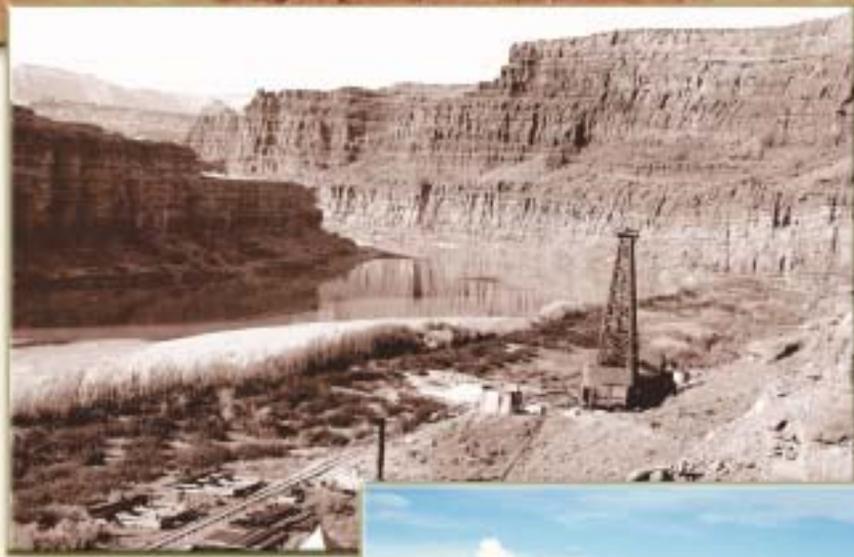


UTAH!

100 YEARS OF EXPLORATION



... and still the place to find oil and gas

Contact Information

For information about oil and gas programs, geophysical well logs, publications, geological samples, regulations and permitting, production, and leasing of state lands, contact the following:

Utah Geological Survey

1594 W. North Temple, Suite 3110
P.O. Box 146100
Salt Lake City, UT 84114-6100
801-537-3300, Fax: 801-537-3400
<http://www.ugs.state.ut.us>

Contact People:

Petroleum Geology
Thomas C. Chidsey, Jr.
Petroleum Section Chief
801-537-3364/801-537-3300
nrugs.tchidsey@state.ut.us

Library
Mage Yonetani, Librarian
801-537-3333
nrugs.myonetan@state.ut.us

Natural Resources Map and Bookstore
801-537-3320
888-UTAH-MAP (888-882-4627)
nrugs.geostore@state.ut.us

Sample Library
Carolyn M. Olsen, Sample Librarian
240 North Redwood Road
Salt Lake City, UT 84114
801-537-3359
nrugs.colsen@state.ut.us

Division of Oil, Gas and Mining

1594 W. North Temple, Suite 1210
P.O. Box 145801
Salt Lake City, UT 84114-5801
801-538-5340
<http://www.nr.state.ut.us/ogm/dogm.htm>

Contact People:

Vicky Dyson and Corinne Gagon
Public Information Center
801-538-5279/801-538-5283

John Baza
Associate Director for Oil and Gas
801-538-5334
nrogm.jbaza@state.ut.us

School and Institutional Trust Lands Administration (SITLA)

675 East 500 South, Suite 500
Salt Lake City, UT 84102-2818
801-538-5100
<http://www.trustlands.com>

Contact People:

LaVonne J. Garrison
Assistant Director/Oil & Gas
801-538-5197
lgarriso.tlmain@state.ut.us

Ed Bonner
Mineral Resources Specialist
801-538-5151
ebonner.tlmain@state.ut.us

Cover Photos:

Top – Cane Creek anticline exposing the Permian Cutler and Pennsylvanian Honaker Trail Formations; view east from Dead Horse Point State Park.

Middle – Midwest Exploration and Utah Southern No. 1 Shafer wildcat well drilled in 1924 targeting the Pennsylvanian Cane Creek shale of the Paradox Formation on the Cane Creek anticline; view southwest down the Colorado River. The well blew out and was abandoned. Used by permission, Utah State Historical Society, all rights reserved.

Lower – Park Road oil field, about 6 miles west of the Southern No. 1 Shafer wildcat well, produces from the Cane Creek shale and was discovered in 1991 using horizontal drilling technology.

Background Photos:

Utah's early oil exploration drilling, development operations, and pipeline construction. Used by permission, Utah State Historical Society, all rights reserved.

Message from the Governor

Utah is experiencing a record 13-year period of economic prosperity. We face new challenges and opportunities to continue this prosperity into the future. Recent events have highlighted that affordable, reliable energy supplies are a critical component of a growing economy.

Utah is energy-rich. At present, more than 95% of our electricity is coal-fired, largely from local coal deposits. Our oil and gas production has ranked in the top 10-15 states nationwide for the last 40 years. Natural gas production has risen spectacularly during the 1990s as gas from coalbed methane resources has supplemented production from conventional gas fields. However our oil production, like that in most other states, has been gradually declining through the 1990s.

In addition to being energy-rich, Utah has managed to balance the preservation of its outstanding natural environment and quality of life. Our challenge will be to maintain this balance between promoting new resource developments and minimizing the environmental impacts. For continued economic growth it is essential we have both sustainable, efficient new energy developments, as well as conservation and wise use of these energy supplies.

I encourage exploration and development companies to consider including Utah in their portfolios. The state needs to increase reserves of oil and gas. Opportunities exist for applying new technologies to more efficiently extract oil from our known fields. Utah has many unexplored areas and the geological potential for concealed targets containing oil and gas. There is also potential for significant expansion of our coalbed methane resources. New technologies enable us to tap natural resources with reduced impact to the environment.

Our state agencies such as the Utah Geological Survey, the Division of Oil, Gas and Mining, and the School and Institutional Trust Lands Administration are ready to help with your queries regarding the exploration and development opportunities. We have a supportive regulatory environment and a streamlined well-permitting process. I hope this brochure encourages you to invest in Utah's energy development during the coming years.

Welcome to Utah!

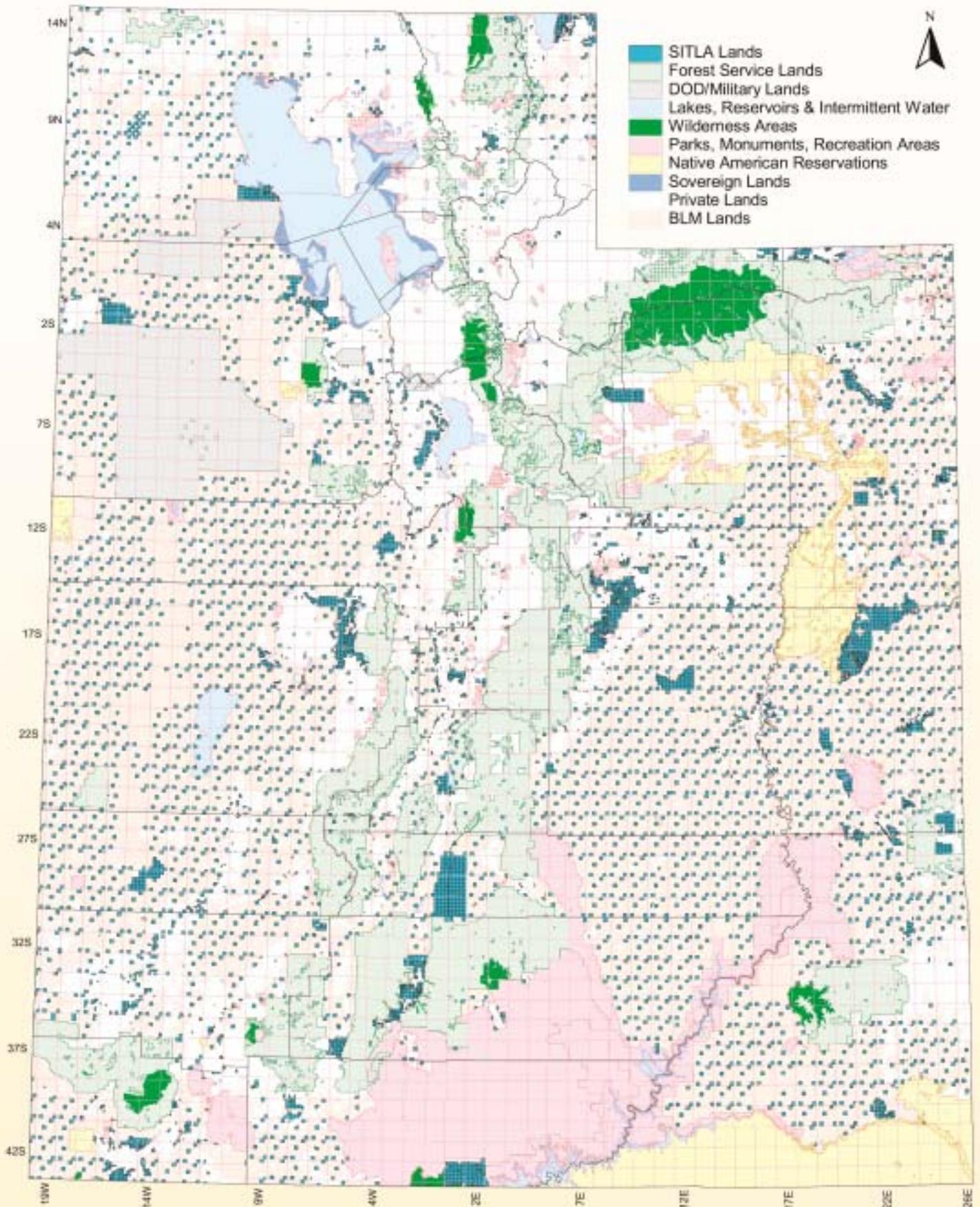


Governor



Michael O. Leavitt

Map of Land Ownership



SITLA: Leasing Environment

What's the Deal?

