REASONABLY FORESEEABLE DEVELOPMENT 2008-2027 OIL AND GAS ACTIVITES IN THE KREMMLING FIELD OFFICE JACKSON, LARIMER, GRAND, AND SUMMIT COUNTIES COLORADO

BLM Kremmling Field Office
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I. Executive Summary

A. Estimates of Future Activity

It is important to keep in mind that forecasting how much drilling activity could possibly occur in the next twenty years on federal, state, and private lands within Kremmling Field Office (KFO) boundaries is highly speculative. This forecast is primarily dependent upon access to the resource, technology, the economics of crude oil and natural gas development, national and global demand for crude oil and natural gas, and the discovery of additional oil and gas reserves in the area. All of these factors are subject to significant changes over time.

In preparation for this analysis, consideration was given to historical drilling activity, potential geologic occurrence of oil and gas, anticipated drilling and production constraints, and an industry development scenario.

The Kremmling Field Office encompasses 3.1 million acres of land located in north-central Colorado, primarily in Jackson, Grand and Summit Counties, but also includes small portions of Larimer, Routt, and Eagle, Counties. Approximately 2.6 million acres (84 percent) are federal mineral estate lands. Approximately 2.1 million acres or 80 percent of the federal mineral estate lands are available for oil and gas leasing. Approximately 204,000 acres, or slightly less than 10 percent of the lands available for leasing, are currently under federal oil and gas leases. Nearly 522,000 acres of federal mineral estate lands, including lands administered by Bureau of Land Management (BLM), United States Forest Service (USFS), United States National Park Service (USNPS) and United States Fish and Wildlife Service (USFWS), are not available for oil and gas leasing.

The KFO has a long history of oil and gas drilling and production activity, with nearly 675 wells having been drilled since the early 1920s. Many of these wells are located in the central portion of the KFO in the McCallum and surrounding fields. This drilling activity has been performed with a one-well-per-pad design and this design is expected to occur over the life of this forecast.

Crude oil and natural gas resources have long been known to exist in the geologic North and Middle Park Basins covering much of the KFO. However, past conventional exploration, drilling, and extraction technologies have not been successful in discovering and producing all the unique geologic features found in these basins. This factor combined with the historic low prices and demand for crude oil and natural gas means this notable reserve has remained essentially untapped. Only in the past several years has new exploration and drilling techniques combined with a much greater demand for and price of crude oil and natural gas stimulated significant interest by the energy industry in developing these resources. There have been many recent expressions-of-interest for the leasing of the federal mineral estate.

Niobrara Formation

A Niobrara Formation play for crude oil located in North Park is in the early stages of exploration and actual production information from the operator is limited. The Niobrara play is in an area located about three miles southeast of the town of Coalmont. The exploration company has received from the COGCC the designation of ten drilling and spacing units sized to accommodate future multi-leg horizontal well bore systems. Early reports from the Oil and Gas Journal (February 29, 2008) are that a 4,000-foot lateral well encountered an average sustained production rate of 320 barrels of oil per day (BOPD) over a 30-day period.

Exploratory activity in the Niobrara Formation will be marginal at first due to the nature of the reservoir and the lack of an oil pipeline out of North Park but may well increase depending on the outcome of recent exploration activities. It is anticipated that about 10 wells will be drilled per year for the first five years and 184 wells drilled over the next 15 years, or 234 wells over the next 20 years. Initially, these wells will be drilled in and around the Coalmont area and may expand to other areas in North Park. Sixty percent of these wells, or 140 wells, will be drilled to the federal mineral estate or involve the federal mineral estate within a drilling and spacing unit.

Production facilities for the Niobrara Formation play will consist of separators, treaters, onsite flow lines, and production tanks. The size of the production tanks will depend on the oil production volumes and method of disposal of the produced waters.

Coalbed Methane

The KFO also has extensive coal with the potential for coalbed methane (CBM) development. There has been some targeted CBM development within the KFO although nothing promising has been encountered. The restricting factors for CBM development are the occurrence of insufficient coal gas content, gas pipeline take-away capacity and, if extensive volumes of water are found, the disposal capability for this water.

Exploration activities for CBM will occur sporadically with about two pilot projects of five wells each for every 5 years over the life of this forecast resulting in about 40 wells. These wells will be drilled in areas where the Coalmont Formation is shallow and thick, namely in the North Park area in Jackson County. The amount of CBM drilling on the federal mineral estate is anticipated to be roughly 10 wells.

Production facilities for CBM wells are usually simple in design since gas production does not involve much equipment. However, if large volumes of water are produced and the disposal methods for this water limited, then the pad size will increase. Pad sizes may range from less than an acre to over four acres if water tanks and produced water hauling are required.

Granby Anticline

A few decades ago wells were drilled around the area of Granby on the Granby anticline. Gas was discovered in the Niobrara and Frontier Formations but at the time determined to be uneconomic. Times and economics have changed and the possibility exists for these

resources to again be rediscovered. It is estimated that approximately four wells every five years will be drilled for a total of 16 wells over the life of this forecast. About 12 of these wells will be drilled on the federal mineral estate. Production facilities for wells drilled in and around Granby will be typical for gas wells with minimal produced water handling requirements.

McCallum and South McCallum Infill

Proposals for infill development in the existing McCallum and South McCallum fields are anticipated to average about two wells per year or 40 new wells over the next 20 years. However, the operator has estimated that almost an equal number of wells would be abandoned. Since both these fields are under federal unit agreement supervision, federal involvement will occur with all the development wells. Full BLM and USFS involvement on the federal mineral leases, including drilling and surface use approvals will occur for about 15 of these wells.

Other Infill

Infill development for the other fields in the KFO is expected to result in about half as many wells as that for the McCallum and South McCallum fields, or about 20 new wells over the next 20 years. None of these fields are under federal unit jurisdiction and little federal mineral estate lands occur in these fields. Approximately five wells will be drilled on the federal mineral estate.

Very limited drilling is expected to occur on USFS lands due to the low potential for hydrocarbons occurring in these portions of the KFO and the lack of hydrocarbon shows and success in past drilling activities.

Wildcat Wells

Exploratory (wildcat) activities for crude oil and natural gas found in the Pierre Shale, Frontier, Muddy, Dakota, Lakota, and Morrison formations will occur in unidentified areas within the boundaries of the Kremmling Field office. Oil and gas shows have been recorded in most parts of the Field office but the extent of these resources is unknown. It is anticipated that approximately one rank wildcat well per year will be drilled for a total of 20 wells, with half of these wells drilled on the federal mineral estate (10 wells).

Pipeline Capacity

A major difficulty in the thorough development of any gas resource in the North and Middle Park Basins is the lack of pipeline take-away capacity. If ample oil and gas resources are discovered by a number of operators on sufficient acreage, then it would not be difficult for these operators to develop the necessary pipeline capacity with numerous interstate pipelines existing nearby in southern Wyoming. Considering the projected moderate productive capability of natural gas wells in North and Middle Park Basins, a significant number of natural gas wells would be required to justify installation of a pipeline.

If installation of a transmission pipeline is determined feasible, the infrastructure may include a pipeline approximately 65 miles in length (22 miles in Colorado) out of North

Park Basin connecting to the existing southern Wyoming pipelines, a compressor station, and a small gas plant, depending on the constituents of the produced gas.

Future Activity

The overall potential exploration and development activity within the KFO for the period 2008 - 2027 could fall within a range of zero to 370 wells (Table 1). Of the 370 wells, 192 will be drilled on the federal mineral estate. The upper range forecast encompasses all activity, including wildcat, exploratory, and development wells on private, state, and federal mineral estates; the assumption that minimum protection for other resources will be imposed on federal leases; and all potentially productive lands (sans those off-limits to leasing) are leased and developed to the maximum possible extent. This is done to ensure an adequate analysis in the Resource Management Plan (RMP) of the tradeoffs between enhanced protections for other resources and the corresponding impacts to oil and gas extraction.

Table 1: Future Anticipated Drilling Activity by Situation

Situation	Total Wells	Federal Wells
Coalmont Niobrara	234	140
CBM	40	10
Granby Anticline	16	12
McCallum and South McCallum Infill	40	15
Other North and Middle Park Field Infill	20	5
Rank Wildcats	20	10
Total	370	192

B. Estimates of Surface Disturbance

A total of 370 well pads are projected to be constructed over a period of 20 years to develop the natural gas resource to the maximum extent, while protecting other resource values. Since approximately five percent of surface disturbance would occur on private surface overlying the federal minerals, 182 well pads are projected to be constructed on federal surface lands and 188 well pads on fee surface lands. Because 10 of the 192 federal wells are predicted to be drilled from non-federal surface, there would be fewer federal well pads than federal wells. (No wells are projected to be drilled on State of Colorado lands due to the limited acreage that exists). With this level of projected activity, a cumulative total over 20 years of 2,960 new acres of associated surface disturbance (construction of well pads, roads, gas plants, flowlines, and other infrastructure) could be expected.

However, not all this activity will occur at once. Old wells will be plugged and interim reclamation will occur on active well pads. The anticipated new total surface disturbance is expected to rise from a base level in 2008 of approximately 1,350 acres to about 4,310 acres in 2027. The associated surface disturbance for this level of activity is significantly less than one percent of the total surface land base in the KFO. The overall range of potential development activity within the KFO for the period 2008 to 2027 could fall within a range of between no new wells to 370 wells and 1,350 to 4,310 acres of associated surface disturbance.

II. Introduction

A. Geographic Description of the Study Area

The BLM's Kremmling Field Office area of jurisdiction encompasses a total of 3,117,640 acres across portions of six counties (Larimer, Jackson, Routt, Summit, Grand, and Eagle, Counties) in northern Colorado (Map 1). The federal government holds roughly 65 percent of the surface land ownership in the KFO (Table 2). These federal lands are administered by the BLM, USFS, USFWS, and USNPS. Combined state, county and other surface ownership comprises less than eight percent of the field office area, while private ownership accounts for the remaining 27 percent of the surface land. Most private land ownership occurs in the North Park and eastern Middle Park areas.

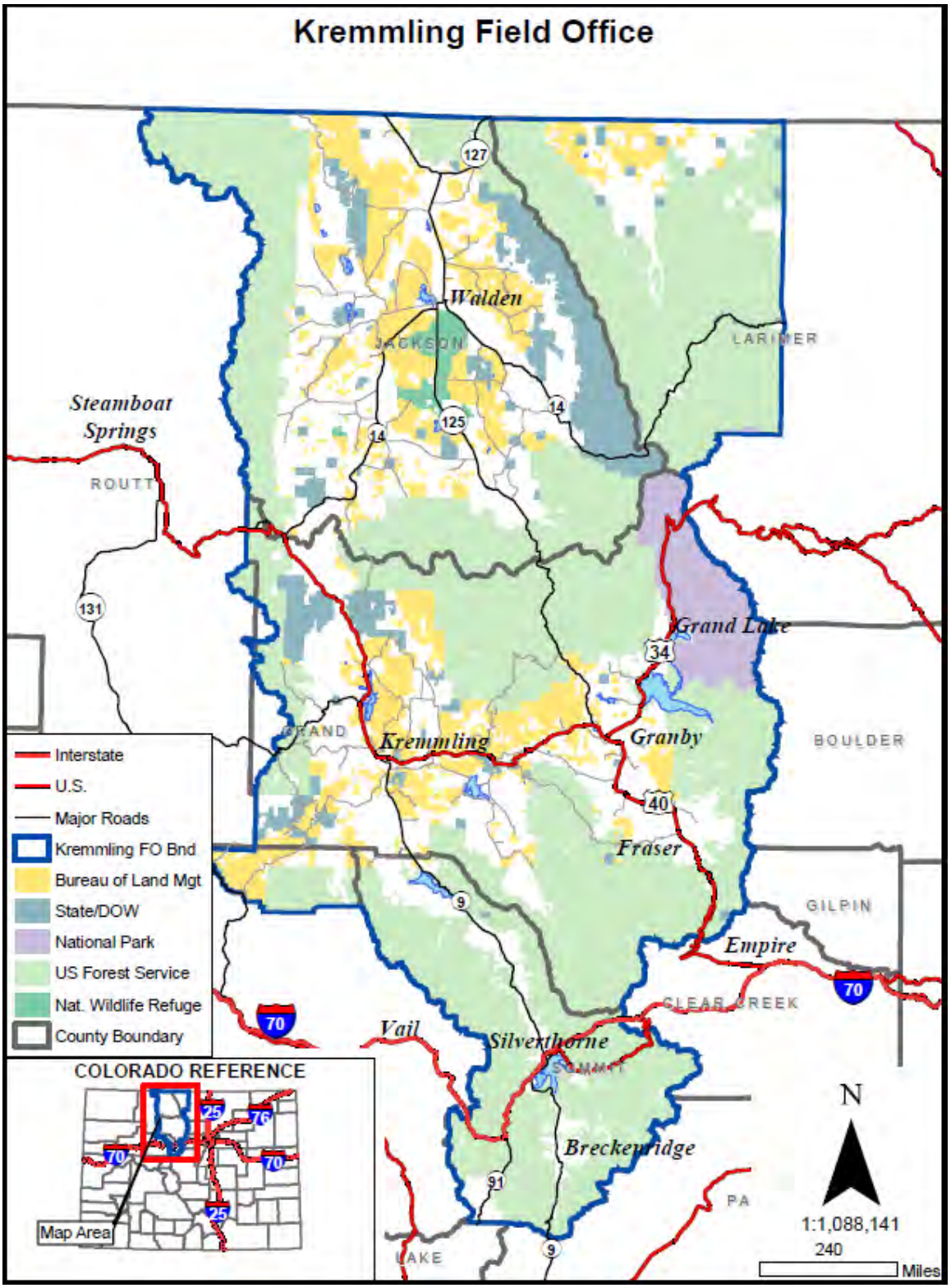
Federal oil and gas mineral estate lands comprise over 83 percent of the KFO (Map 2, Table 2). This percentage is slightly higher than the federal surface land area figure due to the inclusion of split estate acreage. The actual amount of "leasable" federal oil and gas mineral estate, however, is somewhat lower. More specifically, only 80 percent of the KFO is available to oil and gas exploration and development on federal lands after the deduction of several "no lease" statute lands such as the Rocky Mountain National Park, Arapaho National Wildlife Refuge, several USFS Wilderness Areas, the BLM Troublesome, North Sand Hills, and Platte River Contiguous wilderness study areas, and two BLM Special Recreation Management Areas: Upper Colorado River and North Sand Hills. The BLM and USFS manage oil and gas operations occurring on the federal "leasable" mineral estate.

