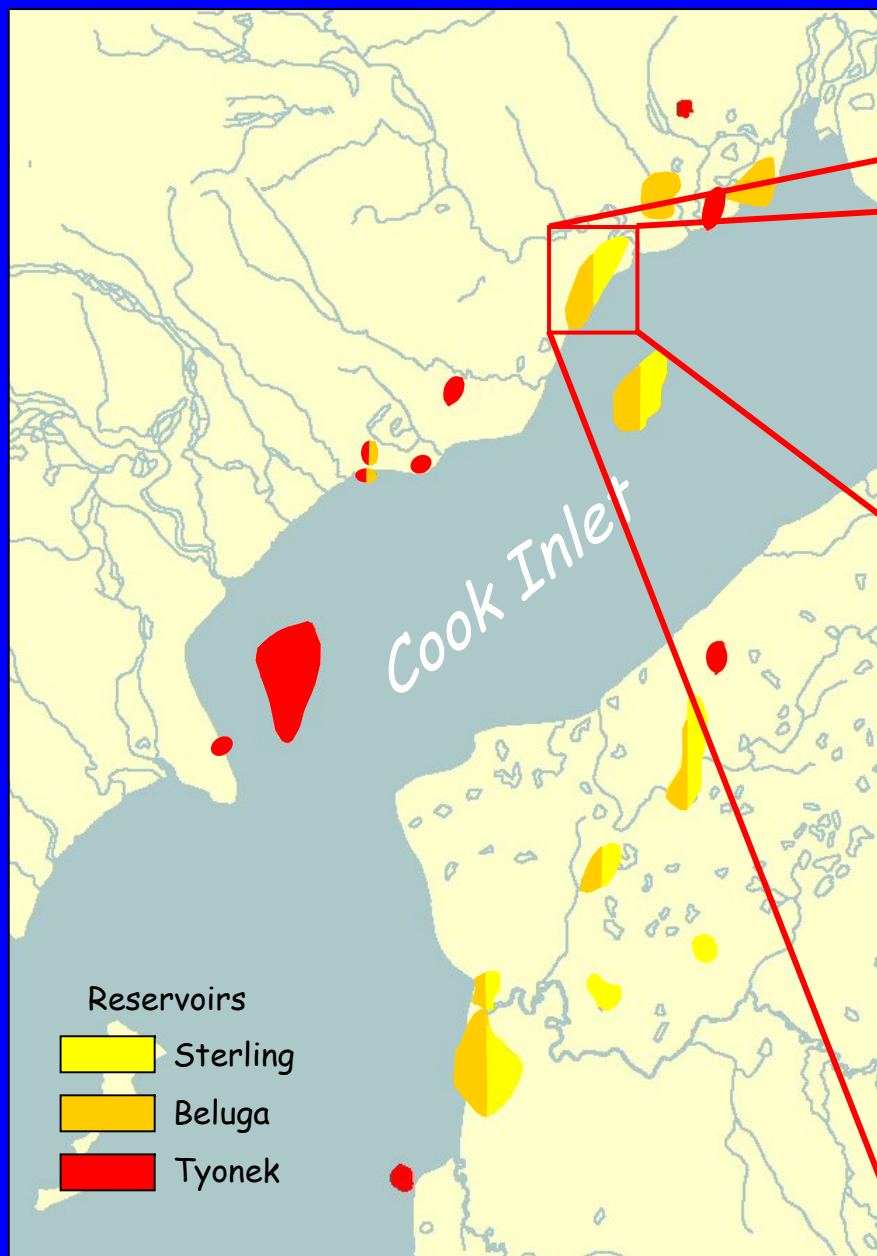
As of 2006, 297 exploratory wells within this area of interest