The School and Institutional Trust Lands Administration (SITLA) is an independent state agency that manages 4.5 million acres of Utah mineral trust lands exclusively for the benefit of Utah's schools and other public institutions. Out of the total oil and gas rights available on state trust land, there are currently about 1.1 million acres leased for oil and gas exploration and development. This means that there are over 3 million acres of trust land yet to be evaluated for oil and gas potential in this time of serious energy shortages.

Why lease from the Trust Lands Administration?

- Faster and Easier to Commit Lands to a Lease or Other Deal.
- Sealed-bid Oil and Gas Lease Offerings – January, April, July and October
Contact us to have your name placed on the bid mailing list or visit our Internet site at www.trustlands.com and follow the "Current and Prior Lease Offering" link.
- Not ONLY Competitive Offerings but Flexible Business Arrangement Terms
 - Exploration and Development Agreements
 - Drill to Earn and Farmouts
 - Other Business Arrangements
- Attractive Royalties
- Speedy State Permitting Process through the Division of Oil, Gas and Mining



Westwater anticline, Uncompahgre uplift, Grand County

Give us a call and let's consider the possibilities.

LaVonne Garrison 801-538-5197
Ed Bonner 801-538-5151

"lgarrison.tlmain@state.ut.us"
"ebonner.tlmain@state.ut.us"

You can download the ownership map on the preceding page or select other Utah maps from SITLA's web page at www.trustlands.com. From the home page click on the map icon located on the left side of the page to view the available map selection.

OGM: Utah's Regulatory Environment

The Oil and Gas Regulatory Program within the Division of Oil, Gas and Mining (OGM) regulates exploration for, and development of, oil and gas resources in Utah.

The Oil and Gas Regulatory Program incorporates important conservation principles derived from the historical exploitation of petroleum resources in the United States. It is our obligation to promote the wise development of oil and gas, preventing waste and maximizing ultimate recovery, while protecting the environment so that the public might realize the greatest possible good from these natural resources.

It is also our duty to protect correlative rights of all owners of oil and gas resources, controlling the proper participation and sharing of the various owners within an oil and gas pool.

OGM issues permits for all wells whether they are on SITLA lands or the vast expanse of Federal (Bureau of Land Management, Tribal, or Forest Service) lands in Utah.

Through roughly 46 years of existence, the oil and gas conservation program has evolved into a user-friendly system for effective regulation of the state's oil and gas industry.



Reese Canyon State 32-2 wildcat well, Kaiparowits basin, Kane County

- **Permits** - The Division provides timely processing and approval of various permits involving drilling, workover and recompletion operations, underground injection, well plugging, and waste management.
- **Monitoring** - An experienced field staff monitors operations with regular inspections, enforcement, and database tracking of field operations.
- **Record Keeping and Public Information** - Basic well data, well histories, injection data, production reporting, operator statuses, and bonding are electronically stored and easily retrieved in our public information room or on our web site.
- **Reporting Compliance** - An audit staff conducts reviews of industry compliance reports to ensure accurate and timely documentation.
- **Other Services** - Technicians provide expertise relating to tax credit qualification, royalty payment disputes, mapping, and abandoned well plugging.

Providing technically current, timely and quality regulatory services –
The Utah Division of Oil, Gas and Mining.

Exploration History

Utah's oil and gas exploration history extends back over 100 years. In 1891, natural gas was accidentally discovered at a depth of 1,000 feet in Farmington Bay on the eastern shore of Great Salt Lake during the drilling of a water well. Between 1895 and 1896, gas from several wells near this location was transported to Salt Lake City in a wooden pipe, marking Utah's first use of local oil or gas. The first oil shows were encountered in wells drilled during the early 1900s at Rozel Point (northern Great Salt Lake), Mexican Hat (near Monument Valley, southeastern Utah), and near the town of Virgin (near Zion National Park). Although oil shows were also found at several other eastern Utah locations in later decades, it was not until 1948 that Utah's first commercial oil well, Ashley Valley No. 1, was drilled near Vernal. By 1960, Utah was the 10th largest oil-producing state in the country, and it has remained in the top 15 since then.



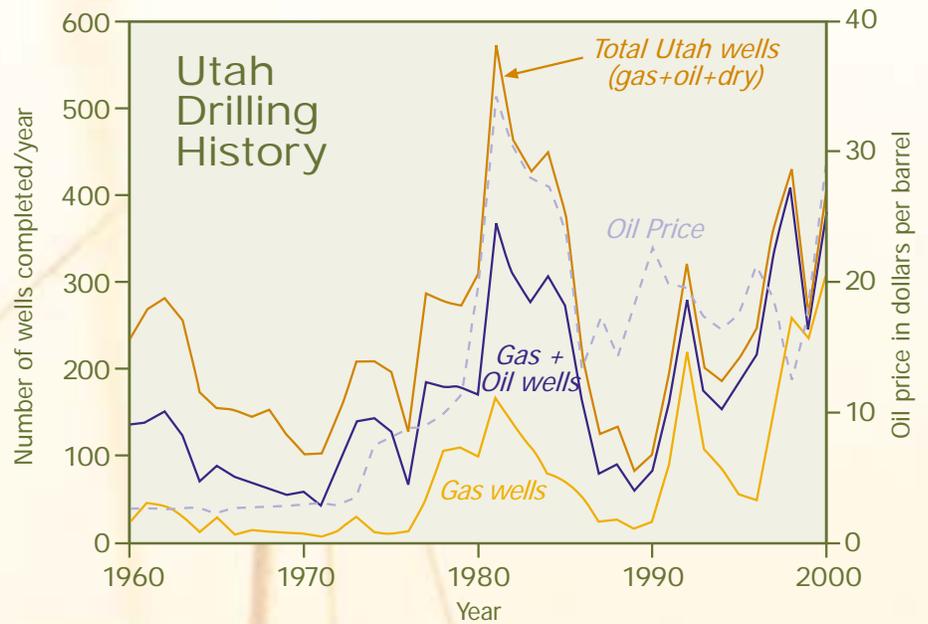
First thrust belt discovery, Pineview field, Summit County, in 1975



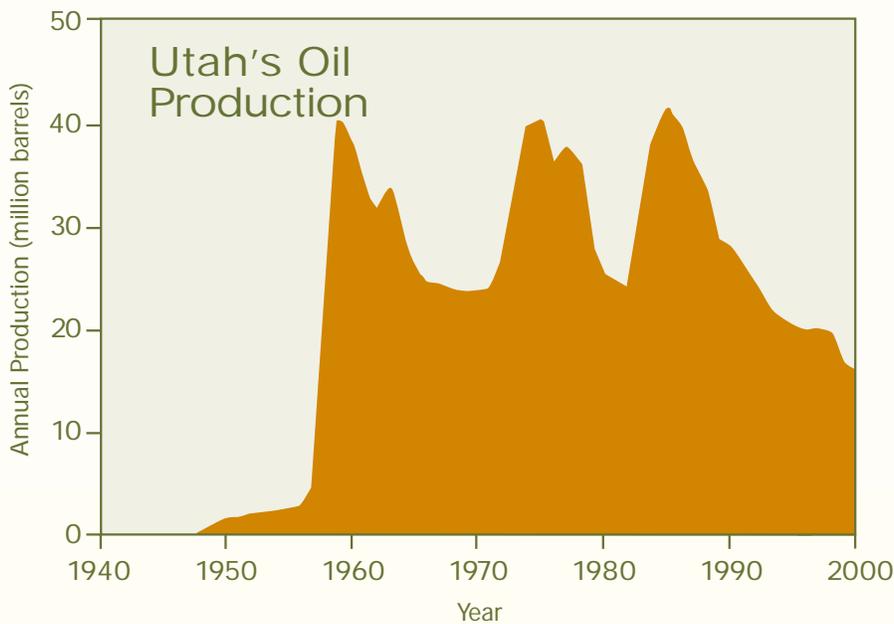
Exploring beneath Great Salt Lake in 1978



Utah's drilling history has fluctuated greatly due to discoveries, oil price trends, and changing exploration targets. During the boom period of the early 1980s, activity peaked at over 500 wells per year. In 2000, completed wells exceeded 400 and approached the very active exploration year of 1998. The numbers of permits issued and wells commenced during 2000 were the highest since the early 1980s, indicating that this decade may be comparable to exploration activity during the 1980s. Most of the wells drilled during the late 1990s were exploring for gas. Very few dry holes were reported compared to earlier years. Sustained high prices are likely to entice less risk-averse exploration investment (more wildcats), resulting in both new discoveries and more dry holes compared to 1999 and 2000.