About 10 percent of the "leasable" federal mineral estate in the KFO is currently leased (Map 2). Approximately 37percent of BLM's "leasable" oil and gas mineral estate in the KFO (Table 2) is currently leased. Given the amount of leased public lands in the field office, the forecasting of oil and gas exploration and development activities is crucial to the future management of the multiple resources in the region.

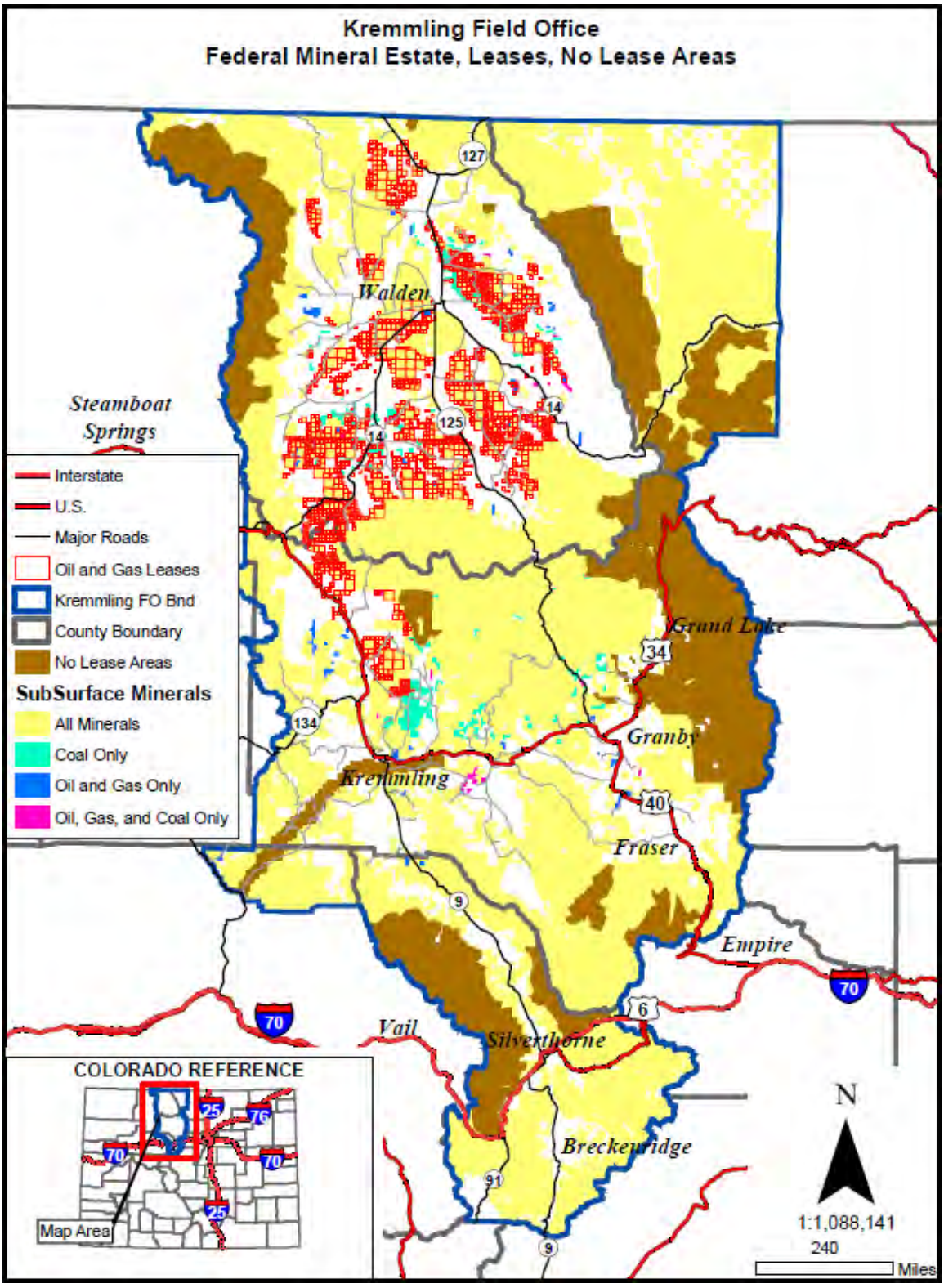
Table 2: Kremmling Field Office Surface Land Status and Federal Oil and Gas Mineral Estate

KFO Total Area (surface acres) (Note: All figures are estimated acres. Acreages may not total due to the use of different data sources.)	3,117,640
Surface Estate Status	
Bureau of Land Management	378,494
U.S. Forest Service	1,556,032
U. S. Fish and Wildlife Service (Arapaho NWR)	23,471
U.S. National Park Service (Rocky Mountain N.P.)	97,500
Arapaho National Recreation Area	34,626
State of Colorado, Land Board	94,801
State of Colorado, State Forest	73,595
Colorado Division of Wildlife	19,811
Private	839,310
Federal Mineral Estate Status Under All Surface Owners	
Federal Oil and Gas Mineral Estate	2,604,155
Non-Federal Oil and Gas Mineral Estate	513,719
Federal "No Lease" Oil and Gas Mineral Estate	576,468
BLM[1]	29,590
USFS Wilderness Areas	395,490
Arapaho National Recreation Area	34,626
USNPS Rocky Mountain National Park	93,538
USFWS Arapaho National Wildlife Refuge	23,242
Federal "Leasable" Oil & Gas Mineral Estate	2,027,699
Currently Open Acreage	1,816,817
Currently Leased Acreage	210,852
Federal Mineral Estate Under BLM-Administered Surface	
Oil and Gas Mineral Estate	346,093
“No Lease” Areas	29,590
"Leasable" Oil and Gas Mineral Estate	316,503
Acreage Currently Open to Leasing	194,824
Acreage Currently Leased Under BLM-administered surface	121,679
1 – BLM Wilderness Study Areas and Special Recreation Management Areas	

Map 1: Kremmling Field Office Base Map



Map 2: Kremmling Field Office Federal Mineral Estate, Current Leases, and No-Lease Areas



B. Purpose of the RFD

This Reasonably Foreseeable Development (RFD) scenario projects the maximum levels and types of industry activity, and the associated surface disturbance that might occur on all land ownerships in the KFO during the twenty year period from 2008 through 2027. The RFD scenario uses the following key assumptions: 1) all potentially productive areas, except those areas designated as closed to leasing by law, regulation or executive order, are open to leasing and development; and 2) for the federal mineral estate only standard lease terms and conditions would be imposed. These assumptions, while unrealistic, are necessary to project the maximum potential levels of development activity for environmental analysis purposes. Through the land use planning and NEPA processes, the BLM will ultimately determine how much and when federal mineral estate lands are made available for oil and gas development and will require specific lease stipulations and conditions of approval (COA) that will protect other resource values.

The RFD scenario provides the data to be analyzed under the various alternatives proposed in the Kremmling RMP Revision and associated Environmental Impact Statement (EIS). This analysis will disclose the potential impacts that a full range of development scenarios and discretionary management actions would have on projected oil and gas activity. The final decision for the RMP Revision will determine the appropriate balance of protecting other resource values, such as wildlife habitat, public health and safety, and local community concerns with the need to meet Congressional and Presidential mandates and the nation's energy demands.

Forecasting how much drilling activity that could possibly occur in the next 20 years on federal, state and private lands within KFO's boundaries is largely speculative. The forecast is primarily dependent upon access to the resource, technology, the economics of crude oil and natural gas development, national and global demand for crude oil and natural gas, and the discovery of additional oil and gas reserves in the area.

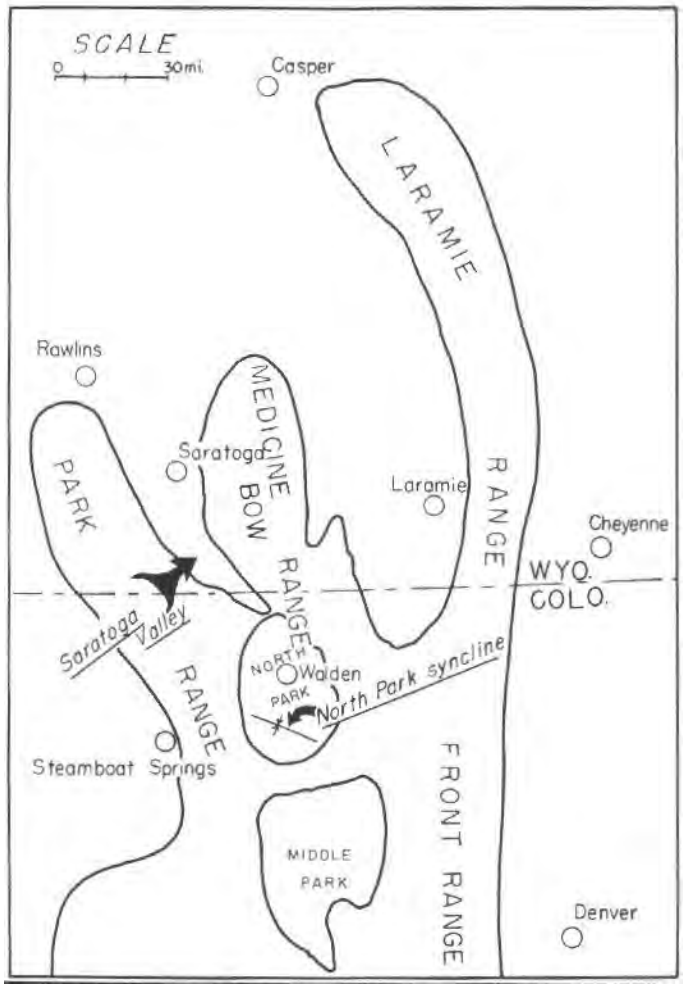
III. Description of Geology

A. General Geologic Description of North and Middle Parks

The Kremmling Field Office area comprises the geographic features of North and Middle parks in Jackson, Grand, and Summit counties, and the northeast corner of Eagle County. Geologically, "North and Middle Parks together constitute an intermontane basin between the Laramide Medicine Bow and Front Ranges on the east and the Park Range on the west (Map 3). The basin is on the site of a part of the late Paleozoic Front Range highland and constitutes synclinal sag between the Laramide uplifts on the other parts of the same old highland. Triassic or Jurassic rocks lie on Precambrian rocks in most of the basin. The Mesozoic rocks were deformed and severely eroded at an early stage in the Laramide, before deposition of the orogenic Middle Park Formation in Middle Park and Coalmont Formation in North Park. In both parks, the upper part of the Pierre shale, the Fox Hills Sandstone, and the Laramie Formation are missing beneath the unconformity at the base of the Middle Park and Coalmont Formations. In southern Middle Park, the

Middle Park Formation extends across truncated Mesozoic formations from Pierre Shale down to Precambrian rocks. In North Park, the Coalmont Formation lies on very uneven surface cut on Mesozoic and Precambrian rocks. In both parks, the deformation that preceded deposition of the Middle Park and Coalmont Formations was followed by thrusting and folding that involved these formations. In addition, the Coalmont, which may reach a thickness of 10,000 feet (3,050 m), contains an uneven unconformity between a Paleocene lower part and a lower Eocene upper part. The Middle Park and Coalmont record the uplift of the adjoining Medicine Bow, Front, and Park Ranges and the erosional stripping of the former sedimentary cover and of early Laramide volcanics that blanketed part of the Front Range." (Tweto 1980) Stratigraphic columns of North and Middle Park basins are shown in Figure 1; Figure 2 shows the structure top of the Dakota Formation in Middle and North Park.

Map 3: Geologic Basins and Ranges of the Kremmling Field Office



(de la Montagne, John, Barnes, W.C., 1957)

Figure 1: Stratigraphic Column (Wandrey, C.J., Barker, C.E., 1995)