About one exploratory well for every 30 square miles

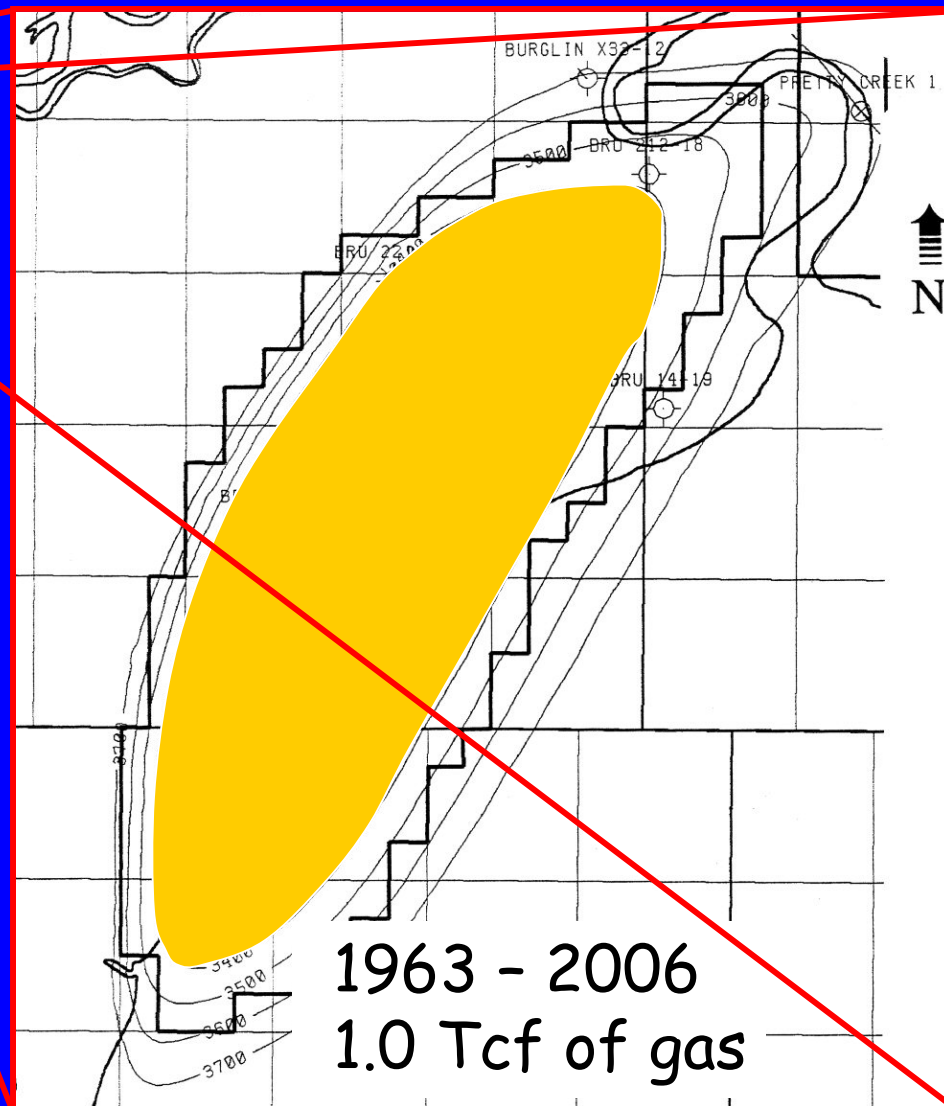


After Thomas, C., and others, 2004

# U. COOK INLET BASIN Beluga River Gas Field

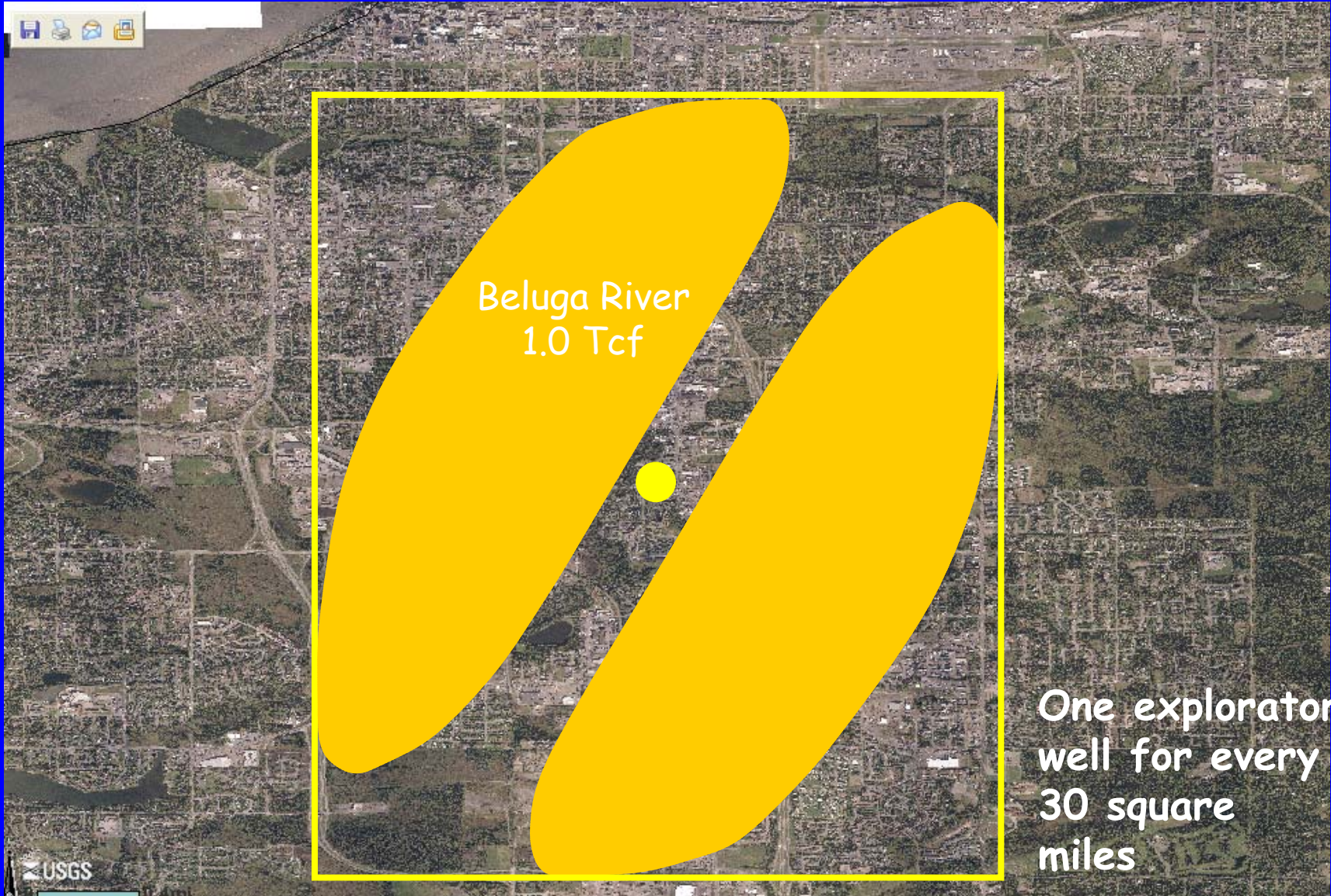