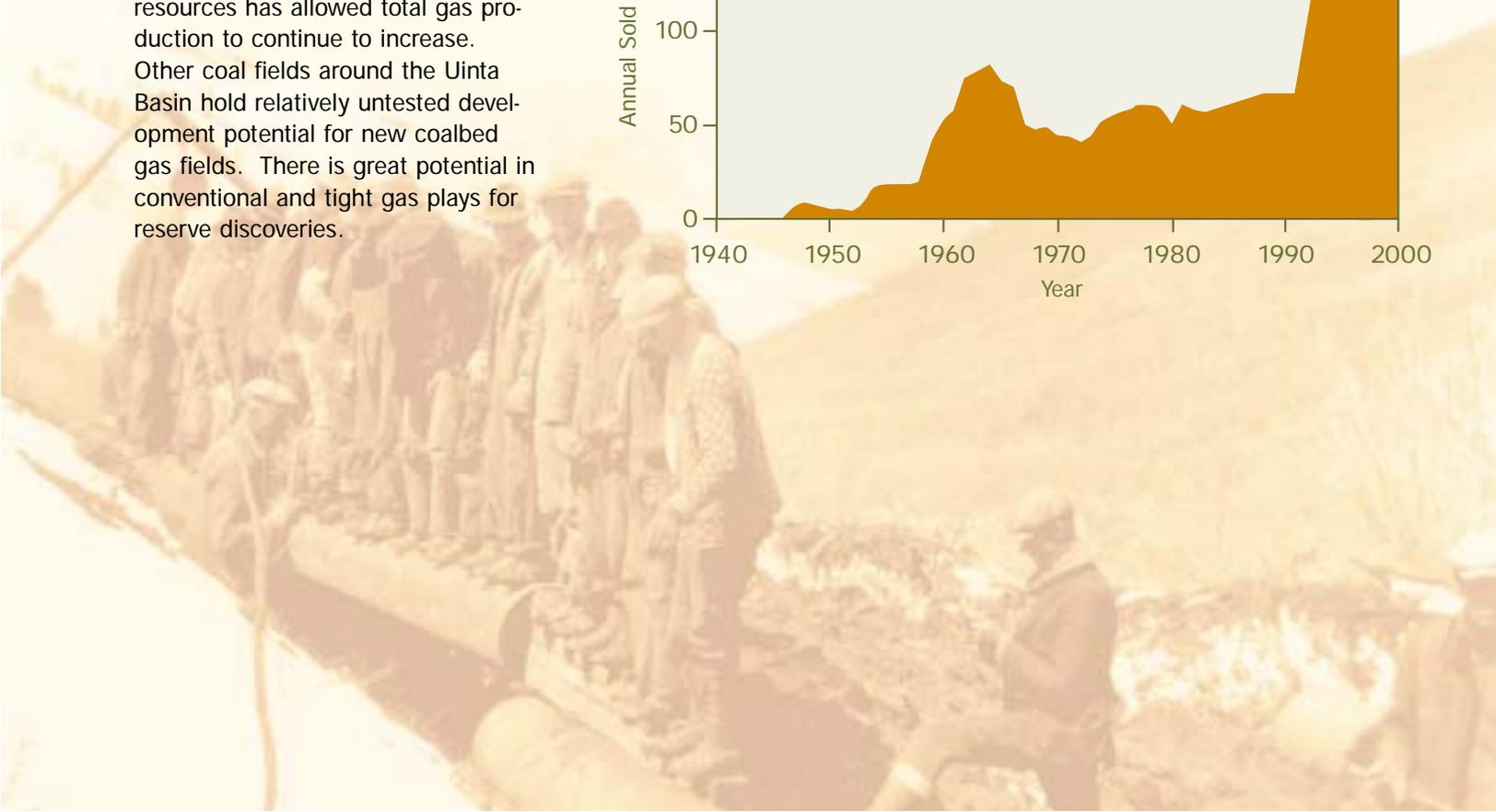
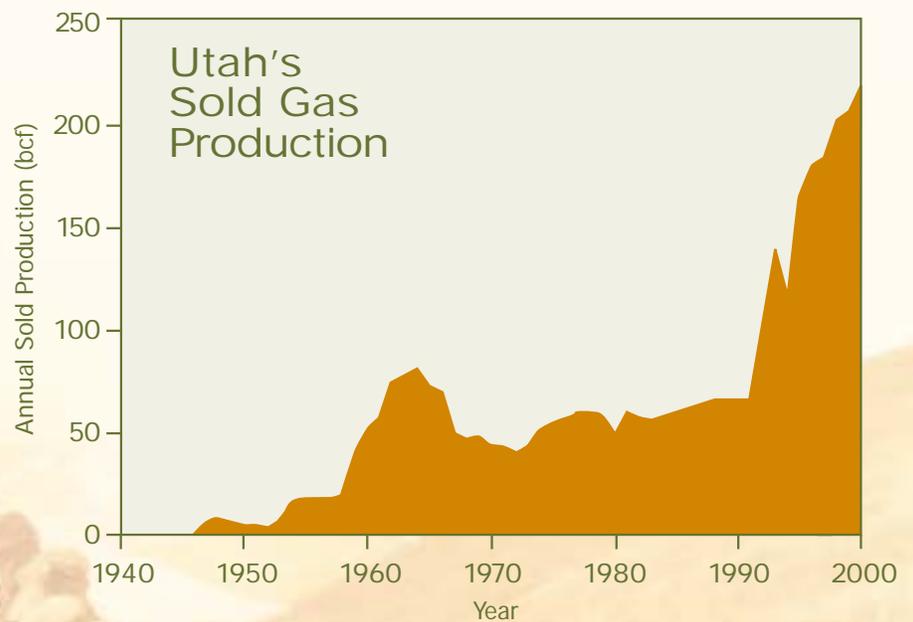


Virgin oil field - Utah's first oil production



Utah oil fields have produced a total of 1.2 billion barrels (bbls); the 15 million bbls of production in 2000 was the lowest level in over 40 years. However, proven reserves are relatively high, at 268 million bbls (1999 statistics). With higher oil prices now prevailing, secondary and tertiary recovery techniques should boost future production rates and ultimate recovery from known fields.

Natural gas production from Utah fields now exceeds 6 trillion cubic feet (tcf), with marketed production close to 4 tcf. The main reason for the difference in these two volumes is due to reinjection of produced gas and nitrogen at Anschutz Ranch East field as part of a pressure maintenance program to prevent retrograde condensate loss. Total proven reserves of gas exceed 3 tcf, so at current production rates of 220 billion cubic feet (bcf) per year the proven reserves will last for 14 years. Although gas production from many fields declined during the late 1990s, the discovery of Drunkards Wash field and development of its coalbed methane resources has allowed total gas production to continue to increase. Other coal fields around the Uinta Basin hold relatively untested development potential for new coalbed gas fields. There is great potential in conventional and tight gas plays for reserve discoveries.

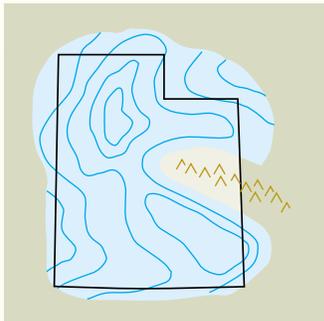


General Geologic Setting

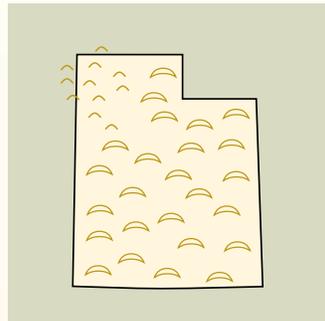
The ages of the rocks exposed in Utah include every geologic eon, era, period, and epoch. Many of these rocks have the qualities necessary to create the oil and gas reservoirs, sources, and seals that make Utah a petroleum-producing state with large, relatively unexplored areas of hydrocarbon potential. Because of Utah's world-class rock exposures, every producing formation and type of trap in the state can be examined in outcrop analogs. Many of these serve as outcrop analogs for oil and gas fields outside of Utah as well as providing a natural laboratory for study.

A combination of depositional and structural events created the major petroleum-producing provinces in Utah: Paradox Basin, Ferron coalbed methane fairway, thrust belt, Uncompahgre uplift, and Uinta Basin.

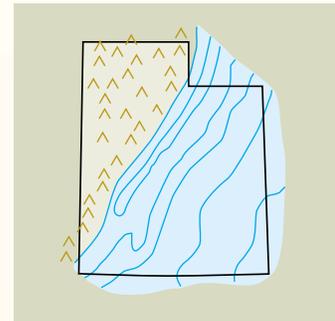
During the Pennsylvanian, the Paradox Basin developed in southeastern Utah where cyclic organic-rich shales, carbonates, and evaporites accumulated under restricted marine conditions in the rapidly subsiding basin. The Paradox Basin contains Utah's largest oil field, Greater Aneth. Renewed movement on deep, older basement faults in the basin formed structures productive in Mississippian-age carbonates.