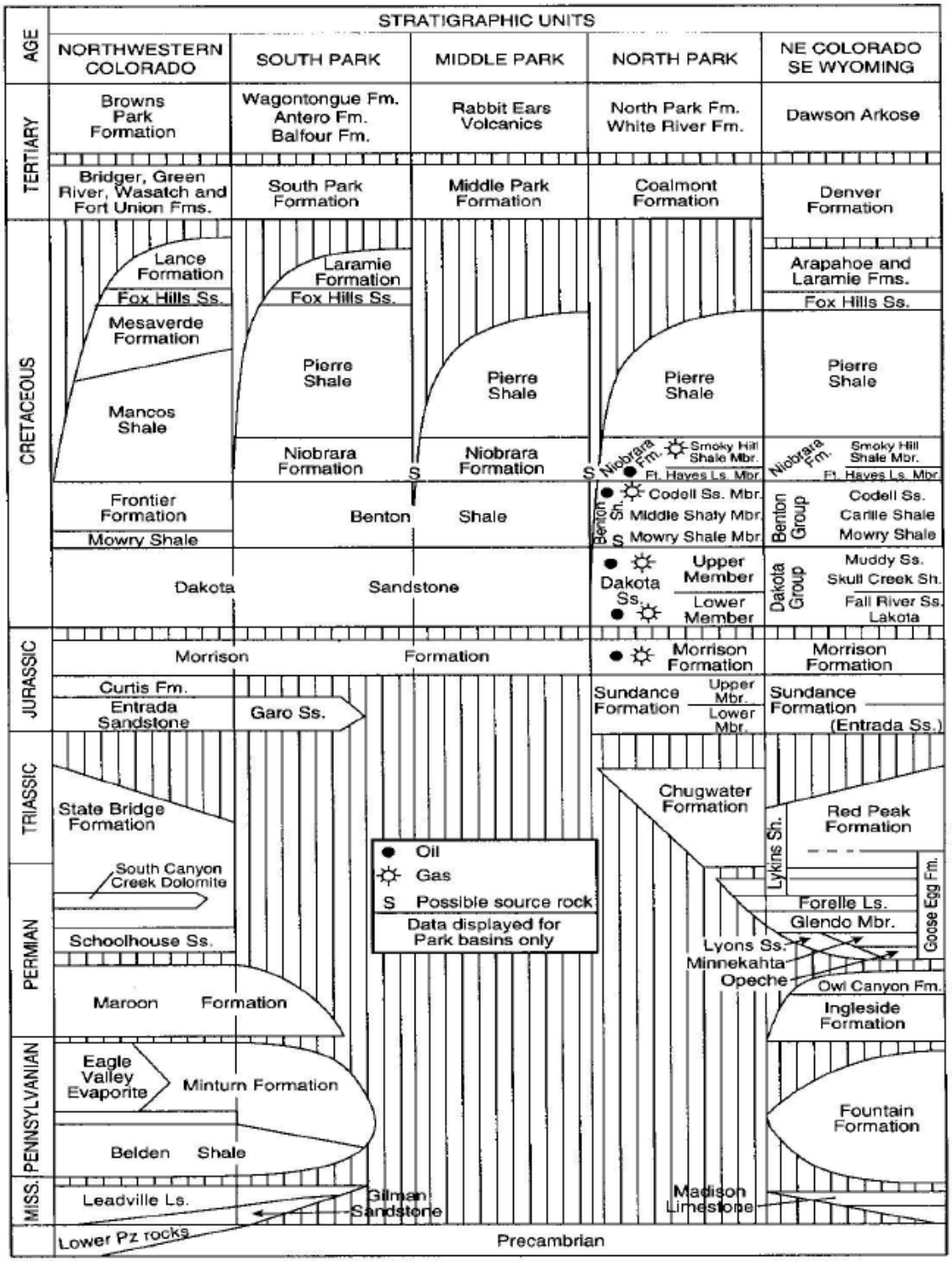
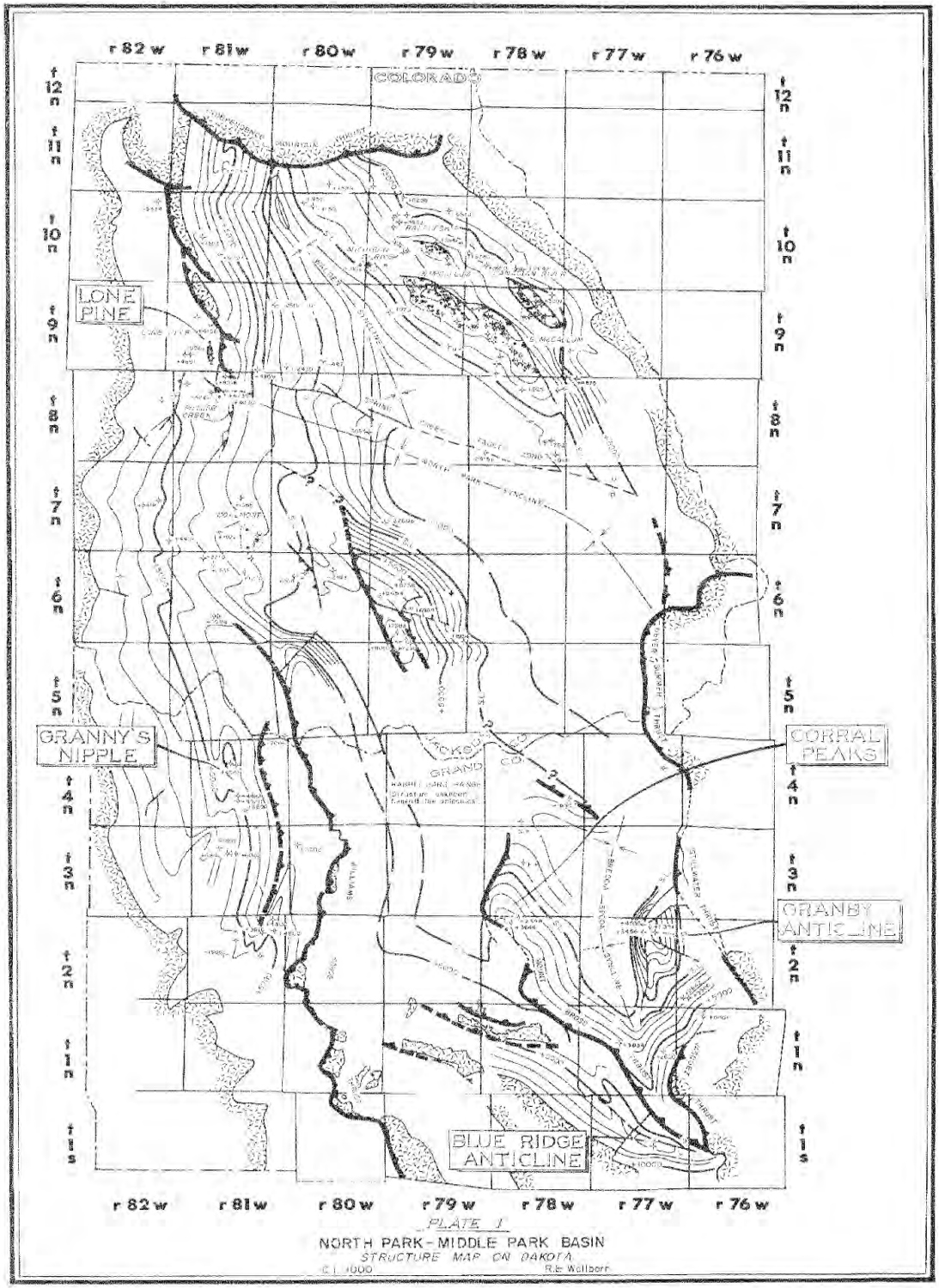


Figure 2: Structure Map on the Dakota Formation – Middle and North Park (Wellborn, R.E., 1977)

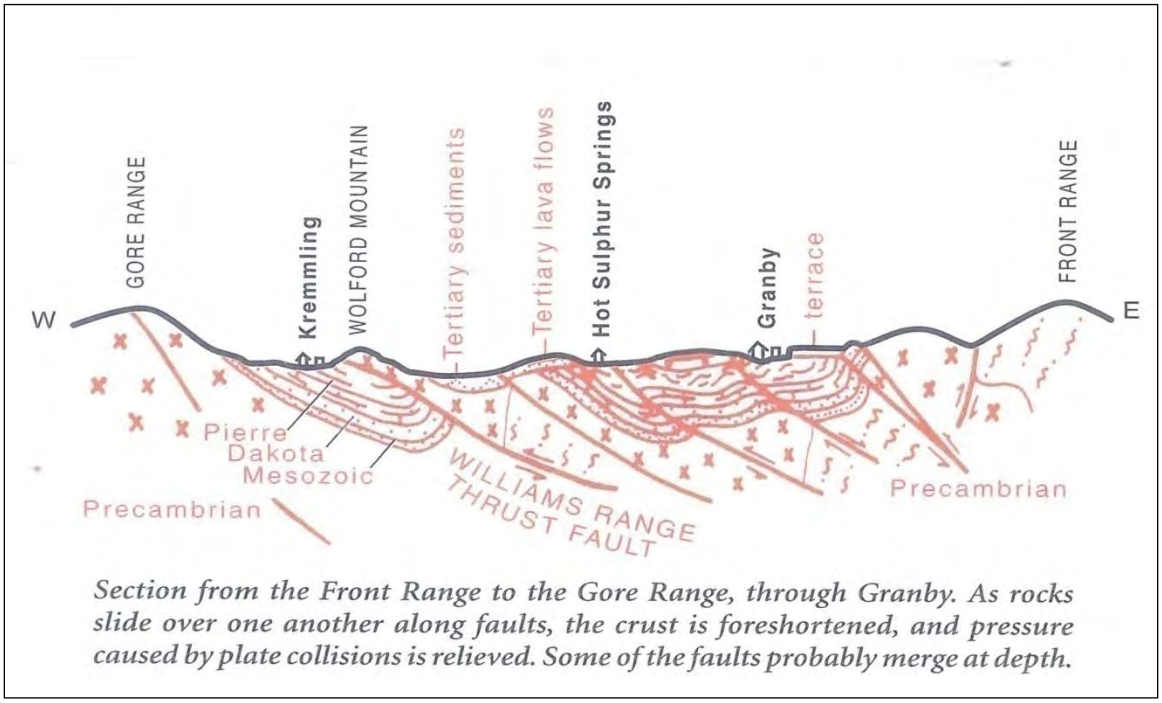


B. Petroleum Geology of the Kremmling Field Office

1. General Geology of Grand and Summit Counties

Grand and Summit Counties lie between and include parts of the Front Range and Gore Range of north-central Colorado. Much of Grand County includes areas of Mesozoic sedimentary and Tertiary volcanic and volcaniclastic rocks in Middle Park, a broad synclinal region and intermontane basin bounded by faults. The core of the mountain ranges consists of Proterozoic igneous and metamorphic rocks, which are overlain by Mesozoic sedimentary formations, of which the oldest Mesozoic formation is the Triassic Chinle Formation. Tertiary rocks include rhyolitic and basaltic volcanic flows and volcaniclastic sedimentary formations. Quaternary gravel deposits are found in the Colorado River and the Blue River drainages. The Front Range marks the eastern boundary of the Middle Park and the area of Summit County covered in this report. The western edge of the Front Range is bordered by regional westward-directed thrust faults. In Middle Park these thrust faults are known as the Vasquez and Stillwater Faults. The Gore Range forms the western border range of Middle Park and is a broadly anticlinal range bordered by faults. In particular, the western edge of the Gore Range is bounded by the Mosquito Fault, a westward dipping normal fault with over 5,000 feet of displacement (Figure 3).

Figure 3: Schematic Cross-section of Lower Middle Park (Chronic, Halka, Williams, Felicie, 2002)



Section from the Front Range to the Gore Range, through Granby. As rocks slide over one another along faults, the crust is foreshortened, and pressure caused by plate collisions is relieved. Some of the faults probably merge at depth.

a. Oil and Gas Resources

There are no oil and gas fields in Grand or Summit County. There are several areas in Grand and Summit Counties where favorable structures exist and numerous wildcat wells have been drilled targeting the Mesozoic rocks. The best result has been uneconomic hydrocarbon shows. This includes tests along the Granby anticline, a feature just west of the town of Granby that trends North-South. With modern completion techniques, the potential for economic oil and gas may exist in this area.

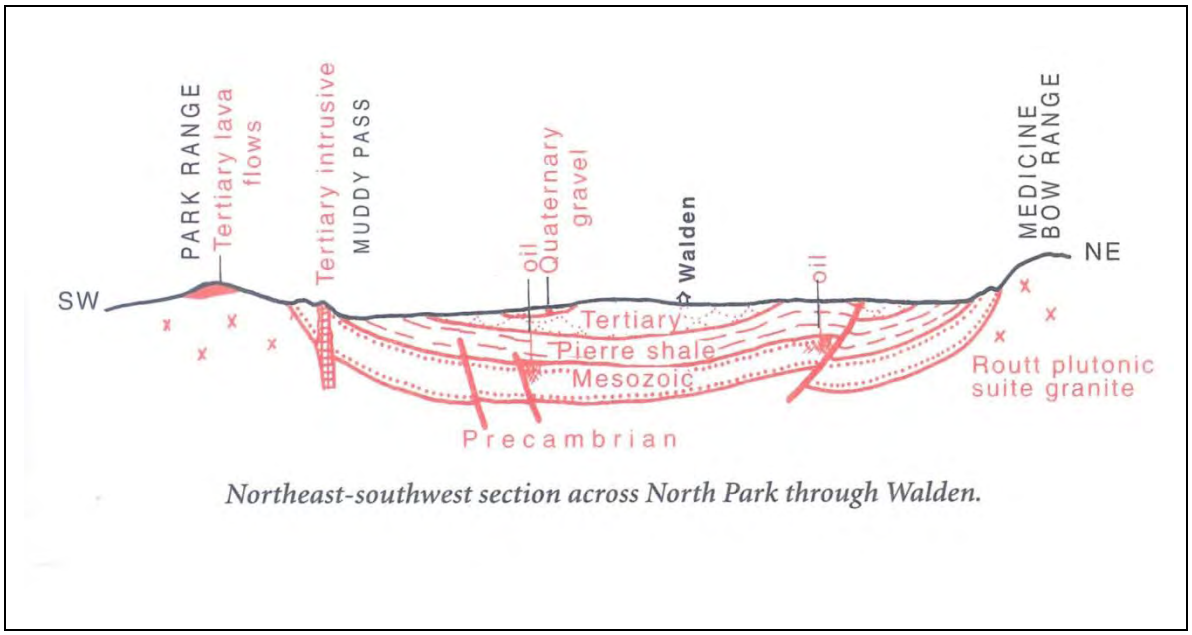
b. Coal Resources

There are no known coal-bearing strata in Grand or Summit County. Coal bearing strata of the Coalmont Formation occur just to the north in Jackson County. (Cappa, J., Hemborg, H.T., Coursey, R.G., 2001)

2. General Geology of Jackson County

Jackson County lies between the Park Range on the west, the Independence Mountains and Medicine Bow Mountains on the north, and the Front Range on the east. Much of the county includes the North Park Basin, a Laramide-age basin with several west–northwest to north-northwest trending faults and anticlines. The Independence Mountain thrust fault trends mostly east-west and provides structural closure to the basin on its north end. The mountain ranges are composed of Precambrian igneous and metamorphic rocks. Permian through Mesozoic age sedimentary rocks overlie the Precambrian rocks around the edge of the North Park Basin. The vast area of the North Park Basin is covered with the early Tertiary sediments of the Coalmont and North Park formations. Quaternary gravel deposits are found throughout the North Park Basin especially along the drainage system of the North Platte River. Eolian sand deposits in large dunes occur along the eastern edge of the basin (Figure 4).

Figure 4: Schematic Cross-section of Upper North Park (Chronic, Halka, Williams, Felicie, 2002)



a. Oil and Gas Resources

i. Structural and Stratigraphic Controls on Production

Jackson County contains North Park Basin, a Laramide-age structural basin that plays a major role for hydrocarbon prospects. The extent of the basin was a positive structural feature along with Middle and South Park basins through much of the Paleozoic and developed into an elongated basin during the Late Cretaceous-Tertiary Laramide Orogeny. North Park is separated from the Middle Park Basin by Late Mesozoic and Tertiary intrusives. High-angle reverse faults on the east and high-angle normal faults on the west characterize the basin margins (Wandrey, C.J., Barker, C.E., 1995).