Modified from Magoon, L.B., 1994  
Basemap from AK DNR, 2005



Modified from AOGCC Annual Report, 2004





Modified from USGS National Map

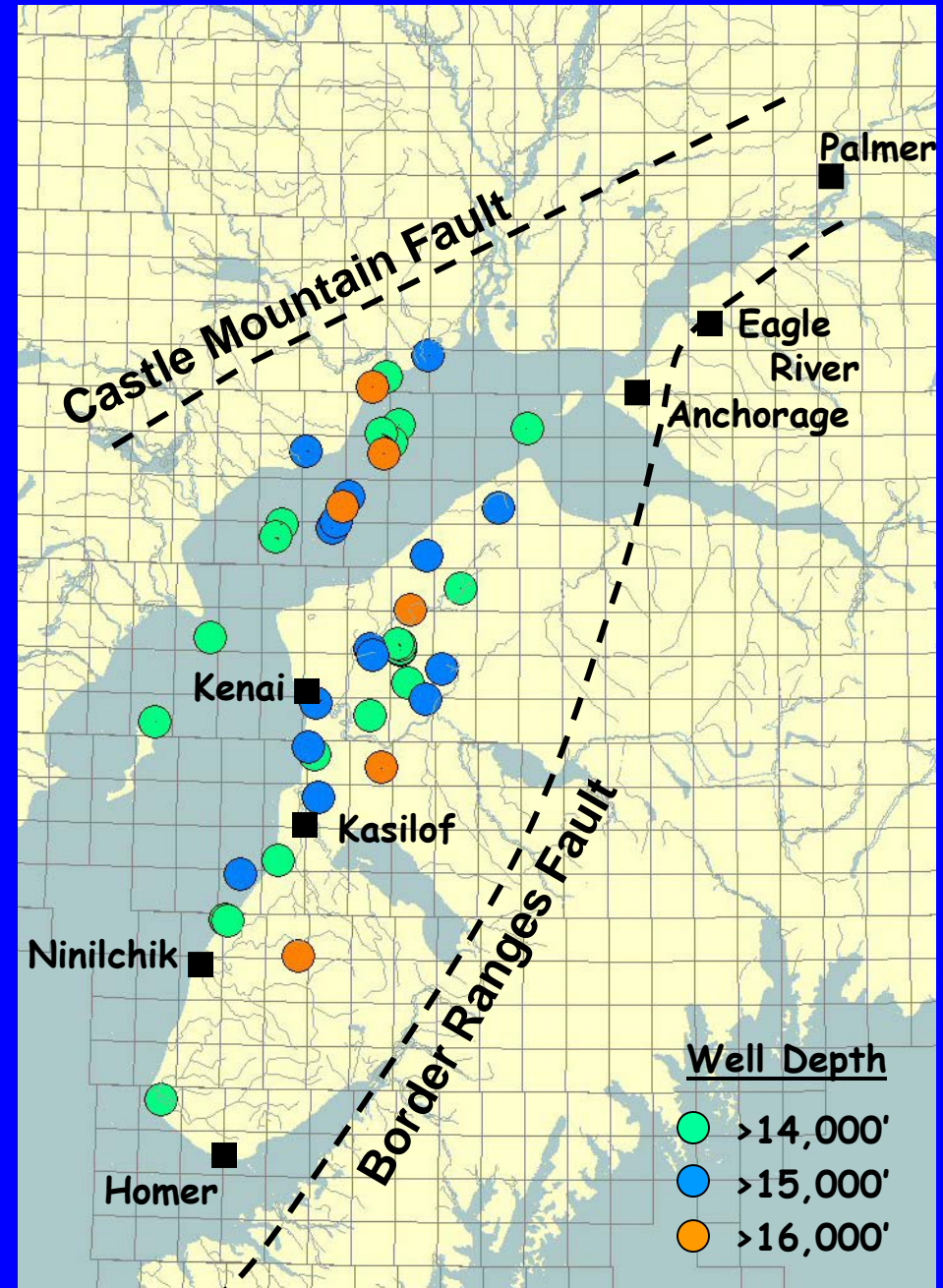


# U. COOK INLET BASIN Exploration History

As of 2006:

42 exploratory wells >14,000 ft  
21 exploratory wells >15,000 ft  
6 exploratory wells >16,000 ft

Still Room for  
Deep Exploratory Drilling!