*Permian - Pennsylvanian
(240 - 330 mya)*



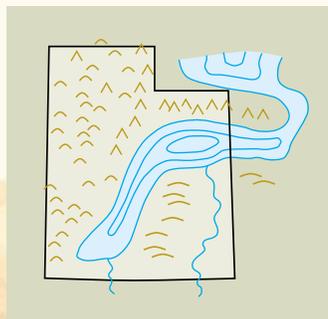
*Early Jurassic
(187 - 205 mya)*



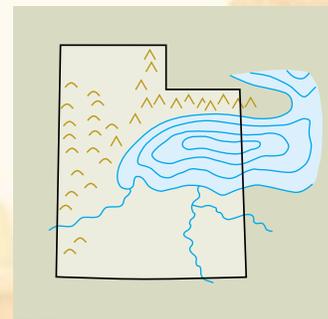
*Cretaceous
(66 - 138 mya)*

In Early Jurassic time, Utah had an arid climate and lay 15 degrees north of the equator. It was then that the most prolific reservoir in the thrust belt, the Nugget Sandstone, was deposited in an extensive dune field comparable to the present Sahara. Correlative rocks form many of the spectacular canyons in the parks of southern Utah.

During the Cretaceous, compressional forces of the Sevier orogeny produced highlands in western Utah and the Western Interior Seaway covered most of eastern Utah. Extensive coal-forming swamps and marshes near the coastline (Emery, Book Cliffs, and Seigo coal fields) and fluvial and wave-dominated deltas migrated eastward



*Paleocene
(55 - 66 mya)*

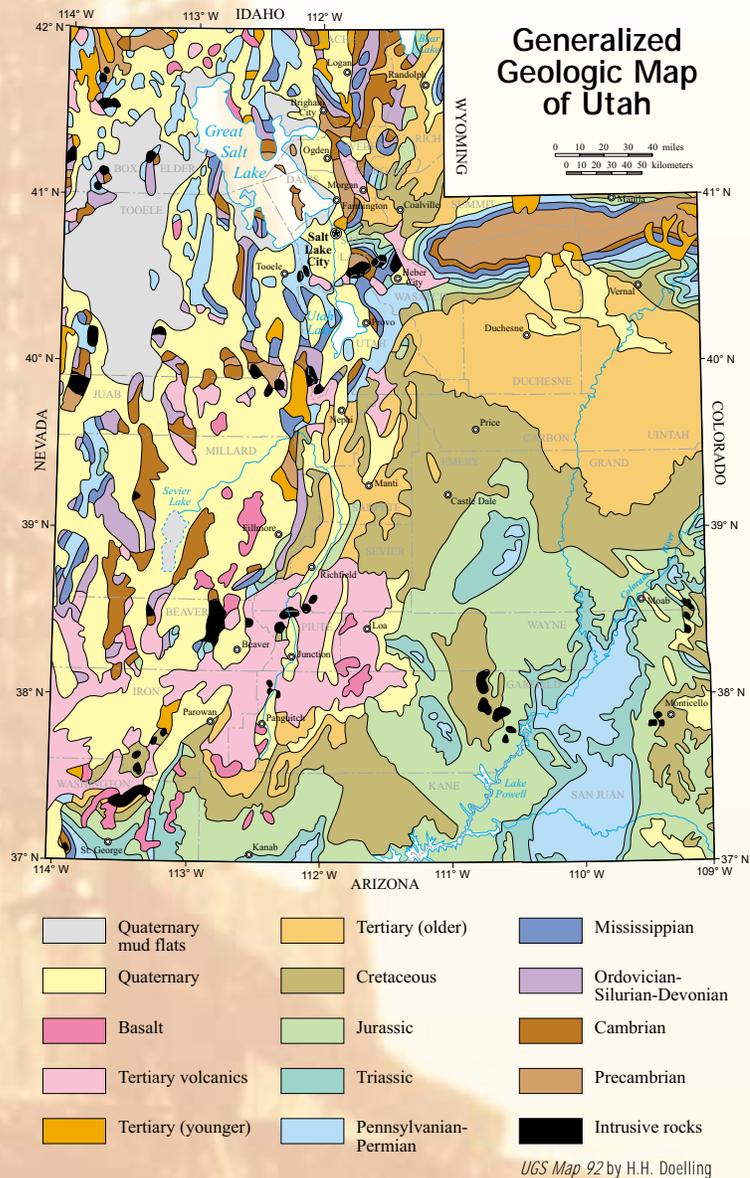


*Eocene
(38 - 55 mya)*

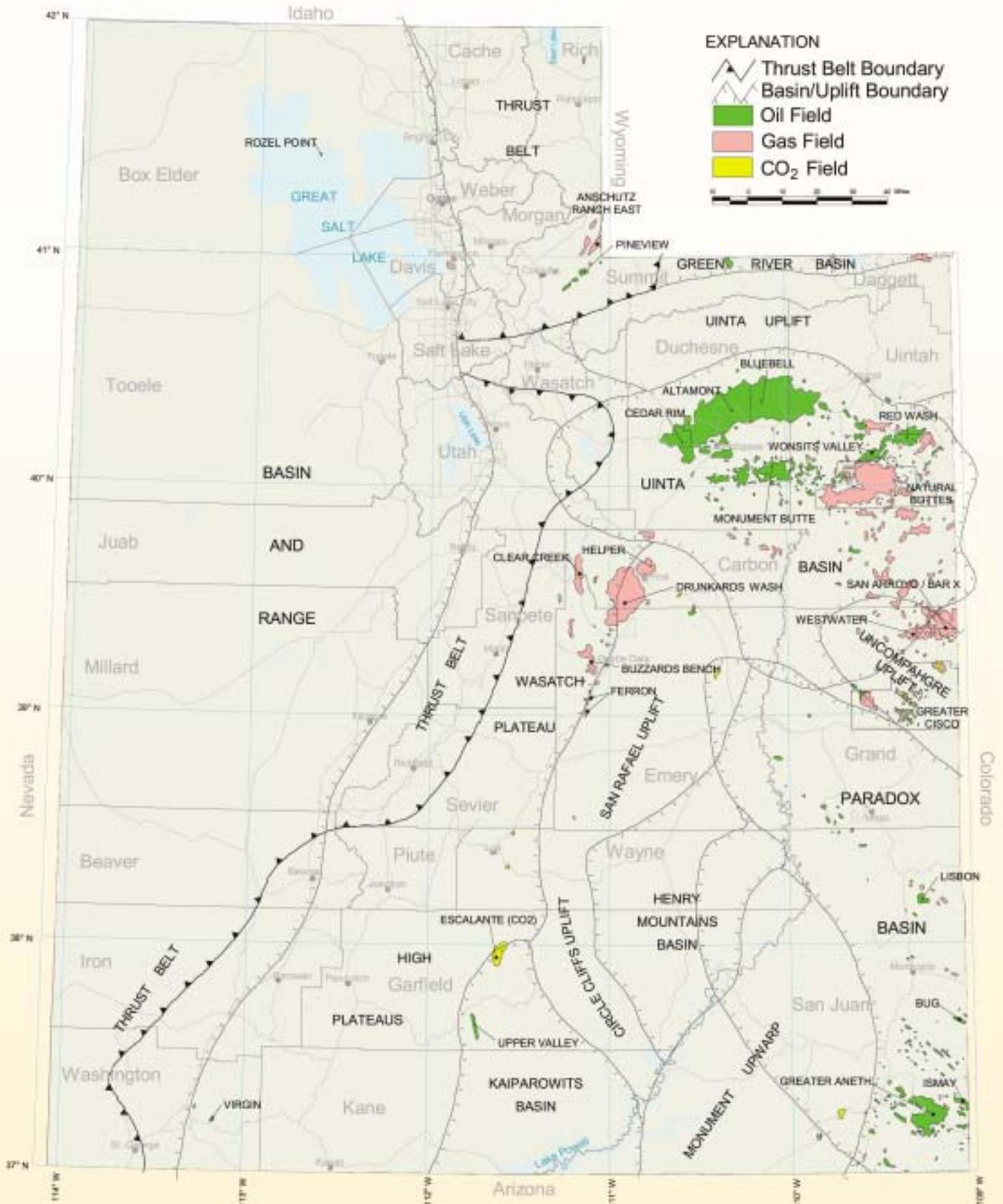
across the state as the sea eventually retreated. The resulting deposits are now the targets for gas production aggressively being pursued in eastern Utah and in the Ferron coalbed methane (CBM) fairway of central Utah. The Sevier orogeny continued into the Paleocene producing the "thin-skinned" folds and faults of the thrust belt that have been such prolific producers in northern Utah. Concealed, deep exploration targets beneath the Sevier thrusts offer frontier drilling opportunities in the poorly explored western half of Utah.

The Laramide orogeny, between latest Cretaceous and Eocene time, produced numerous basins and basement-cored uplifts in the Rocky Mountain states. In Utah, the Uinta Basin and Uncompahgre uplift are the major petroleum contributors. The northwest-trending Uncompahgre uplift represents a reactivation of ancient highlands of the Pennsylvanian-Permian Ancestral Rockies. Numerous subsidiary structures formed along the uplift and produce mainly gas. During the Paleocene and Eocene, lakes Flagstaff and Uinta formed in the Uinta Basin where over 11,000 feet of alluvial, marginal lacustrine (fluvial, deltaic, beach, etc.), and open lacustrine sediments accumulated in an inter-tonguing relationship. The eastern Uinta Basin is Utah's most prolific producer of non-associated (dry) gas; recent water-flood projects have been very successful in increasing oil production in the southern part of the basin.