The first discovery was made in the McCallum Field in 1926 with the drilling of the Continental Oil Company's Sherman A-1 discovery well on the North McCallum Anticline. The well produced an estimated 500 barrels of 46º API gravity condensate per day and 30 MMcf of CO_2 until it was abandoned in 1943 (Wandrey, C.J., Barker, C.E., 1995). Faulted basin-margin anticlines of the North Park Basin in Jackson County account for all of the commercial production of oil, gas, and CO_2.

The Lone Pine Field is an example of production from a faulted basin-margin anticline. The field was discovered in 1971 and has produced a significant amount of oil and gas. The field sits on top of a tightly folded, complexly faulted anticline with 24º to 45º dips on the eastern flank and 45º to 60º dips on the western flank (Wellborn, 1982d). The field produces from the Lower Cretaceous Lakota Formation that has a 350-foot oil column with an average porosity of 18 percent (Wellborn, 1982d). Structural plays account for the majority of production in Jackson County although stratigraphic traps controlled by onlap and porosity pinchouts may be present. The best results from the three Laramide-age basins come from North Park Basin where the Cretaceous section is thickest and burial was deepest. The two types of plays that exist in Jackson County are the Cretaceous-Upper Jurassic Structural Play and the Subthrust Play (Wandrey and Barker, 1996). A listing of oil and gas fields in Jackson County can be found in Table 3. Maps 4 and 5 graphically display the fields and wells.

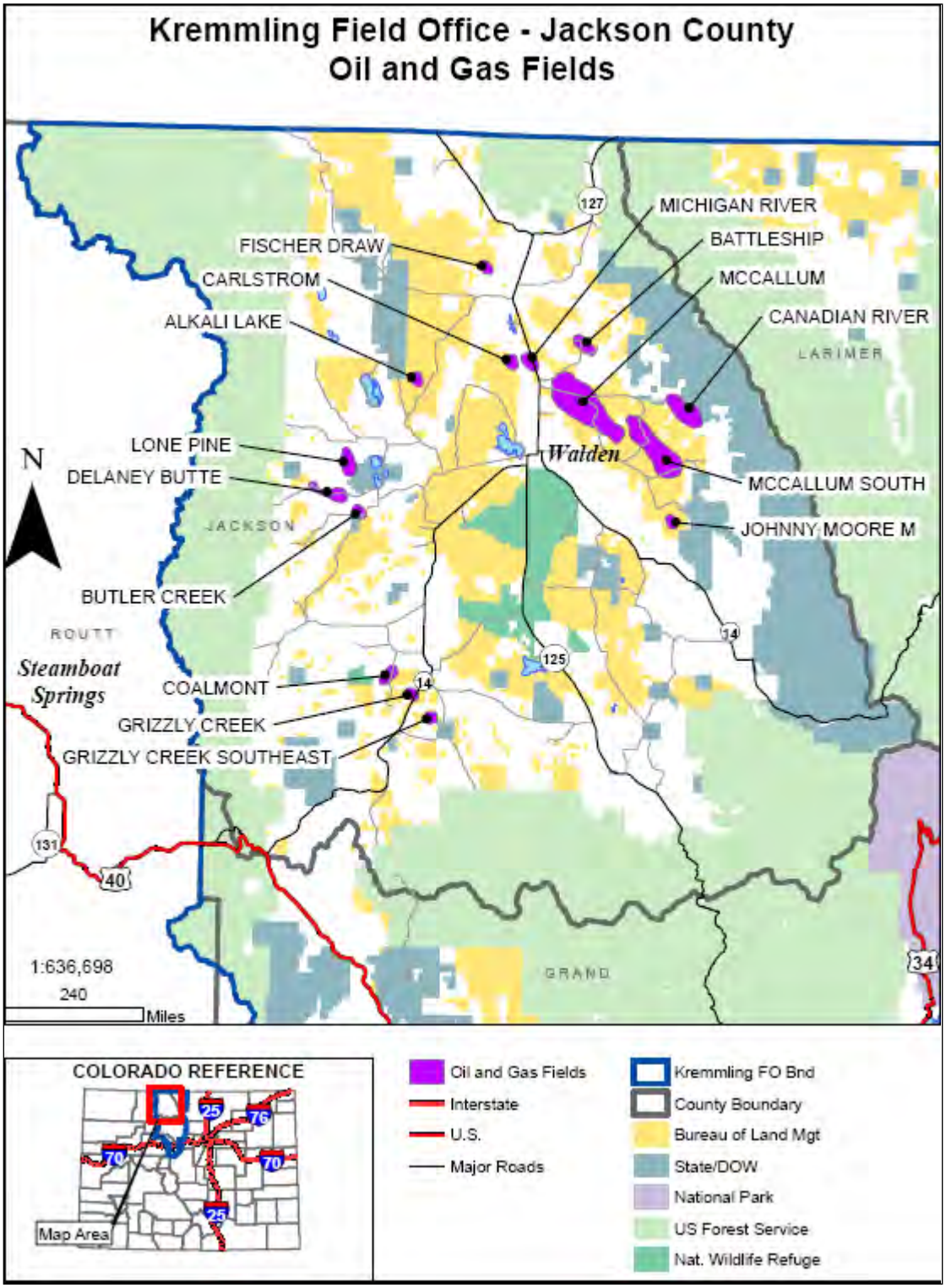
Table 3: Oil and Gas Fields of Jackson County

Field Name	Approximate Location (Township-Range)	Field Type
Grizzly Creek	6N-80W	Oil
Grizzly Creek S.E.	6N-80W	Oil
Coalmont	7N-81W	Oil
Johnny Moore Mountain	8N-78W	Oil
Butler Creek	8N-81W	Oil
Delaney Butte	8N-81W	Oil
Canadian River	9N-78W	Gas
South McCallum	9N-78W	Carbon Dioxide
McCallum	9N-79W	Carbon Dioxide/Oil
Lone Pine	9N-81W	Oil
Carlstrom	10N-79W	Oil
Michigan River	10N-79W	Oil
Battleship	10N-79W	Oil
Alkali Lake	10N-80W	Oil
Fischer Draw	11N-80W	Oil
Source: Colorado Oil and Gas Conservation Commission, 11/2007		

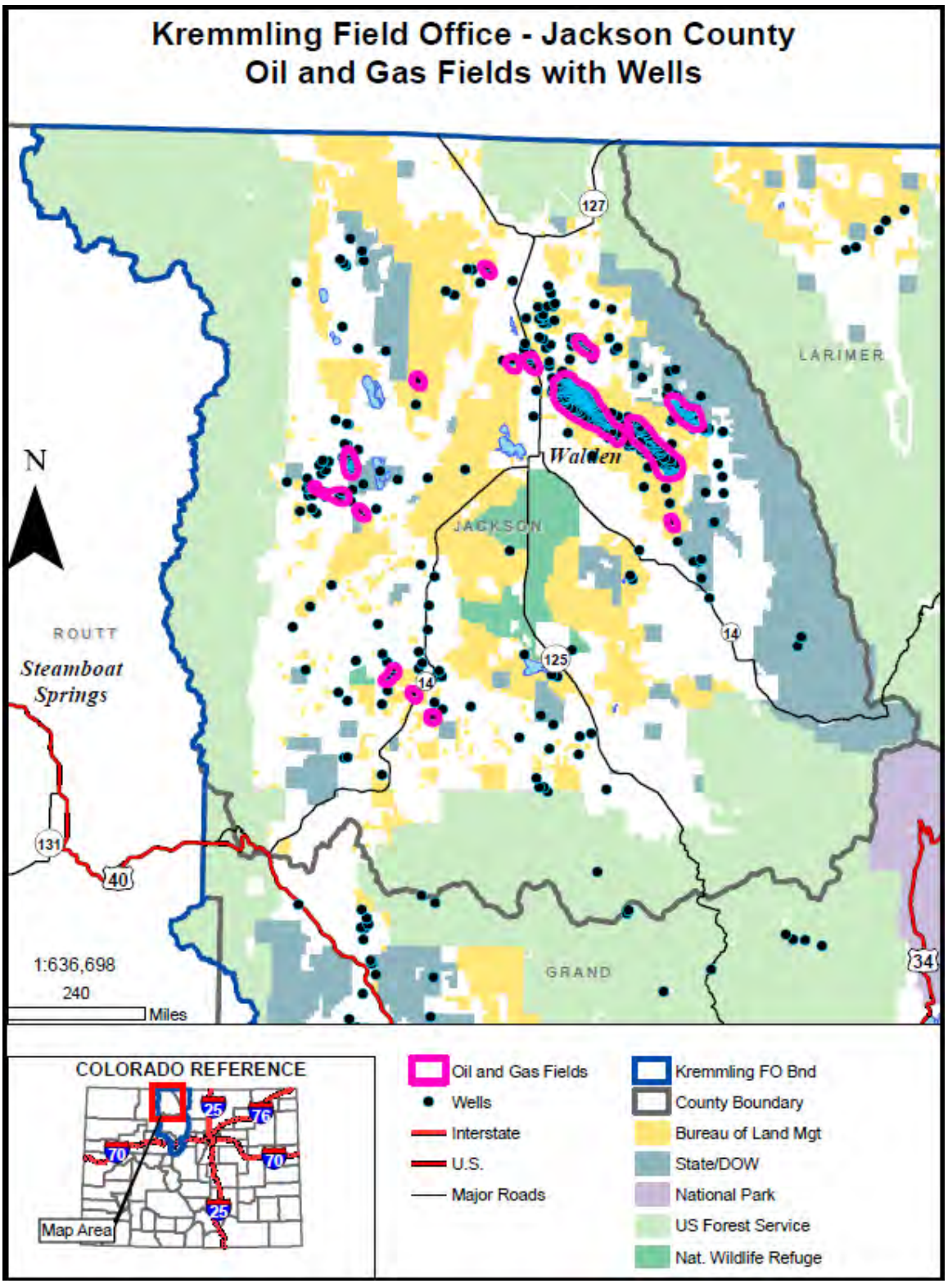
ii. Cretaceous-Upper Jurassic Structural Play

Late Laramide thrusts formed north-south-trending, faulted basin-margin anticlines in North Park Basin. Most surface structures have been tested with production from these structures and account for virtually all of the oil and gas production in Jackson County. All of the fields contain a structural component even though some may exist in combination with stratigraphic traps. Upper Jurassic through Cretaceous strata are the main reservoirs for these plays.

Map 4: Oil and Gas Fields of Jackson County



Map 5: Oil and Gas Fields of North Park With Wells



The volcanic fields that separate North and Middle Park basins may conceal similar traps, but no wells have produced from beneath these fields. The reservoirs identified by the United States Geological Survey (1996) that produce from this play are the Upper Jurassic Morrison, the Lower Cretaceous Dakota, Lakota and Muddy Sandstones and the Middle to Upper Cretaceous Frontier, Niobrara and Pierre formations.

Upper Jurassic Reservoirs: The Morrison Formation consists of alluvial and lacustrine mudstone, siltstone, limestone, and sandstone. Reservoir thicknesses range from 15 to 140 feet with porosity averaging 15.7 percent and permeability averaging 31 millidarcies.

Lower Cretaceous Reservoirs: The Dakota Sandstone is the most prolific reservoir. It consists of intertongued beds of fluvial shoreline sandstone, conglomeratic sandstone, carbonaceous siltstone, claystone, and occasional thin coals. Thicknesses average 25 to 40 feet. Porosity and permeability values average 18 percent and 70 millidarcies, respectively. The Lakota Sandstone is a buff, medium- to coarse-grained sandstone and conglomerate. Reservoir thickness averages 70 feet and porosity and permeability values average 18.5 percent and 100 millidarcies, respectively. The Muddy Sandstone has an average thickness of 30 feet. This reservoir is a white to tan, very fine-grained sandstone with an average porosity of 24 percent and average permeability of 300 millidarcies.

Middle to Upper Cretaceous Reservoirs: Reservoirs in the Frontier Formation are very fine grained sandstones that form a continuous blanket across the basin. The average reservoir thickness is 35 feet with porosity values averaging 20 percent. The Niobrara Formation is a thin bedded calcareous claystone with limestone at its base. Reservoir thicknesses average 25 to 35 feet. Porosity and permeability values average 33 percent and 0.1 to 1.0 millidarcies, respectively. The Pierre Shale has an average thickness of 20 feet and is a dark-gray to brown fissile claystone or mudstone with occasional beds of sandstone, limestone, and thin beds of bentonite. Porosity values average 14 percent and permeability values average 7 millidarcies.

The primary source rock for the above reservoirs is the Lower Cretaceous Mowry Shale. The Mowry Shale was deposited during the second major Cretaceous sea transgression. Vitronite reflectance values (R_o) in the deepest part of North Park are within the thermal zone of oil and gas generation and total organic carbon

(TOC) values averaging 1.5 percent. Burial history plots for North Park Basin indicate maximum burial depths of 20,000 feet. They also suggest that expulsion of hydrocarbons occurred approximately 45 to 40 million years ago. Migration was along open fracture systems and bedding planes over short distances vertically and updip. (Wandrey and Barker, 1996) Laramide anticlines and faulted anticlines produced the oil and gas traps. A combination of structural and stratigraphic traps (e.g. onlap pinch-outs) also played a role in trapping oil and gas. These traps are generally small, but are relatively thick or stacked. (Wandrey and Barker, 1996).