# UPPER COOK INLET BASIN REVIEW

- Basin / Accumulation Origins
- Exploration History
- Future



● Anchorage

USGS

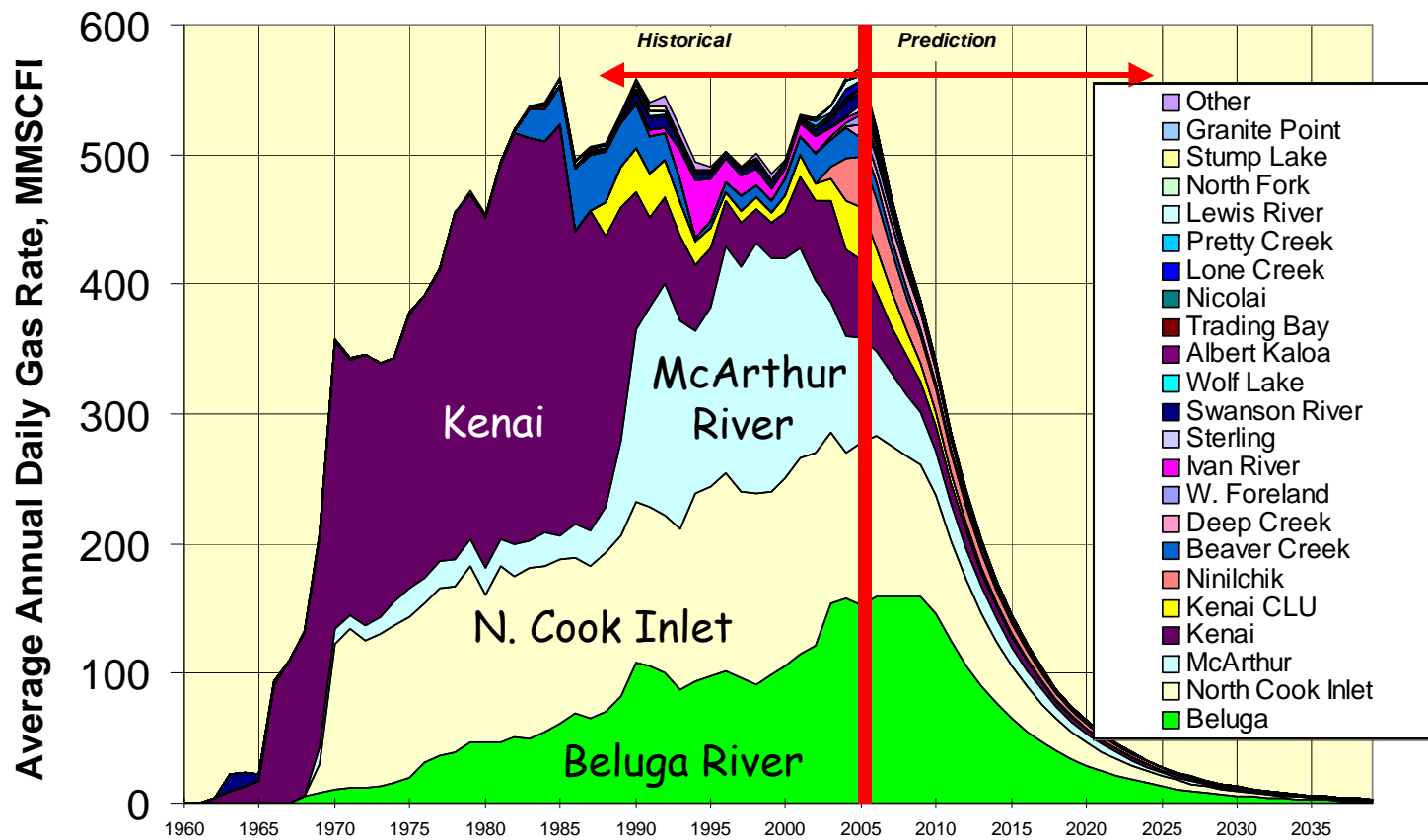
Modified from USGS National Map

# Cook Inlet Gas Pools Rates

## Historic & Forecast

### Cook Inlet Historical and Projected Production

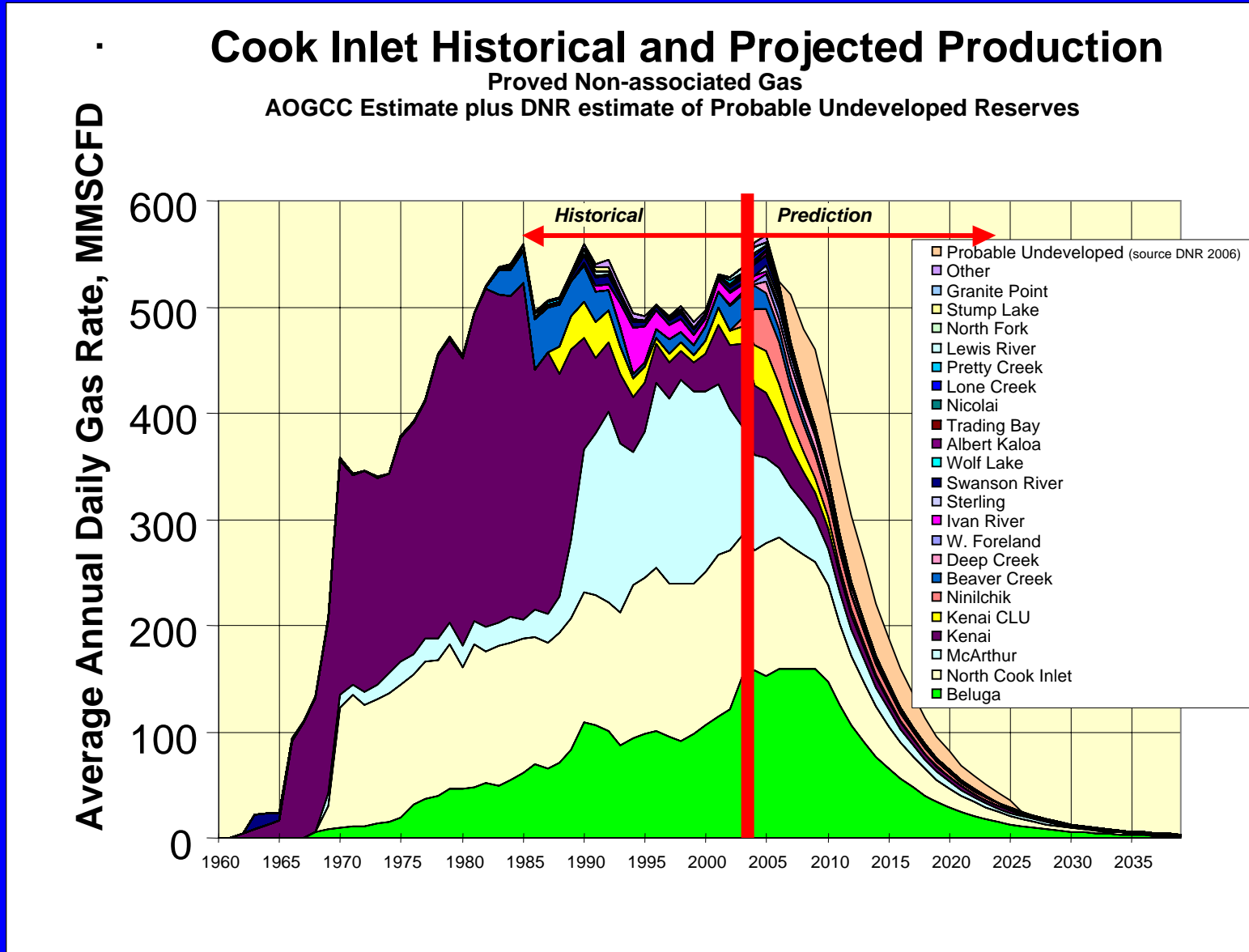
Proved Developed Non-associated Gas  
 No additional drilling, compression, other reserves addition  
 or production acceleration