The principal source rocks for these provinces were deposited during the Pennsylvanian, Permian, Cretaceous, and Tertiary as marine and lacustrine shale, and coal. The reservoir rocks were deposited in a variety of environments including deltas, shallow-shelf marine, eolian dunes, coastal-plain, and river-floodplain settings.

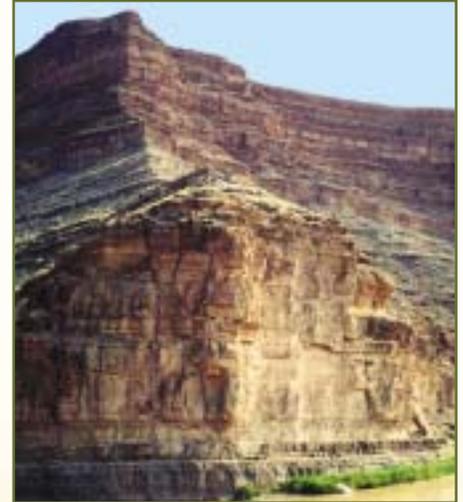


Utah's Oil and Gas Fields

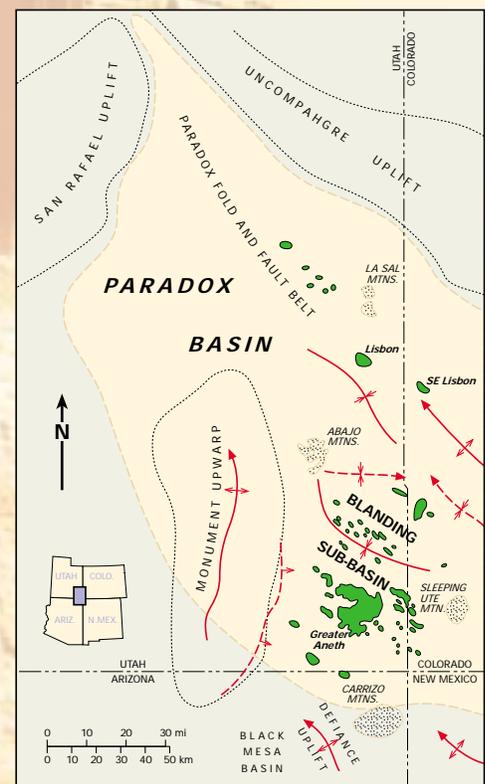


Paradox Basin

- Major Reservoirs: Devonian McCracken Sandstone Member of the Elbert Formation, subtidal to supratidal dolomite to delta-front sandstone; Mississippian Leadville Dolomite, shallow-shelf marine dolomite and limestone; Pennsylvanian Paradox Formation, shallow-shelf marine limestone and dolomite; Permian Coconino Sandstone, eolian sandstone.
- Trapping Mechanisms: stratigraphic – carbonate buildups (algal mounds, shoals, islands) sealed by anhydrite, salt, or organic-rich shale; structural - faulted asymmetrical anticlines.
- Source Rocks: black, organic-rich marine shale within the Pennsylvanian Paradox Formation.
- First Commercial Discovery: Boundary Butte field, 1947.
- Number of Active Fields/Wells: 68 fields/779 wells.
- Recent Monthly Production: 525,000 bbls of oil, 2.0 bcf of gas.
- Cumulative Production: 523 million bbls of oil, 1.3 tcf of gas.
- Types of Enhanced Oil Recovery Projects: waterflood, CO₂ flood, gas injection, horizontal drilling.
- Major Pipelines: Four Corners Pipeline Co. (12" oil), Texas-New Mexico Pipeline Co. (16" oil), UNOCAL Pipeline Co. (10" oil), Western Gas Resources, Inc. (16" gas), Northwest Pipeline Corp. (26" gas), ExxonMobil (carbon dioxide), Mid-America Pipeline System (10" products).
- Land Ownership: 56% BLM, 11% National Parks, 9% Native American, 8% SITLA, 8% Private, 7% National Forest, 1% Wilderness.
- Outcrop Analogs in Utah: Ismay and Desert Creek algal mounds, Pennsylvanian Paradox Formation, exposed along the San Juan River in southeastern Utah.
- Utah Geological Survey Contact: Thomas C. Chidsey, Jr., ph.: (801) 537-3364; e-mail: nrugs.tchidsey@state.ut.us.

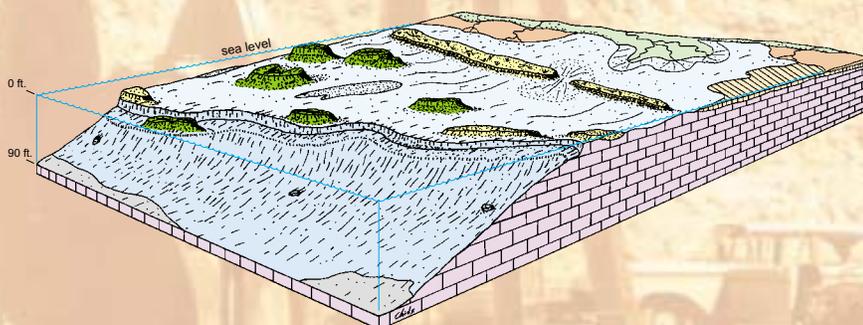


Paradox Formation algal mound, San Juan River Canyon



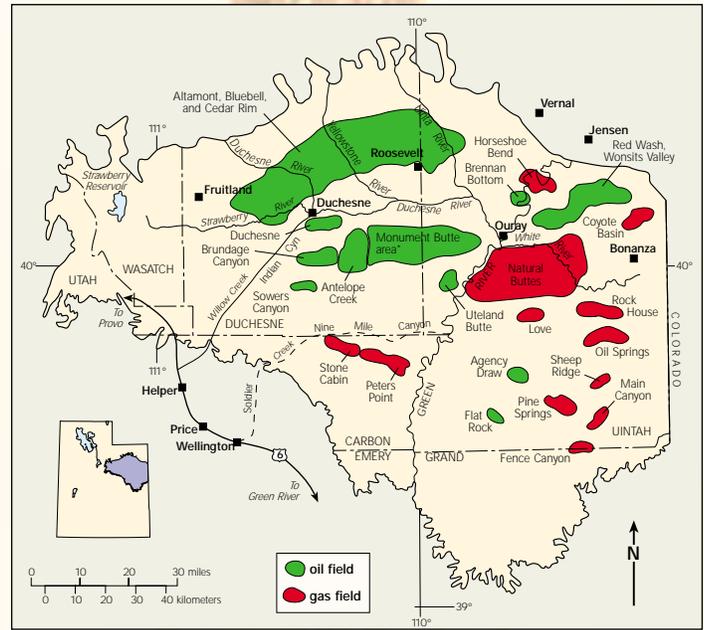
Paradox Basin fields (shown in green)

Paradox Formation depositional environments

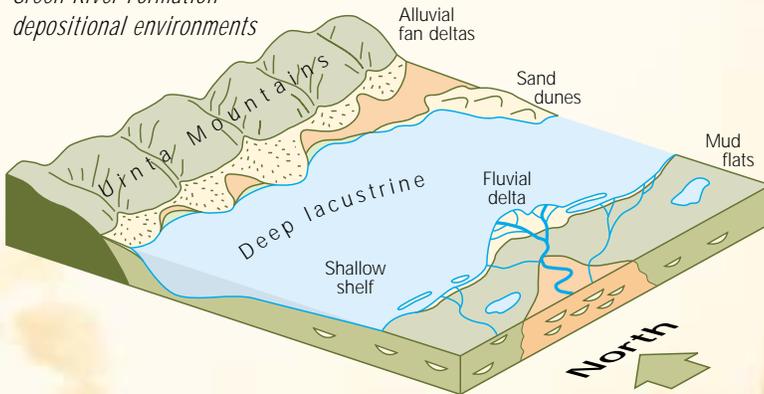


Uinta Basin

- Major Reservoirs: Eocene Uinta, Green River, and Colton Formations, lacustrine to alluvial channel and bar sandstone; Cretaceous Mesaverde Group, fluvial and littoral sandstone; Permian Park City Formation, shallow marine limestone and dolomite; and Pennsylvanian Weber Sandstone, coastal eolian and littoral sandstone.
- Trapping Mechanisms: anticlinal at Ashley and Peters Point fields, stratigraphic conventional and basin centered.
- Source Rocks: Cretaceous coals and shale, Eocene lacustrine shale.
- First Commercial Discovery: Gas at the Ashley Valley field, 1925, and oil at Roosevelt field, 1949.
- Number of Active Fields/Wells: 51 fields/ 3,499 wells.
- Recent Monthly Production: 637,925 bbls of oil, 8.8 bcf of gas.