Drilling activity has decreased since the mid-1980s, probably due to very limited successes in finding fields of any size since the mid-1970s. Although North Park Basin in Jackson County can be considered as a mature petroleum play, further discoveries of small traps may be expected with continued drilling. (Wandrey and Barker, 1996)

iii. Subthrust Play (Hypothetical)

This play occurs under Laramide thrusts where pre-existing traps were preserved beneath the thrust or where the overthrust Precambrian rocks formed a trap in conjunction with a thick low permeability shale seal. In Jackson County, the Independence Mountain Thrust is the largest thrust fault that can create traps of one million barrels of oil (MMBO). The rocks of the Cretaceous-Upper Jurassic Structural Play are typically under the thrust and are differentiated by the mechanism of trapping and greater burial depths. The source rocks remain the same but there is a potential for higher maturity levels resulting from increased heating in the subthrust. The traps may be created by the thrusts themselves, by Laramide anticlines and faulted anticlines, or by some combination of structural and stratigraphic traps that were preserved under the thrusts. (Wandrey and Barker, 1996)

b. Coal Resources

Within the North Park Basin, the Coalmont Formation of Paleocene – Eocene age unconformably overlies the Upper Cretaceous Pierre Shale. The Coalmont Formation is composed of conglomerate, sandstone, siltstone, shale, carbonaceous shale and coal beds. Locally, the coal beds exceed 50 feet in thickness. Significant subbituminous coal resources were recovered from the Riach coal bed of the lower Coalmont Formation in Section 26, T. 7 N., R. 81 W. In the Coalmont quadrangle, the Riach coal bed ranges from 25 to 80 feet in thickness. (AAA Engineering and

Drafting, 1979) The Sudduth coal bed occurs near the base of the Coalmont Formation. (Cappa, J., Koenig, N.V., Coursey, R.G., 2001)

C. USGS Assessment of Undiscovered Oil and Gas Potential in the North and Middle Park Province

The North and Middle Parks Province has not been addressed in a USGS Assessment of Undiscovered Oil and Gas Potential. In addition, this province was not included in either Phase I or Phase II inventories of the Energy Policy and Conservation Act of 2000, (P.L. 106-469, 604 as amended by the Energy Policy Act of 2005, P.L. 109-58, 364).

IV. Past and Present Oil & Gas Exploration and Development Activity

A. Historical Description of Drilling and Development Activity

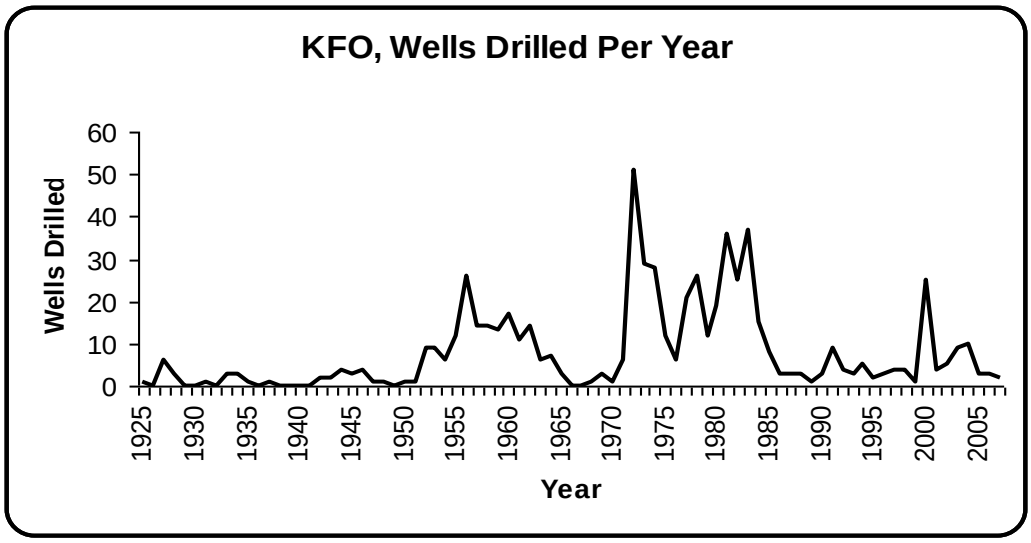
1. Overview

The number of drilling permits issued in the State of Colorado by the Colorado Oil and Gas Conservation Commission (COGCC) continues to trend upward, with 2,917 Applications for Permit to Drill (APDs) approved in 2004, 4,364 in 2005, 5,904 in 2006, and 6,368 approved in 2007. This relates to annual increases above previous years of 50 percent, 35 percent, and eight percent, respectively.

Total permits issued for locations in Jackson County were 22 in 2008, five in 2007, eight in 2006, six in 2005, and 14 in 2004 (Figure 5). No other counties within the KFO's boundaries had any drilling activity. There was a flurry of activity during 2000 to 2002, with 73 wells permitted by the COGCC. Most of these wells were infill development wells with very little chance of a repeat performance considering the modest development opportunities remaining in existing fields.

In 2008, the KFO approved three APDs for wells under federal jurisdiction on current leases in Jackson County. In 2006 and 2007, there were no Federal APD approvals by the KFO. There were three Federal APD approvals in 2005 and all were in or near existing fields.

Figure 5: Kremmling Field Office, Wells Drilled Per Year



2. Production

No oil and gas production has occurred in Summit or Grand counties (Middle Park Basin) in the past 20 years. No oil and gas production occurs in the Laramie River area of Larimer County (Laramie Basin).

Oil, methane gas, and CO_2 gas production currently occurs in Jackson County (North Park Basin). There are five major, and 10 minor oil and gas fields in Jackson County. Of the minor fields, four are no longer producing, and six are held by just one or two wells. Of the five major fields, two are predominately federal minerals and unitized (McCallum and South McCallum), and two fields, the Canadian River and Lone Pine fields, are predominately private.

Oil production and shows have occurred in the fields in North Park from the Triassic Entrada Formation, the Jurassic Morrison Formation, and from several Cretaceous Formations. The Cretaceous Formation units include the Dakota and Lakota sandstones of the Dakota Formation, the Niobrara Formation (fracture porosity), sandstones of the "Frontier" and "Muddy" "formations", and the Pierre Formation. Generally, the sandstones of the "Frontier" and "Muddy" "formations" are not considered to be formations in Colorado, but these are sandstone members of the Benton Formation, with the Muddy sandstone as the basal sand of the Benton Formation, and the Frontier correlating to the uppermost sandstone (Codell Member) of the Benton Formation. The Pierre "A" and "B" sandstone horizons possibly correlate to the Hygiene interval of the Pierre Formation in the Denver Basin.

Carbon Dioxide gas production occurs in the McCallum and South McCallum fields from the Cretaceous Dakota and Lakota formations and Jurassic Morrison

Formation; however, in most of the other fields in the North Park Basin, including production from the Dakota and Lakota formations, methane gas is or has been produced. Wandrey and Barker (1995), and Newton (1957) give excellent oil and gas overviews for the North Park Basin.

3. Field Histories

Table 4 contains a summary of recent (1999-2006) oil and gas field data. The production data is from the IHS Production Data database and the federal mineral estate contained in a field is estimated from a review of field-area mineral estate ownership as viewed on the COGCC web site. The production numbers depicted in Table 4 may or may not occur from federal oil and gas leases in these fields since the percent federal mineral estate is based on land area and not actual well locations.

Table 4: Oil and Gas Production by Field, 1999-2006

Field Name	Field Type	Field Production Type	Oil Production (bbls)	Gas Production (mcf)	Current Producing Wells (#)	Producing Formations (name)	Percent Federal Mineral
McCallum	Major	Oil, Carbon Dioxide, Some Methane	818,000	7,200,000	110	Pierre, Dakota, Lakota, Morrison	95
South. McCallum	Major	Oil, Carbon Dioxide, Some Methane	18,970	4,100,000	5	Pierre, Dakota, Lakota	100
Lone Pine	Major	Oil, Methane	168,300	2300	13	Dakota, Lakota	10
Battleship	Major	Oil	80,500	0	5	Frontier, Dakota, Lakota	80
Coalmont	Minor	Oil, Some Methane	31,000	0	2	Niobrara	75
Michigan River	Minor	Oil, Methane	11,900	0	1	Niobrara, Muddy, Dakota, Lakota	30
Canadian River	Major	Oil, Methane	4,000	0	6	Niobrara	10
Butler Creek	Minor	Oil, Some Methane	3,570	0	1	Frontier	30
Delaney Butte	Minor	Oil, Methane	1,300	0	2	Dakota, Lakota	5
Alkali Lake	Minor	Oil	1,800	0	1	Niobrara	100
Fischer Draw	P&A	Oil, Some Methane	0	0	0	Niobrara	90
Carlstrom	P&A	Oil, Methane	0	0	0	Niobrara	40
Johnny Moore	P&A	Oil, Methane	0	0	0	Niobrara	100
Grizzly Creek	P&A	Oil	0	0	0	Pierre, Niobrara	30
Grizzly Creek SE	Minor	Oil	0	0	1	Pierre, Niobrara, Frontier	75

The McCallum Field is the oldest in North Park. The McCallum Unit anticline, located near Walden, possesses highly unusual fluid characteristics because the produced gas is 92 percent carbon dioxide. The retrograde condensate cap of the Dakota-Lakota reservoir on the structure was discovered in 1926, but the oil ring along the anticline flank was not encountered until 1960. Quite a few additional Dakota-Lakota and Morrison Formation wells that produce CO_2 and condensate were drilled during the 1940s, 1950s, and 1960s. Production is now primarily from the 30 degrees API oil ring which contains nearly pure carbon dioxide gas in solution. Most of these wells have been plugged and abandoned with about two Dakota-Lakota Formation and one Morrison Formation well remaining.

Production from the Pierre Formation was first discovered in 1971. A secondary recovery waterflood operation was initiated in 1973 and continues to this day. There were two extensive development periods in the 1970s and 2000s. Currently there are over 40 injection wells and about 70 production wells.

There has been recent exploration in the Niobrara Formation, with mixed results. Test coring has also been made in the coals of the Coalmont Formation.

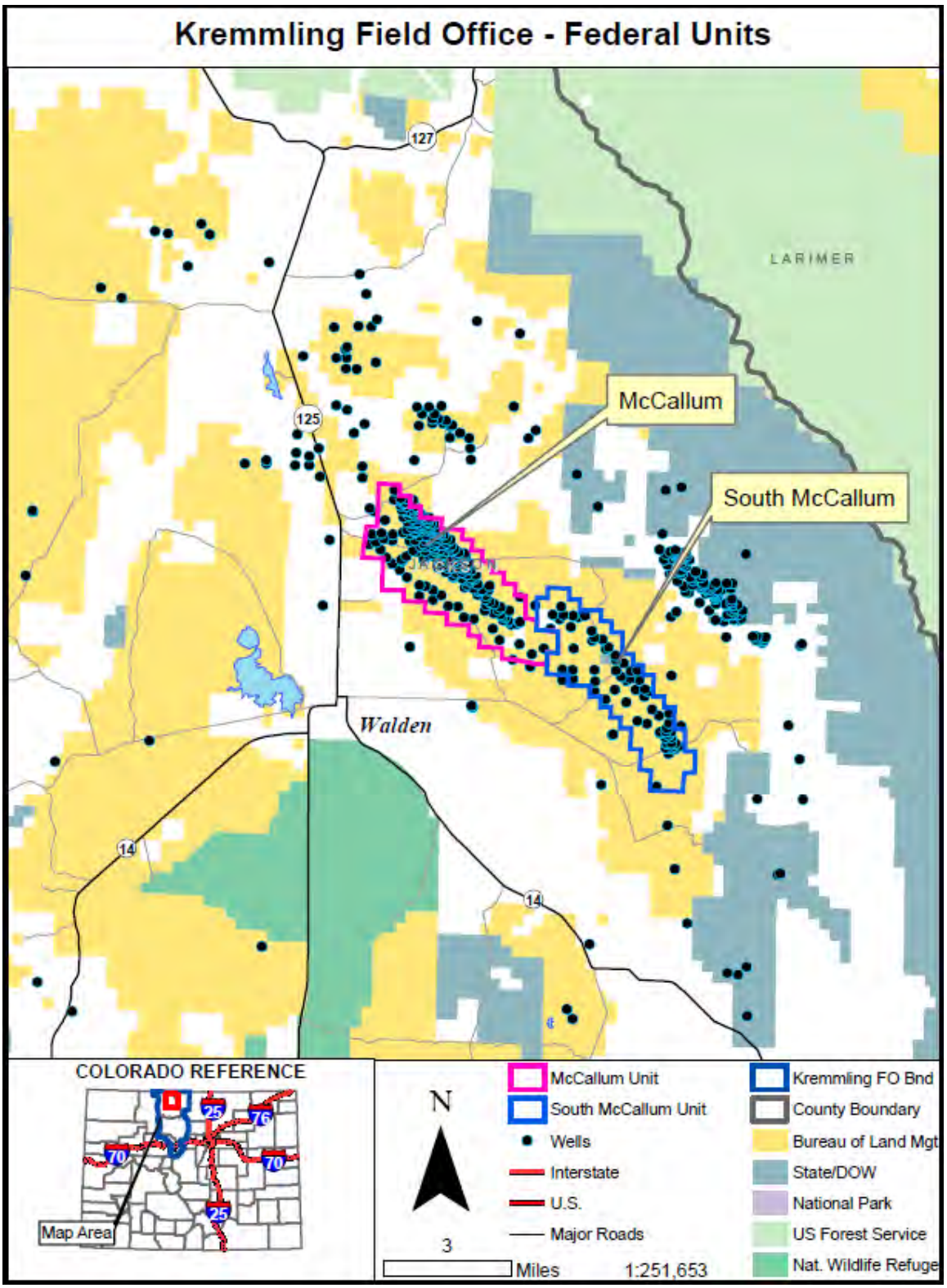
The field is a doubly-plunging anticline, with a slightly curving NW-SE anticlinal axis. The anticline is asymmetric, with a faulted, steep to overturned northeast limb and a gentler southwest limb, and an inclined axial plane. Thus the deeper Dakota-Lakota oil pool is offset to the southwest, down the inclined axial plane, from the higher Pierre oil pool. Biggs (1957), Carpen (1957a), and Sims and Goth (1953), give historic and early geologic descriptions of this field.

This field contains all or parts of 12 sections, mostly in T. 9 N., R. 79 W. and includes lands in T. 9 N., R. 78 W. and T. 10 N., R. 79 W. The field contains largely federal mineral estate lands, with about 500 acres of private mineral estate surrounding the field.

The McCallum Unit, being one of two federal units within North Park (Map 6), comprises most of the McCallum Field. The McCallum Unit was formed in 1952 and later, in 1956, was expanded to include the North McCallum Unit that was previously formed in 1937. The McCallum Unit contains both federal (majority) and private mineral estate lands. Some lands within the unit are not committed to the unit, however, the production figures and well counts reflect all wells within the unit.