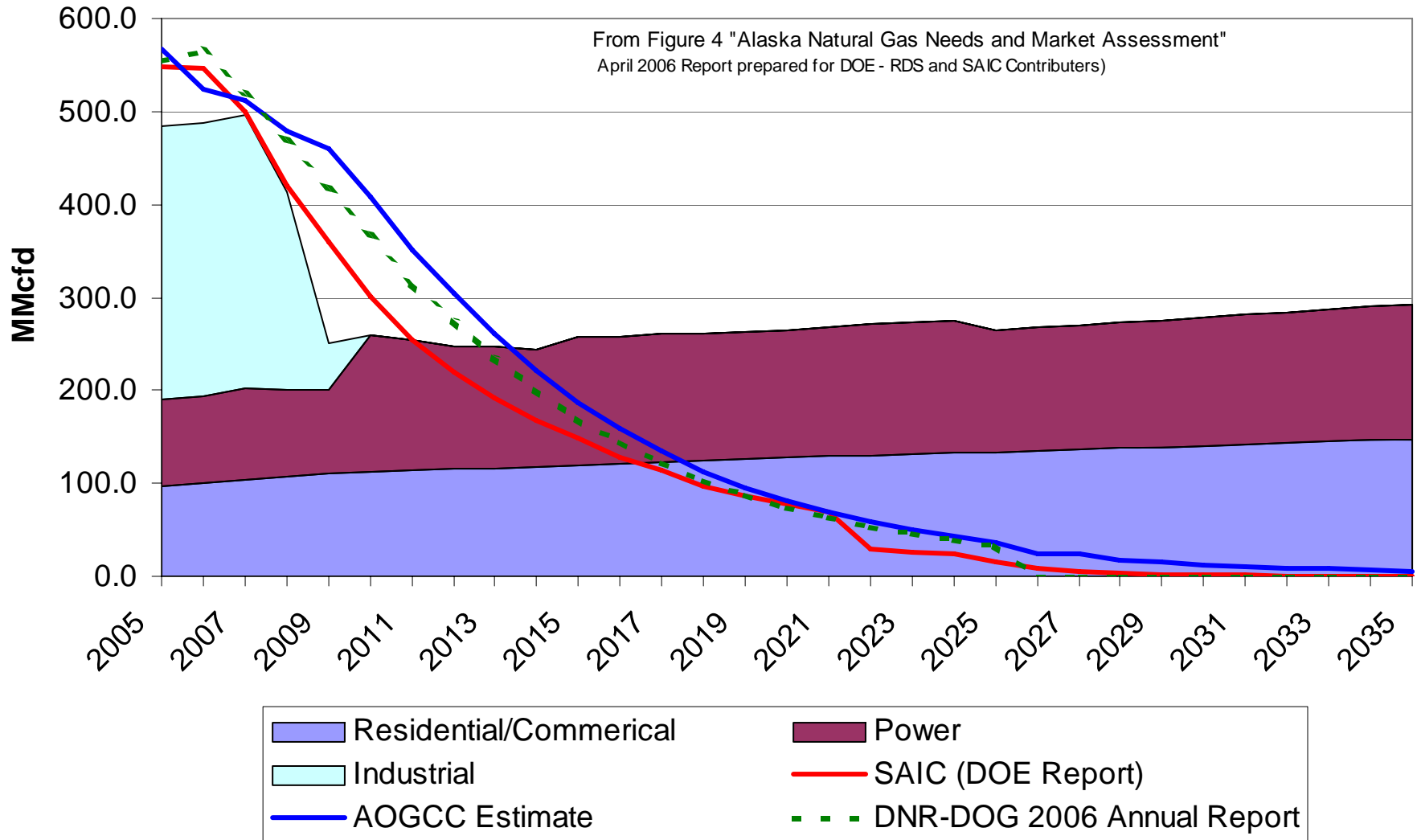


# Cook Inlet Gas Pools Rates

## Historic & Forecast



### Forecast for Proven Gas Reserves and Annual Gas consumption for the Residential/Commercial and Power Sectors



Modified from Thomas, C., and others, 2006



# Cook Inlet Gas Supply/Demand Conclusions

- There is still plenty of opportunity left for exploratory drilling!
- AOGCC, DNR, and DOE: CI reserves projections are similar
- Without additional gas reserves or an alternative energy supply:
  - 2008 to 2009
    - Production will not meet full demand of industrial users along with power generation and gas utilities
  - 2014 (+/-) (with all industrial users Shut-in)
    - Production will not fully supply South central power and gas utility requirements.

Notes:

\*For current decline. Workovers, gas storage may delay the shortfall from existing fields.



Alaska Oil and Gas Conservation Commission  
(AOGCC)

**Solutions are needed!**  
**(That's why we're here today.)**

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