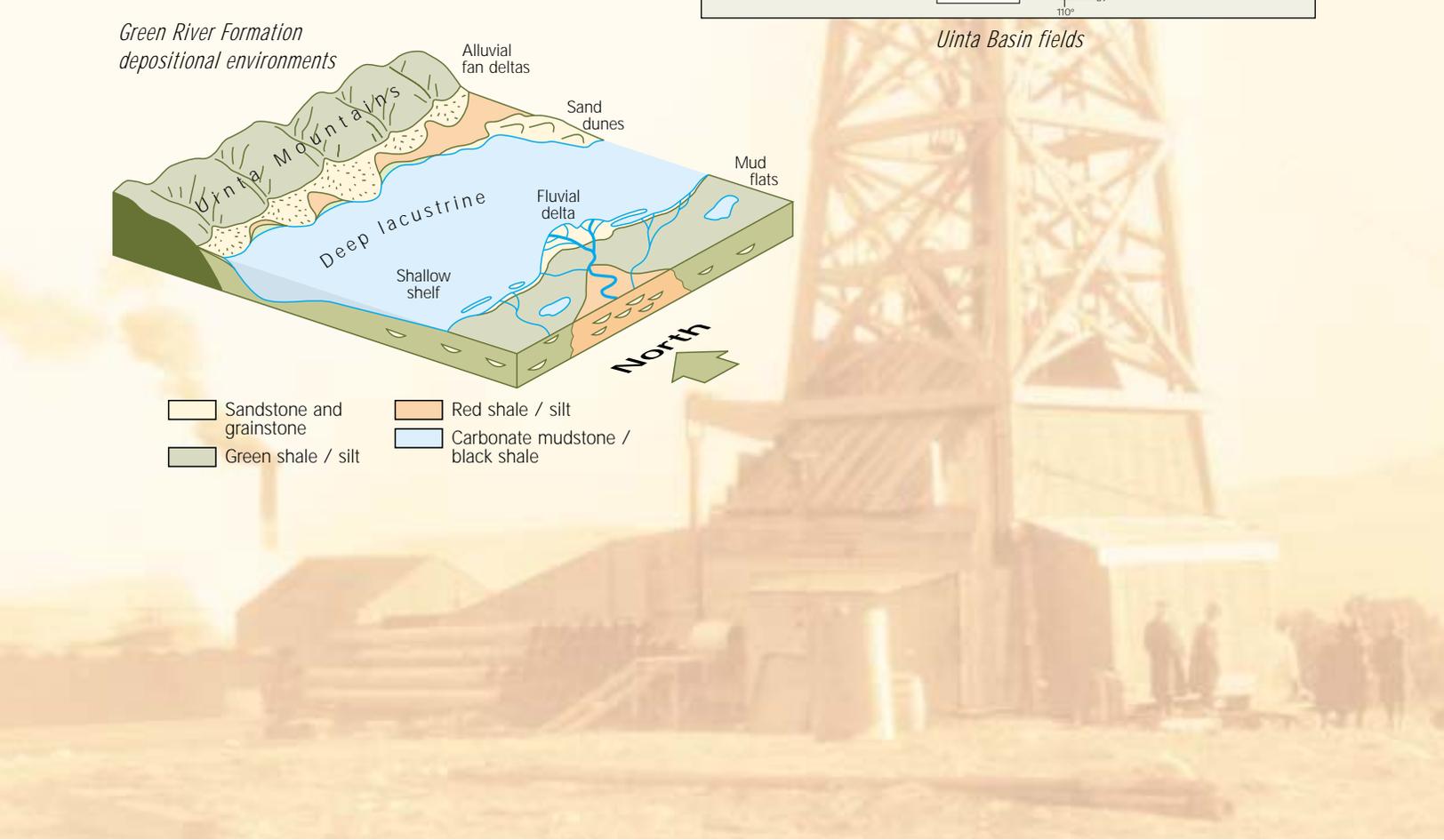


Green River Formation depositional environments

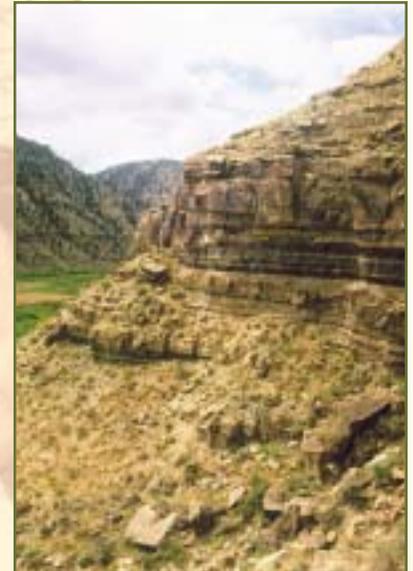


- | | |
|--------------------------|----------------------------------|
| Sandstone and grainstone | Red shale / silt |
| Green shale / silt | Carbonate mudstone / black shale |

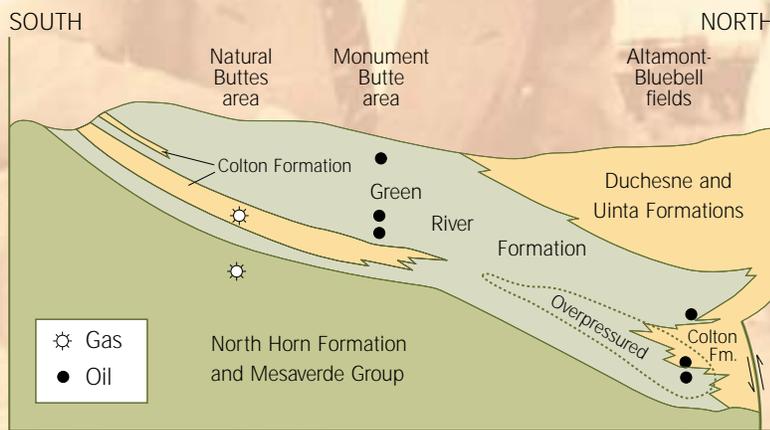
Uinta Basin fields



- Cumulative Production: 486 million bbls of oil, 1.9 tcf of gas.
- Types of Enhanced Oil Recovery Projects: waterflood in the Green River Formation.
- Major Pipelines: Chevron Pipe Line Co. (10" oil [2 lines]), Mid-America Pipeline System (10" LPG), Northwest Pipeline Co. (26" gas), Questar Pipeline Co. (16" and 20" gas).
- Land Ownership: 80% BLM, 7% National Forest, 6% Native American, 5% Private, 1% SITLA.
- Outcrop Analogs in Utah: Book, Roan, and Badlands Cliffs, and Raven Ridge.
- Utah Geological Survey Contact: Craig D. Morgan, ph.: (801) 537- 3370; e-mail: nrugs.cmorgan@state.ut.us.



Fluvial channel deposits, Green River Formation, Nine Mile Canyon



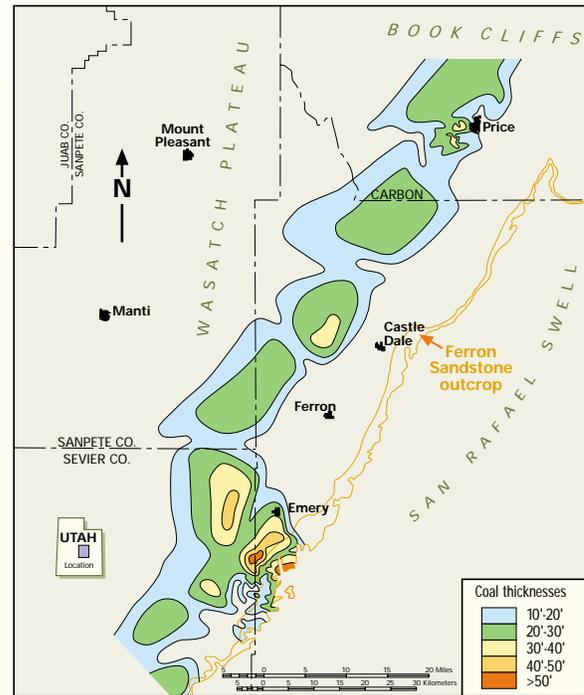
South-north cross section through Uinta Basin



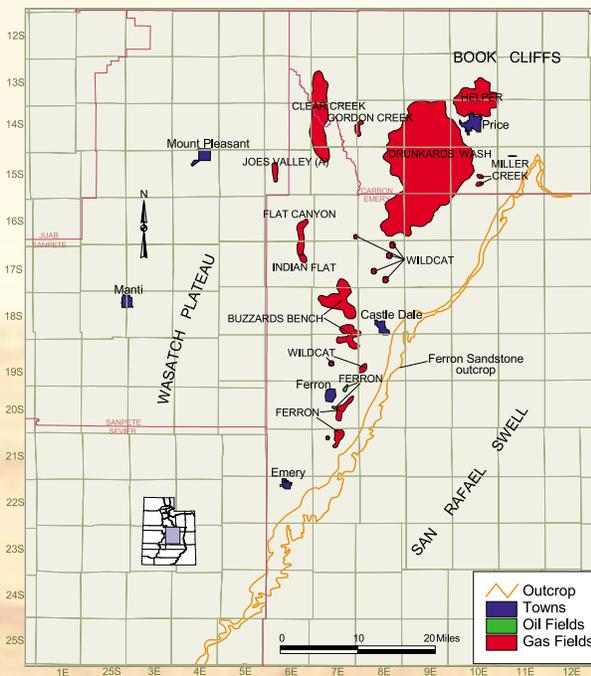
Red Wash field, Uintah County

Ferron Sandstone Coalbed Methane (CBM) Play

- Major Reservoirs: primarily coal, with some organic shale and sandstone beds in the Ferron Sandstone Member of the Mancos Shale.
- Trapping Mechanisms: self-sourcing reservoir beds with some secondary biogenic gas and some migrated gas trapped by updip stratigraphic pinchout of reservoir beds.
- Source Rocks: coal and organic shale beds in the Ferron Sandstone Member of the Mancos Shale.
- First Commercial Discovery: Drunkards Wash field, 1992.
- Number of Active Fields/Wells: 3 fields/ 452 wells.
- Recent Monthly Production: 0 bbls of oil, 7.0 bcf of gas.
- Cumulative Production: 0 million bbls of oil, 0.2 tcf of gas.