The McCallum Field has produced 818,000 barrels of oil (BO), some methane, and 7.2 Bcf of CO_2 gas since 1999, with cumulative production totals of 10,340,000 BO, some methane, and 524 Bcf of CO_2 gas. Due to the age of the field and lack of accurate record keeping practices in the early part of the 20th century, caution should be used when considering the cumulative production numbers.

Map 6: Federal Units in the Kremmling Field Office



The South McCallum Field is located in northeast North Park and was discovered in 1935, having with CO_2 and condensate production from the Dakota and Lakota Formations. About 61 wells have been drilled during the life of this field. About 17 wells have had production this decade. There is one CO_2 gas well currently producing in the field. The current CO_2 production is from the Dakota and Lakota formations. There are four producing and three shut-in oil wells in the field, all completed in the shallow Pierre Formation. Minor production has occurred previously from the Niobrara Formation.

The South McCallum Unit, being one of two federal units within North Park was formed in 1983. The South McCallum Unit contains federal (majority), state, and private mineral estate lands. Some lands within the unit are not committed to the unit however the production figures and well counts reflect all wells within the unit.

This field is a strongly curved asymmetric doubly plunging anticline, trending north-south at its south end and northwest-southeast at the northwest end. The northeast flank is strongly dipping, while the southwest flank is gentler. Carpen (1957b), and Sims and Goth (1953) give historic and early geologic descriptions of this field.

This field contains all or parts of 10 sections centered on Sections 17, 21, 27, 34 in T. 9 N., R. 78 W. Almost all lands within the productive portion of the anticline are Federal mineral estate lands.

The South McCallum Field has produced 18,970 BO, some methane, and 4.1 Bcf of CO_2 gas since 1999, with cumulative production totals of 830,300 BO, some methane, and 15.4 Bcf of CO_2 gas. Due to the age of the field and lack of accurate record keeping practices in the early part of the 20th century, caution should be used when considering the cumulative production numbers.

The Lone Pine Field is located in western North Park, and currently has 13 producing and eight shut-in oil wells. The field was discovered in 1971, and has had about 22 wells drilled over its history. Methane gas and oil production is from the Dakota and Lakota formations. There have been additional hydrocarbon shows but no production from the Frontier and Morrison formations.

The Lone Pine Field is a north-south oriented, double plunging, complex faulted, asymmetric anticline, with thrust offsets to both east and west flanks, and oil reservoirs located along the central anticlinal axis and on the eastern fault slice near the central portion of the anticline. Wellborn (1977, 1983d) has excellent reviews and detailed structural interpretation of this field.

This field contains parts of five sections, centered on Sections 28 and 33, T. 9 N., R. 81 W. The field outline designated by the state contains some federal mineral estate, mostly on about 100 acres (Sections 33 and 34) at the southeast

edge of the anticline. However, the federal mineral estate is outside the productive areas of the field. The Lone Pine Field has produced 168,300 BO and 2,300 Mcf of methane gas since 1999, with cumulative production totals of 2,784,000 BO and 696,300 Mcf of methane gas.

The Battleship Field is located in northeastern North Park, and currently has five producing wells, including one shut-in and one operating injection well. The field was discovered in 1954. Fourteen wells have been drilled in and around the field with production established from eight of the wells. Production currently is from the Frontier, Dakota, and Lakota formations.

The Battleship Field is a curving, asymmetric double plunging anticline, like many other fields in northeastern North Park. The north flank of this anticline is strongly faulted, with moderate dips on its southwest flank. It is a slightly elongate NW-SE trending anticline, and is similar to other anticlines in this area with a steeper NE flank and a curving anticlinal axis. Grote (1957) gives an early description and analysis of this field.

This field covers parts of seven sections, centered around Section 23, T. 10 N., R. 79 W. The field contains about 80 percent federal mineral ownership, with private lands at the northwest and southeast ends. The Battleship Field has produced 80,500 BO since 1999, with a cumulative production total of 3,096,000 BO.

The Coalmont Field is located in southwestern North Park, currently has two producing wells, and has had five productive wells in its history. One of the producing wells is located just northwest of the field boundary. Current production is from the Niobrara Formation, but oil and gas shows have also been recorded in the basal Pierre Formation and Frontier sandstone.

The Coalmont Field is a gentle, broad, north plunging anticline, truncated by a fault on its southwest side. Early production was from permeable formations on structural traps high on the flanks of the anticline, but current production appears to be controlled by fracture porosity with some fault control in the Niobrara Formation. Severy and Thompson (1953) give early history and geologic analysis of this field.

This field covers parts of four sections, centered around Section 35, T. 7 N., R. 81 W. The field includes approximately 75 percent federal mineral ownership with some private mineral estate lands at the northern end and Federal surface with private mineral estate lands on the east-southeast side. The two remaining productive wells are both on the private mineral estate. The Coalmont Field has produced 31,000 BO since 1999, with cumulative production totals of 222,500 BO and 85,300 Mcf of methane gas.

The Michigan River Field is located in north-central North Park. The field consists of one producing well and has had six wells drilled over its history. Current production is from the Lakota Formation. There have been shows and limited production from the Niobrara and Dakota formations. Structure is little known, and no published information could be found for the Michigan River Field.

This field covers parts of three sections, centered around Section 29, T. 10 N., R. 79 W. There is approximately 30 percent federal mineral ownership in the field with the remaining lands held in private mineral estate. The Michigan River Field has produced 11,900 BO since 1999, with cumulative production totals of 177,200 BO and 155,900 Mcf of methane gas.

The Canadian River Field is located in northeastern North Park. It was discovered in 1956, and appears to be en-echelon with the north and south McCallum anticlines. Initially the field produced methane gas and was followed by oil production. Production was mostly in Dakota-Lakota and with shows in the Niobrara Formation and the Muddy and Frontier formation sandstones. Currently, six wells are productive, all from the Niobrara Formation, of the more than 60 wells that have been drilled in the field.

The Canadian River Field is another elongate, curving, and northwest-southwest trending anticline in northeast North Park, also asymmetric with a steeper and faulted northeast flank. Saterdal (1957) gives an early description and analysis of this oil field.

This field covers parts of six sections, centered around Section 11, T. 9 N., R. 79 W. It has about 10 percent ownership of federal mineral land, mainly in a small piece near its center and on the southwest side of the field. The Canadian River Field has produced 4,000 BO since 1999, with cumulative production totals of 8.8 Bcf of methane gas and 503,000 BO.

The Butler Creek Field is located in western North Park, and appears to lie on trend with the Delaney and Lone Pine fields. Original production dates from 1974, from the fractured Frontier sandstone. Shows also occurred in the Mowry, Dakota, Lakota, Morrison and Entrada formations. It currently contains only one productive well, and has had two wells drilled over its history. Wellborn (1983b) has an excellent review of this field.

The field is shown on subsurface maps as a small closed high on the southeast plunging nose of the Delany Butte anticline, about two miles southeast of the Delaney Butte field structural high and center, on the thrust faulted east side of the anticline.

This field covers parts of four sections, centered around Section 9, T. 8 N., R. 81 W. The field contains about 30 percent federal mineral estate, mainly in the southern portion. The sole producing well is on private mineral estate. The Butler Creek Field has produced 3,570 BO since 1999, with cumulative production totals of 30,800 BO and 15,000 Mcf of methane gas.

The Delaney Butte Field is located in western North Park. Current production is from the Dakota and Lakota formations, with two productive wells on private surface and mineral estate. It has had 20 wells drilled in or adjacent to the field over its history, including wells producing from the Frontier and Niobrara formations, with shows in the Benton Formation. A COGCC drilling permit was issued in April 2007 (with an expiration of April 2008) for well No. 8-81 #5-2, in Section 5, T. 8 N., R. 81 W. The objective was the Niobrara, Frontier, Muddy, Dakota, and Lakota formations. The well was spud on May 7, 2007, and completed on September 3, 2007, in the Dakota/Lakota formations. The well is currently shut-in

The Delaney Butte Field structure is an asymmetric northwest-southeast trending anticline, with a steep and thrust faulted northeast flank, plunging to the southeast. The plunging nose undulates, and a minor closed high contains the small Butler Creek Field about two miles to the southeast. Wellborn (1983c) has an excellent review of this field.

This field covers parts of three sections, centered around Sections 5 and 6, T. 8 N., R. 81 W. The field contains about five percent federal mineral estate lands, located mainly in the far western and eastern edges. The Delaney Butte Field has produced 1300 BO since 1999, with cumulative production totals of 1460 Mcf methane gas and 16,400 BO.

The Alkali Lake Field is located in northwestern North Park. There have been two wells drilled in the field and oil shows were encountered in both the Niobrara and Dakota formations. Current production is from the Niobrara Formation in one productive well. The current Niobrara Formation producer was recompleted a few years after spud as a horizontal completion. Structure is little known, and no published information could be found for the Alkali Lake Field.

This field covers parts of two sections, centered around Section 31, T. 10 N., R. 80 W. The field is 100 percent federal mineral estate. The Alkali Lake Field has produced 1,800 BO since 1999, with a cumulative production total of 10,300 BO.

B. Recent Drilling Activity and Development

No drilling activity has occurred in the past 20 years in Grand or Summit counties.

Only three exploratory drill holes (T. 11 N., R. 76 W.) have occurred in the Laramie River area of Larimer County (Laramie Basin) in the past 20 years, bringing the total number of wells drilled in this area to five, with all being plugged and abandoned as dry holes.

In the past 10 years, drilling activity, and reentry and recompletions of existing wells, continues to occur in Jackson County (North Park Basin). A summary of recent field activity follows.

McCallum
Although a considerable number of new wells have been drilled in the past 20 years, only a handful of new wells have been drilled in the past five years. Several in-field development wells, exploration of the Pierre Shale Formation near complex structural features, CBM test cores, and a short-lived Niobrara fracture play/test have occurred in the past five years. Secondary water injection operations in the Pierre Shale Formation are continually adjusted to ensure the most efficient extraction of the oil.

South McCallum
Several attempted recompletions have been mostly met with casing and hole problems. Production tests and recompletion operations at the south end of the field have occurred in the last few years and have brought this end of the field into better utilization.

Battleship
Recent field activities include the recompletion of a well into a water injection well and a watered-out production well plugged.

Alkali Lake
The drilling of an additional lateral well bore in the only productive well in the field has been planned, but a scarcity of rigs has delayed this project.

Coalmont
As noted elsewhere in this document, there is current, ongoing activity by EOG Resources, Inc., in the area of the Coalmont Field.

Delaney Butte
The most recent activity is a COGCC drilling permit issued in April 2007 (with an expiration of April 2008) for well No. 8-81 #5-2, issued for private surface/mineral estate in Section 5, T. 8 N., R. 81 W. The objective is the Niobrara, Frontier, Muddy, Dakota, and Lakota Formations. The well was shut-in July 2007.

1. Carbon Dioxide (CO_2) Gas

CO_2 gas production with some condensate oil occurs in the McCallum and South McCallum fields. Minor amounts of methane gas are present in these fields. CO_2 gas is present in the deeper parts of the fields, primarily in the Dakota, Lakota and Morrison formations. A liquid CO_2 plant is present near the McCallum

headquarters facility where CO_2 production is sold to the CO_2 plant and is shipped by truck to markets.

2. Coalbed Methane

A single CBM well, now plugged and abandoned, was drilled in the Coalmont area, and several CBM wells have been drilled and are producing on private mineral lands in the McCallum area.

USGS and other coal resource data indicates that although the Coalmont coal seams are quite thick and are of good quality at the old coal mine and townsite of Coalmont, these thick beds quickly split, thin, and become carbonaceous shale north and east from the old mining center.

Coal resource data in the northern part of North Park indicate that the coal seams at the McCallum area are fairly continuous over several miles to tens of miles, and that this resource is thick and extensive enough to be considered a Known Recoverable Coal Resource Area (KRCRA) for surface and underground mining, covering over 408 sections northeast of and around Walden. The KRCRA is located in 24 townships from T.s 6 - 10 N. and R.s 77 – 82 W., and includes a total of 226,015 acres containing potentially recoverable coal resources.

Considerably greater acreage of these same seams exists in the subsurface in northeast North Park beyond the KRCRA boundary. This implies that the coal resource is present over much of northeast North Park for a potential CBM play. COGCC records show eight wells are permitted, or have been drilled in northeast North Park for this resource. Three federal exploration CBM test core holes have been permitted in this same general area, with two drilled and subsequently plugged.

Further CBM development is likely based on the continued testing of the existing and permitted wells, the local gas market, availability of an existing distribution pipeline, and construction of new pipeline capacity out of the North Park Basin. If continued positive results occur, and economic methods for the disposal of excess produced water are developed, considerable CBM activity may occur over the more than 250,000 acres of subsurface coal occurrences in northeast North Park.

C. Niobrara Formation Activity

1. Niobrara Formation Resources

The Middle to Upper Cretaceous Niobrara Formation is a thin-bedded calcareous claystone with limestone at its base. It acts as both source rock and reservoir rock and occurs over most of the North Park Basin. As a reservoir, it has been most

successful where there is flexure and faulting, as evidenced in the Canadian River, Alkali Lake, and Michigan River fields. However, Niobrara Formation exploration and discovery is picking up in the Walden and Coalmont areas.

2. Niobrara Formation Drilling Activity

In the February 29, 2008, edition of the Oil and Gas Journal, EOG Resources Inc. (EOG), Houston, reported plans to drill seven Niobrara wells in the Coalmont area during 2008. As of June 2008, COGCC reports show EOG to have 15 approved APDs in this location and play. EOG has also contracted two phases of a 3D seismic survey believed to be targeting a horizontal play for oil in the Cretaceous Niobrara. Phase I of the 3D seismic survey covered 36 square miles, Phase II covered 44 square miles, both surveys covered lands in the Coalmont area.

EOG, which has amassed 100,000 net acres and drilled five wells in Jackson County, estimated the Niobrara Formation has a reserve potential of 10 to 80 million barrels of oil equivalent (BOE) at an implied recovery efficiency of one to five percent. Estimated oil in place is 10 to 40 million barrels per square mile. The company is very encouraged by the first well, the Buffalo Ditch #1-32H, drilled in Section 32, T. 7 N., R. 80 W., 15 miles south-southwest of Walden, to 7,500 feet true vertical depth plus a 4,000-foot single lateral. A multistage formation fracturing treatment was applied in the fourth quarter of 2007.