Total net coal in the Ferron Sandstone CBM play

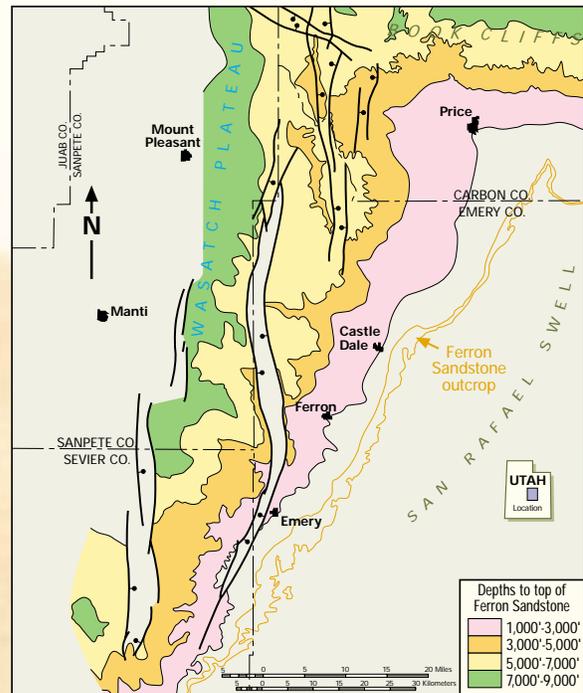


Fields in the Ferron Sandstone CBM play

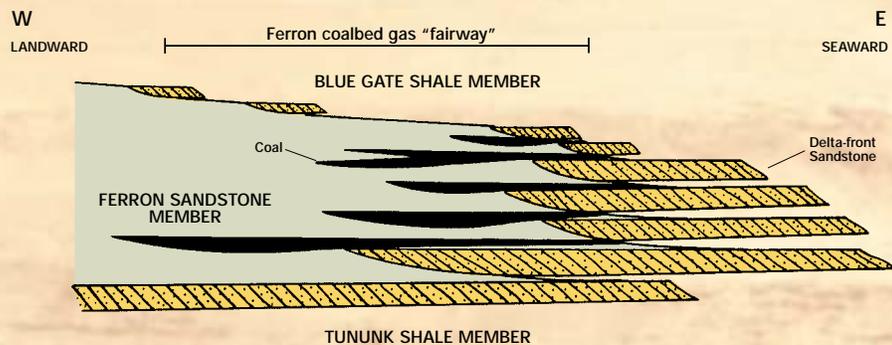
- Types of Enhanced Oil Recovery: none at present.
- Major Pipelines: Questar Pipeline Co. (6" and 20" gas)
- Land Ownership: 48% National Forest, 26% Private, 16% BLM, 8% SITLA, 1.2% State Wildlife Resources, <0.1% State Park.
- Outcrop Analogs in Utah: exposures of the Ferron Sandstone Member of the Mancos Shale along the western flank of the San Rafael Swell to the southeast of Emery, Utah.
- Utah Geological Survey Contact: David E. Tabet, ph.: (801) 537-3373; e-mail: nrugs.dtabet@state.ut.us.



The thick basal marine sandstone and the overlying shales, sandstones, and coals of the Ferron Sandstone as exposed near Emery, Utah



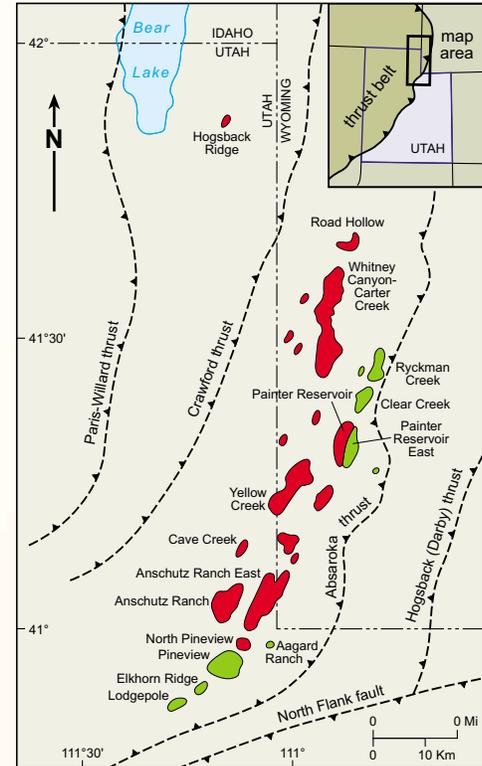
Depth of cover above the Ferron Sandstone CBM play



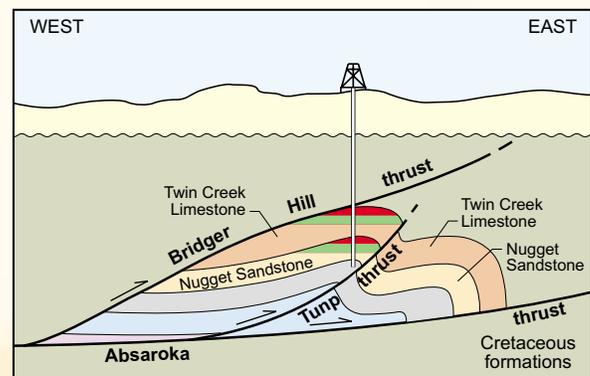
West-east cross section across the Ferron Sandstone CBM play

Thrust Belt

- Major Reservoirs: Mississippian Madison Group, open-marine to supratidal limestone and dolomite; Pennsylvanian Weber Sandstone, coastal eolian and littoral sandstone; Permian Phosphoria Formation, shallow marine limestone, dolomite, phosphatic shale, and chert; Triassic Dinwoody Formation, tidal-flat dolomite; Jurassic Nugget Sandstone, eolian dune sandstone; Jurassic Twin Creek Limestone, shallow marine limestone.
- Trapping Mechanisms: anticlines in the hanging walls of detached (not involving basement rocks) thrust systems, and untested subthrust structures (beneath detached and basement-cored faults).
- Source Rocks: Cretaceous Mowry Shale; possibly Permian Phosphoria Formation.
- First Commercial Discovery: Pineview field, 1975.
- Number of Active Fields/Wells: 10 fields/88 wells.
- Recent Monthly Production: 120,000 bbls of oil, 6.4 bcf of gas.
- Cumulative Production: 174 million bbls of oil, 3 tcf of gas.
- Types of Enhanced Oil Recovery Projects: gas re-injection to maintain pressure, horizontal drilling.
- Major Pipelines: BP Amoco (8" oil), Frontier Pipeline Co. (16" oil), Chevron Pipeline Co. (10" oil), Pioneer Pipeline Co. (8" oil), Phillips Pipeline Co. (6" oil, 6" products), Questar Pipeline Co. (24", 20", 18", 16" gas), Kern River Gas Transmission Co. (36" gas), Anadarko (10" hydrogen sulfide).
- Land Ownership: Statewide thrust belt - 52% BLM, 25% Private, 10% Military Reservations, 7% SITLA, 4% Forest Service, 1% Native American, 1% Wildlife Refuges; Northeast Utah - 71% Private, 16% National Forest, 6% BLM, 3% SITLA, 3% Wilderness, 2% Utah Division of Wildlife Resources.
- Outcrop Analogs in Utah: northern Wasatch Range, Crawford Mountains.
- Utah Geological Survey Contact: Thomas C. Chidsey, Jr., ph.: (801) 537-3364; e-mail: nrugs.tchidsey@state.ut.us.