The initial production rate was 550 BOPD of 38° gravity sweet crude with a gas-oil ratio (GOR) of 600 standard cubic feet of gas per barrel of oil (SCF/BO), and the well averaged 320 BOPD in its first 30 days on production.

Preliminary estimated ultimate recovery is 250 million BOE per well, compared with two vertical wells drilled by others within three miles that produced more than 100,000 BO per well. The Coalmont oil field lies just to the southwest of this formation.

On its acreage, which represents the majority of the play concept, EOG estimates the reservoir to be 90-450 feet. thick with 3.5 to six percent average porosity, initial reservoir pressure of 3,700 psi, and a temperature of 210° F.

The company predicts costs of $6 million per well on a 640-acre spacing pattern and plans to use a single rig. The North Park Basin has no oil pipeline, and the company sees no production impact until 2009.

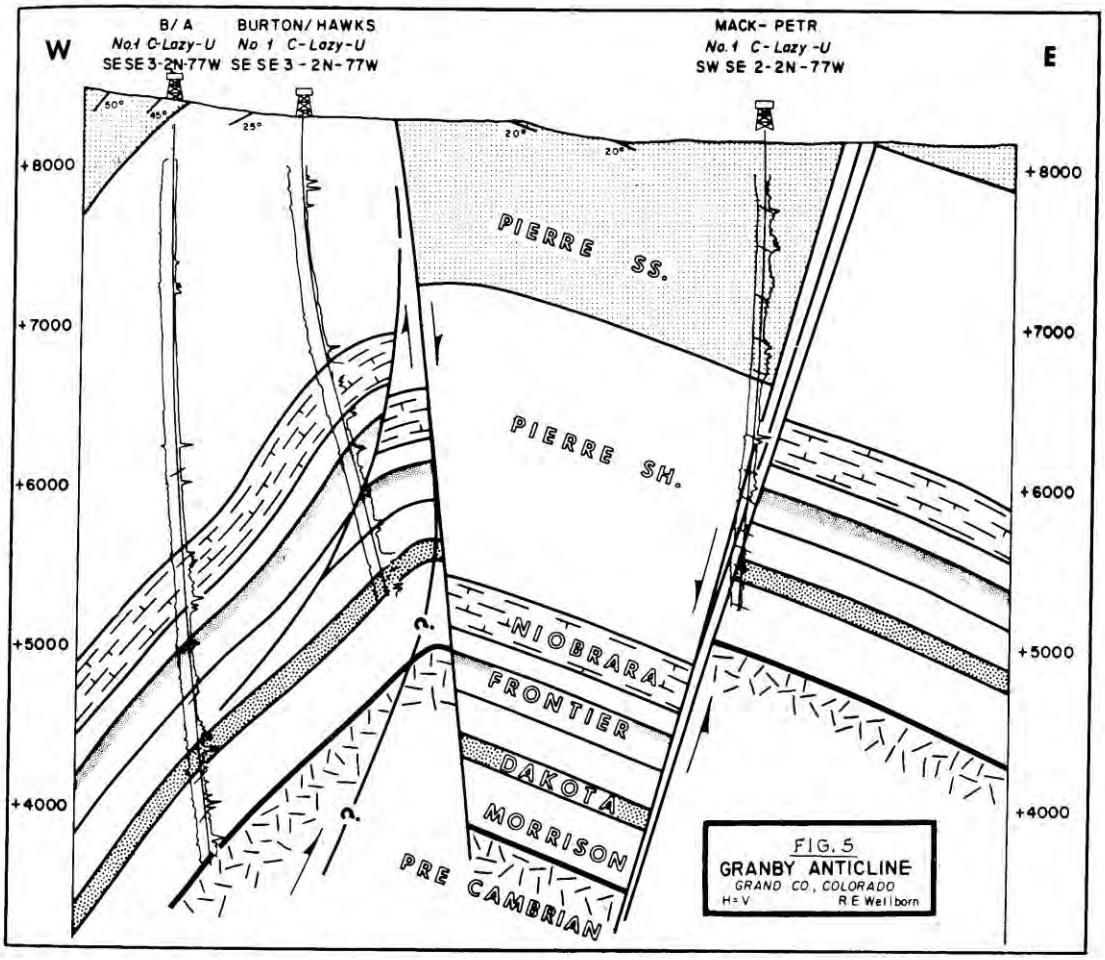
D. Granby Anticline

Since 2006, there has been great interest in leasing in the area of the Granby Anticline. The Granby Anticline is located in the southeast part of the Middle Park Basin, just

northwest of the town of Granby. The anticline is at least eight miles long with several thousand feet of reversal. Anticlinal plunge is observed on both ends. Complex faulting includes a "V"-shaped graben at the crest in the southern half of the structure (Figure 6). There is a large north-south fault bounding the west side of the graben extending along the entire crest of the anticline. While it is up to the west on the basin side, appearing to be a normal fault from surface data, it may be a reverse fault at depth, originating in the Precambrian in the basin to the west.

The exploration history for the anticline shows that the following four dry holes have been drilled on the anticline and are of particular interest. British American drilled the first hole in 1953, on the west flank to a total depth of 4,628 feet in the Precambrian.

Figure 6: Cross-section, Granby Anticline (Wellborn, R.E., 1977)



Productive potential was indicated when the Niobrara Formation tested methane gas at a rate of 294 Mcfpd, decreasing to 135 Mcfpd in an hour. The Muddy-Dakota interval

tested 100 Mcfpd in three minutes, decreasing to 0 Mcfpd in 30 minutes. Pipe recovery was 720 feet of mud and 2,950 feet of water.

In 1954, Mack Petroleum drilled the structure east of the surface crest to a total depth of 3,114 feet in the Morrison. The well encountered a normal fault zone on the east edge of the graben that cut out most of the Pierre Shale and much of the Niobrara. Below the fault zone, good stain, fluorescence and a mud gas show were recorded in the Frontier. Mud gas shows also occurred in the Muddy and Dakota, but were not tested. The operator attempted to complete the well by perforating 33 zones within the interval 1,702 to 2,998 feet with 255 shots, but only produced water.

Kamphausen drilled the third test well on the structure midway between the first two tests to a total depth of 2,068 in the Pierre Formation in the crestal graben. There were no cores, tests, or logs run.

The last test on the Granby anticline was drilled by Burton/Hawks, Inc., in 1974 to a total depth of 3,074 feet in the Morrison Formation. The only oil shows occurred in the Niobrara and in a thin zone of fracturing in the Mowry. Mud-gas shows were also observed in the Niobrara, Frontier-Greenhorn and Mowry. A drill-stem test (DST) in the Niobrara from 1,570 to 1,860 feet measured 65 Mcfpd, decreasing to 19 Mcfpd in one hour, and recovering 260 feet of gas cut mud. A DST of the basal Niobrara through the Frontier from 1,857 to 2,203 feet measured 134 Mcfpd, decreasing to 13 Mcfpd in one hour, and recovering 210 feet of very slightly gas cut mud. The Mowry show was not tested. The primary objective in the well was the Dakota Group, but drill cuttings and electric logs indicated very low porosity and no shows were observed. The well was plugged and abandoned on September 22, 1974. Figure 7 shows the Dakota structure of the Granby Anticline area.

ɪrn, R.E., 1977)

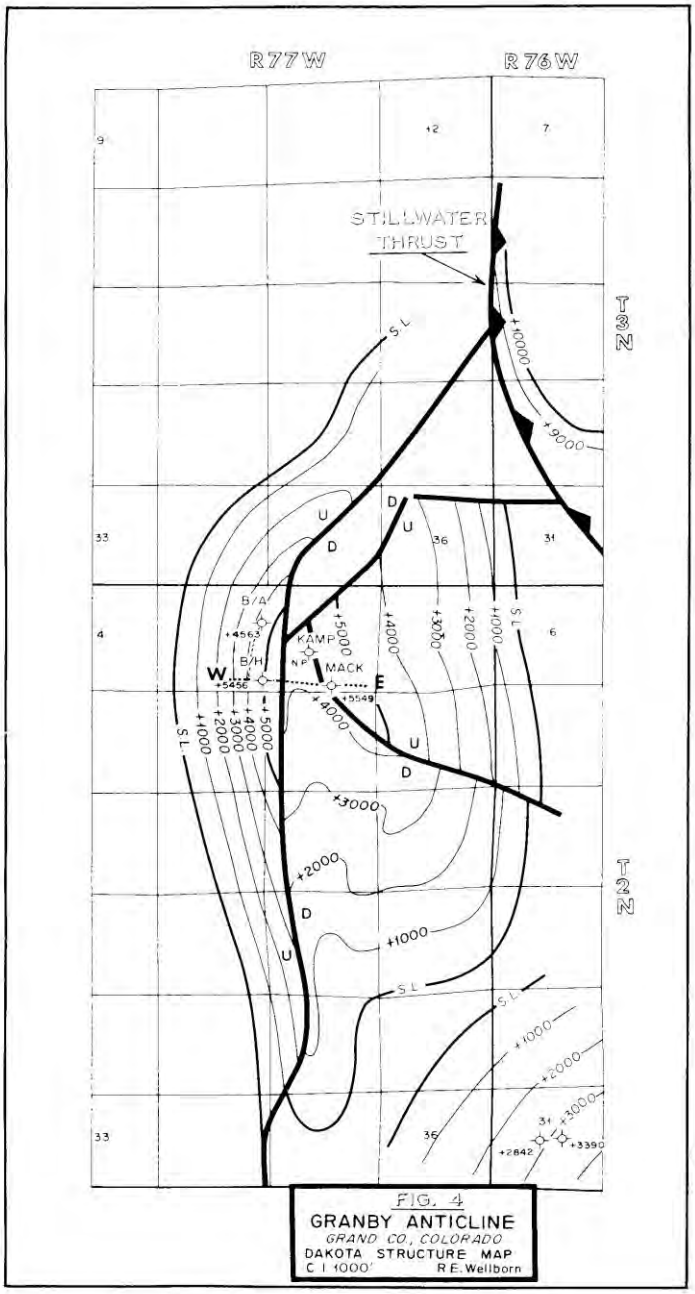


FIG. 4
GRANBY ANTICLINE
GRAND CO., COLORADO
DAKOTA STRUCTURE MAP
C.I. 1000'
R.E. Wellborn

The Granby Anticline discussion and diagrams above were modified from Wellborn, R.E., 1977.

E. Leasing Activity

1. Existing Leases

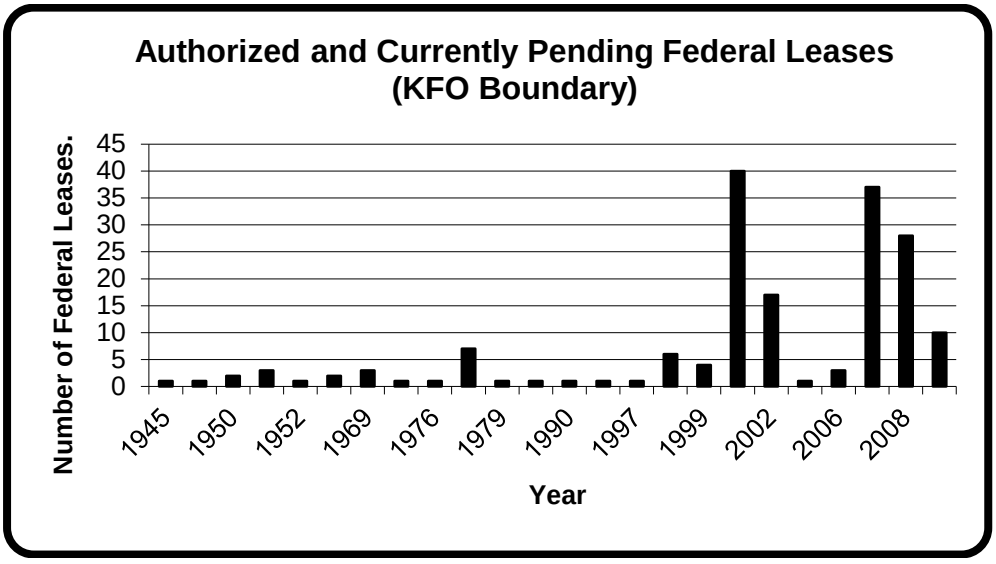
No oil and gas leases currently exist in the Laramie River area of Larimer County or in Summit County. Map 7 shows the areas of federal mineral estate open for leasing and the no lease areas.

Jackson County has 176,728 acres of federal mineral estate leased; Grand County has 26,993 acres (Map 8). Current lease-tract holders include Red Willow Production, EOG Resources, Inc., Bonanza Creek Energy, and Lance Lasrich (12 percent). Red Willow, EOG Resources Inc., and Bonanza Creek continue to be active producers and drillers in the area.