Thrust belt fields



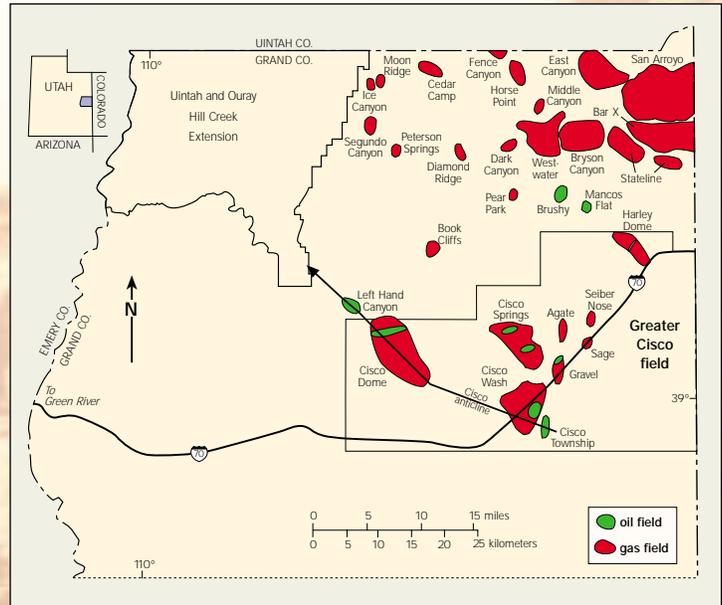
West-east structural cross section



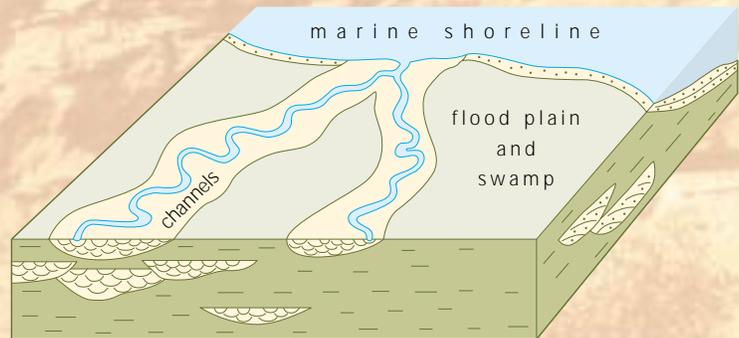
East-dipping Ogden thrust, Ogden Canyon

Uncompahgre Uplift

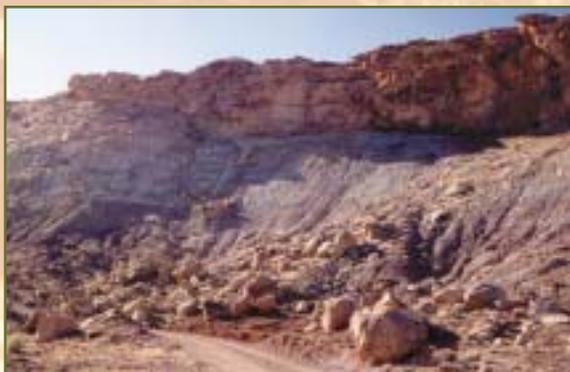
- Major Reservoirs: Cretaceous Dakota and Cedar Mountain Formations, fluvial and littoral sandstone; Jurassic Morrison Formation, fluvial sandstone; and Jurassic Entrada Sandstone, eolian sandstone.
- Trapping Mechanisms: combination structural and stratigraphic.
- Source Rocks: Cretaceous shale and possibly Permian and Pennsylvanian shale.
- First Commercial Discovery: Cisco Dome field, 1925.
- Number of Active Fields/Wells: 21 fields/ 539 wells.
- Recent Monthly Production: 6,076 bbls of oil, 4.4 bcf of gas.
- Cumulative Production: 3.6 million bbls of oil, 0.3 tcf of gas.
- Types of Enhanced Oil Recovery Projects: one waterflood unit (Calf Canyon) in the Cedar Mountain Formation.
- Major Pipelines: Northwest Pipeline Co. (26" gas), Mid-America Pipeline System (10" LPG).
- Land Ownership: 98% BLM, 1.6% Native American, 0.6% SITLA.
- Outcrop Analogs in Utah: Cretaceous and Jurassic outcrops south of the production area along the flanks of the Uncompahgre uplift.
- Utah Geological Survey Contact: Craig D. Morgan, ph.: (801) 537- 3370; e-mail: nrugs.cmorgan@state.ut.us



Uncompahgre uplift fields

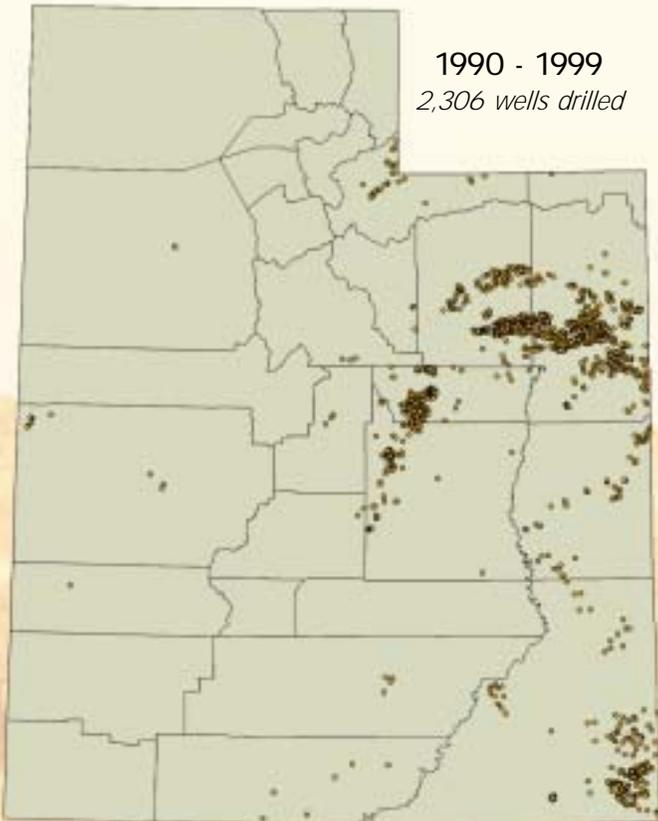
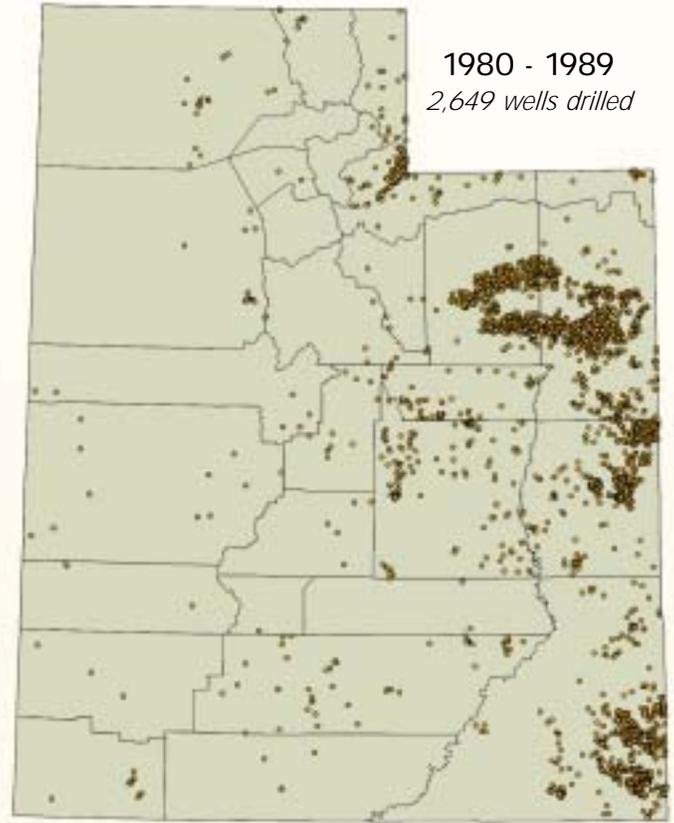
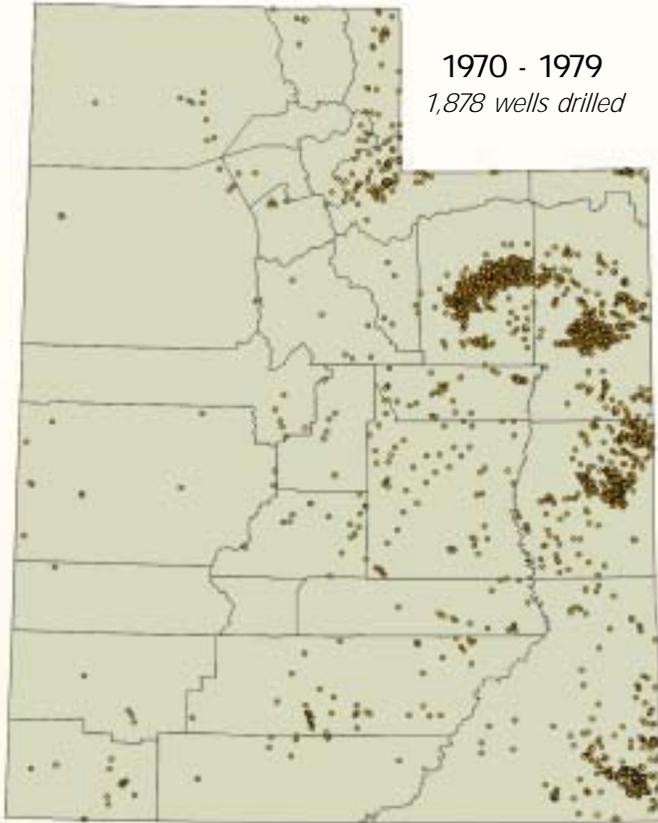


Dakota Sandstone depositional environments



Dakota Sandstone cutting into Cedar Mountain Formation

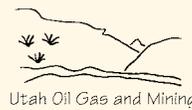
Drilling Permits Issued



Utah Geological Survey



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