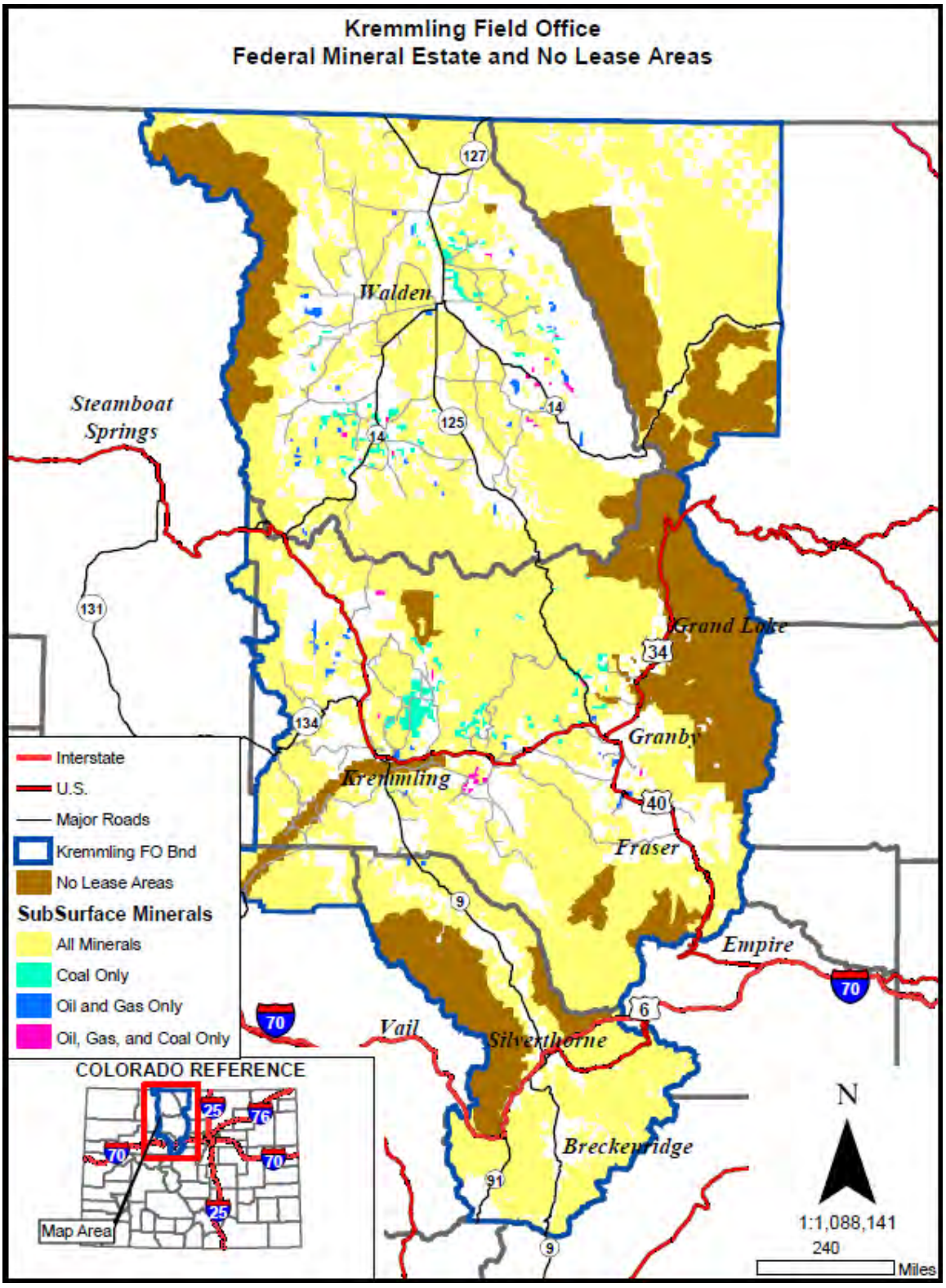
2. General Leasing Interest

Recent leasing activity in Jackson County include leases in the northwest (Alkali Lake), west (Lone Pine, Delaney Butte, Butler Creek), and southwest (Coalmont, Pole Mountain, Grizzly Creek) areas. Approximately 45,200 acres were requested for oil and gas leasing in 2006, in Jackson County. In the August 2006, BLM lease sale alone, 41,200 acres of federal mineral estate were requested for leasing, including 25,000 acres of split estate lands (private surface/federal minerals), and 15,000 acres of BLM-managed surface. Figure 8 shows leasing activity in the KFO throughout the years.

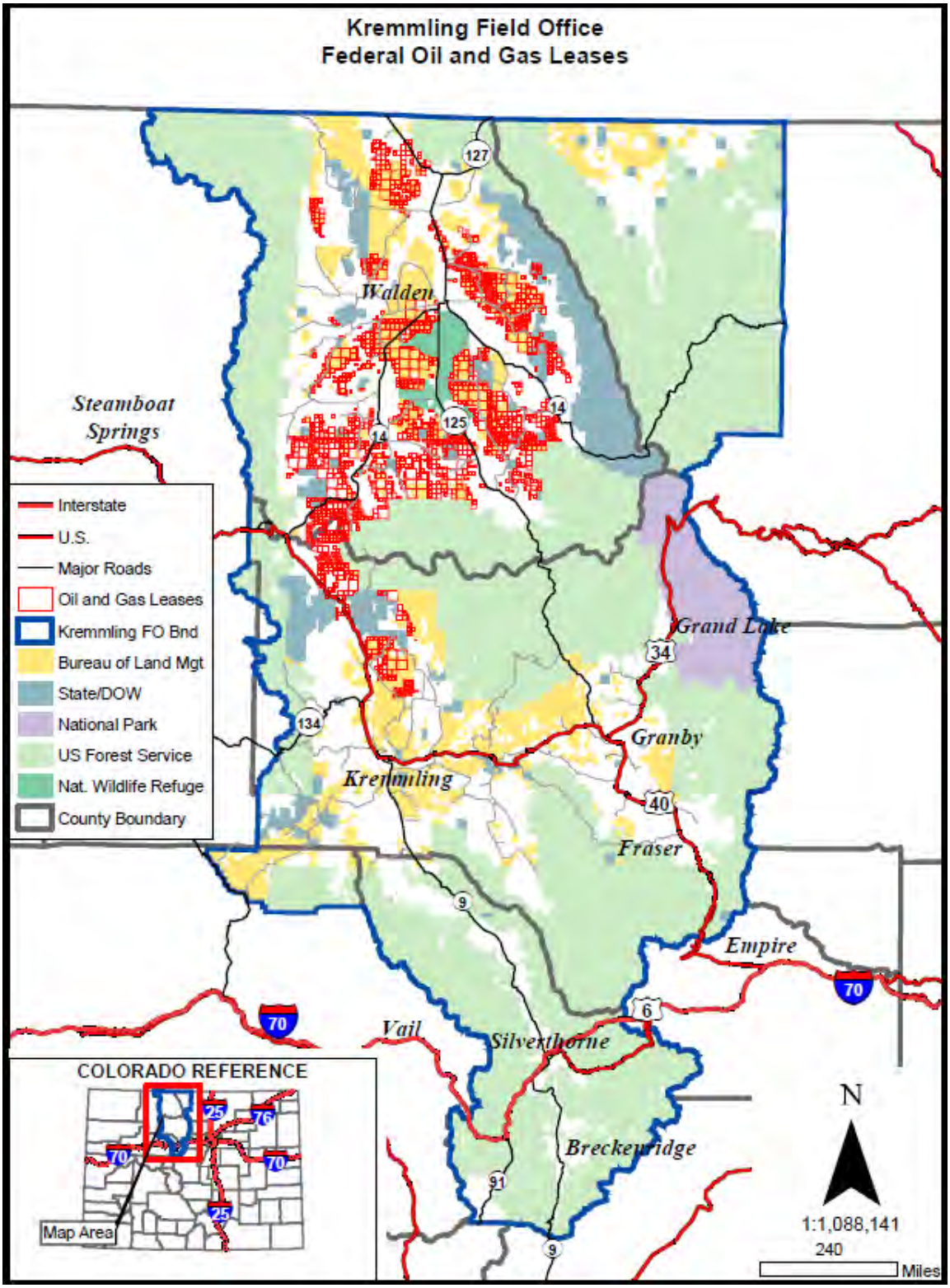
Figure 8: Kremmling Field Office Leasing Throughout the Years



Map 7: Leasable Acreage (Federal Mineral Estate and No-Lease Areas)



Map 8: Existing Federal Oil and Gas Leases



In 2007, the leasing interest in Jackson County amounted to almost 69,150 acres. Most of the requested acreage is located in T.s 10 and 11 N., R. 80 W., and T. 10 N., R. 81 W., about 15 miles northwest of Walden. Most of this acreage has been deferred from leasing for the time being due to wildlife concerns, pending completion of the Kremmling RMP revision.

In 2008, new leasing interest in Jackson County totaled about 5,500 acres. Most of the acreage is located about 20 miles south of Walden in T. 5 N., R. 78 W., with the remainder located about 15 miles southeast and about 12 miles southwest of Walden, in T. 7 N., R. 77 W., and T. 8 N., R. 81 W., respectively. Currently (mid-2009), there is a total of approximately 178,000 acres of federal mineral estate leased in Jackson County.

Grand County has also seen recent leasing interest activity over the past few years, predominately in the far northwest corner, in the Whitely Peak and Carter Mountain areas, and in the west Troublesome WSA area. The 2006, leasing interest totaled approximately 12,350 acres, and was the first leasing interest in Middle Park in a number of years. Nearly all of the 12,350 acres were on split estate lands (private surface/federal mineral).

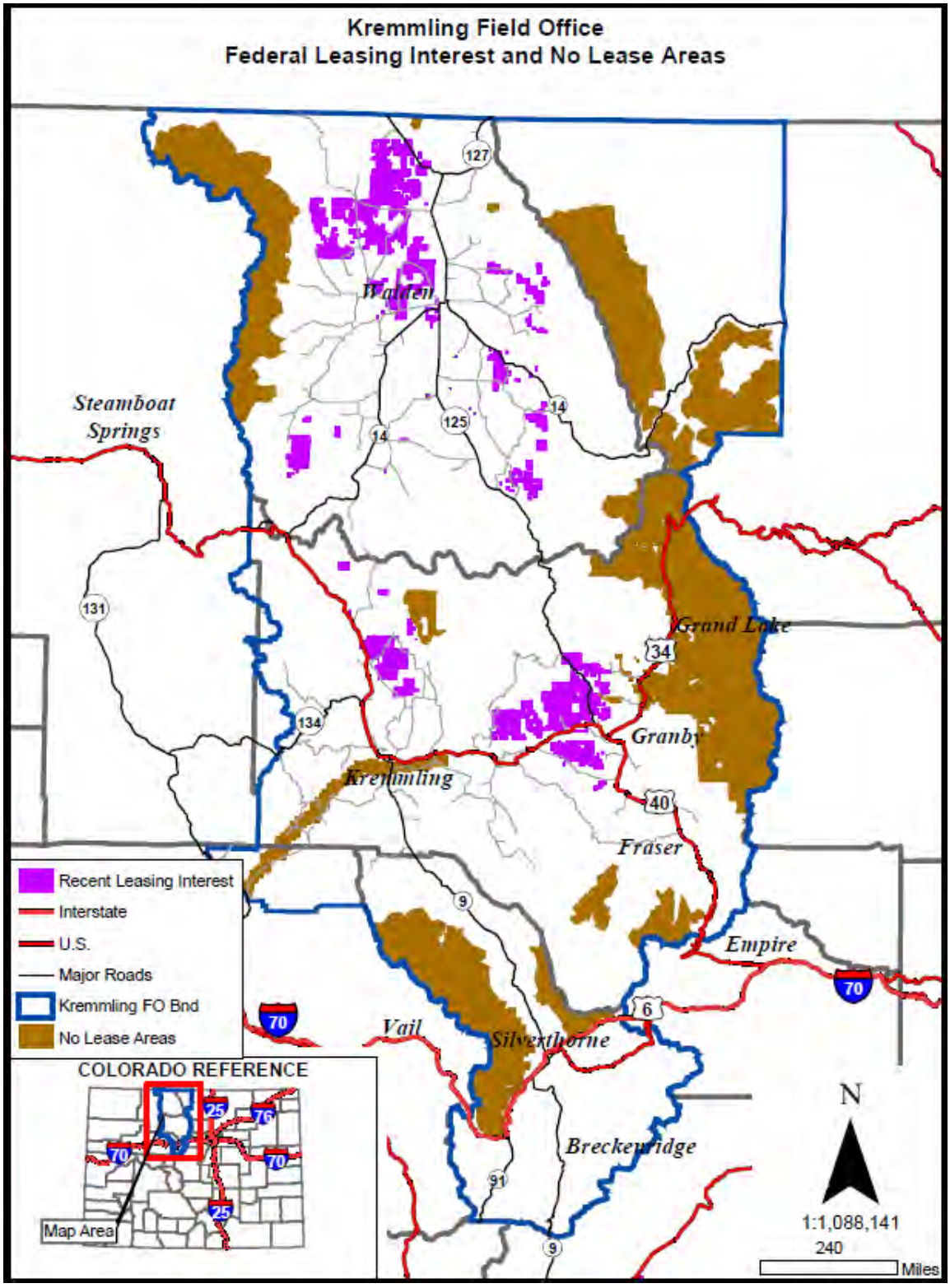
In 2007, leasing interest increased dramatically in Grand County, with over 54,500 acres requested for leasing. The areas of interest included T.s 1-3 N., R. 77 W. and T. 2 N., R. 78 W. These areas are just west, northwest, and southwest of Granby about six to 10 miles. Most of this acreage has been deferred from leasing for the time being due to wildlife winter range concerns, pending completion of the Kremmling RMP revision.

In 2008, the leasing interest in Grand County dropped off with less than 1,000 acres with all the requested acreage located in T. 3 N., R. 80 W. Map 9 shows areas within the KFO with recent federal leasing interest, as well as areas that are designated as no lease areas. Currently (mid-2009), there are approximately 27,000 acres of federal mineral estate leased in Grand County.

3. Coalbed Methane and Niobrara Leasing Interest

The recent lease applications give an interesting picture as to potential future interest in CBM in North Park. Considerable new lease interest has occurred west and south of the Coalmont and Grizzly Creek areas in southwest North Park and near Whitely Peak and Carter Mountain in T.s 4 - 6 N., and R.s 80 - 81 W. These areas have previously had minimal or no conventional oil and gas inaterest and production. This area has been reported and published as having subsurface coal seams and beds.

Map 9: Leasing Interest and No-Lease Areas



The McCallum coal area has had only slight oil and gas leasing interest, but this is because the majority of the area is already leased.

The interest in CBM leasing is similar to Niobrara Formation leasing. Both areas of CBM interest somewhat overlap with the Niobrara Formation leasing interest area, including areas more north and east in T.s 6 – 9 N., R.s 78 – 81 W. The recent horizontal extraction technique for, and economic discovery of, Niobrara oil production will continue to promote leasing interest in the KFO.

F. Typical Oil, Gas, and Water Production Estimates

Water production varies throughout the KFO. Generally speaking, produced water production, when it occurs, is associated with Dakota/Lakota Formation production or with waterflood operations such as the Pierre Formation in the McCallum and South McCallum fields. Dakota/Lakota water production, sometimes reaching 1,000 barrels of water per day (BWPD), is handled by surface discharge into pits (i.e., Lone Pine Field) or re-injected into the subsurface (i.e., Battleship Field). However, not all Dakota/Lakota formation fields produce water.

Figure 9 provides a generalized summary of the production amounts from Jackson County. The production amounts do not discriminate between the type of production (i.e. produced water as a result of waterflooding operations, CO_2 versus methane, later life field response, etc.) but do give an idea of the relative amounts of production and well counts numbers.

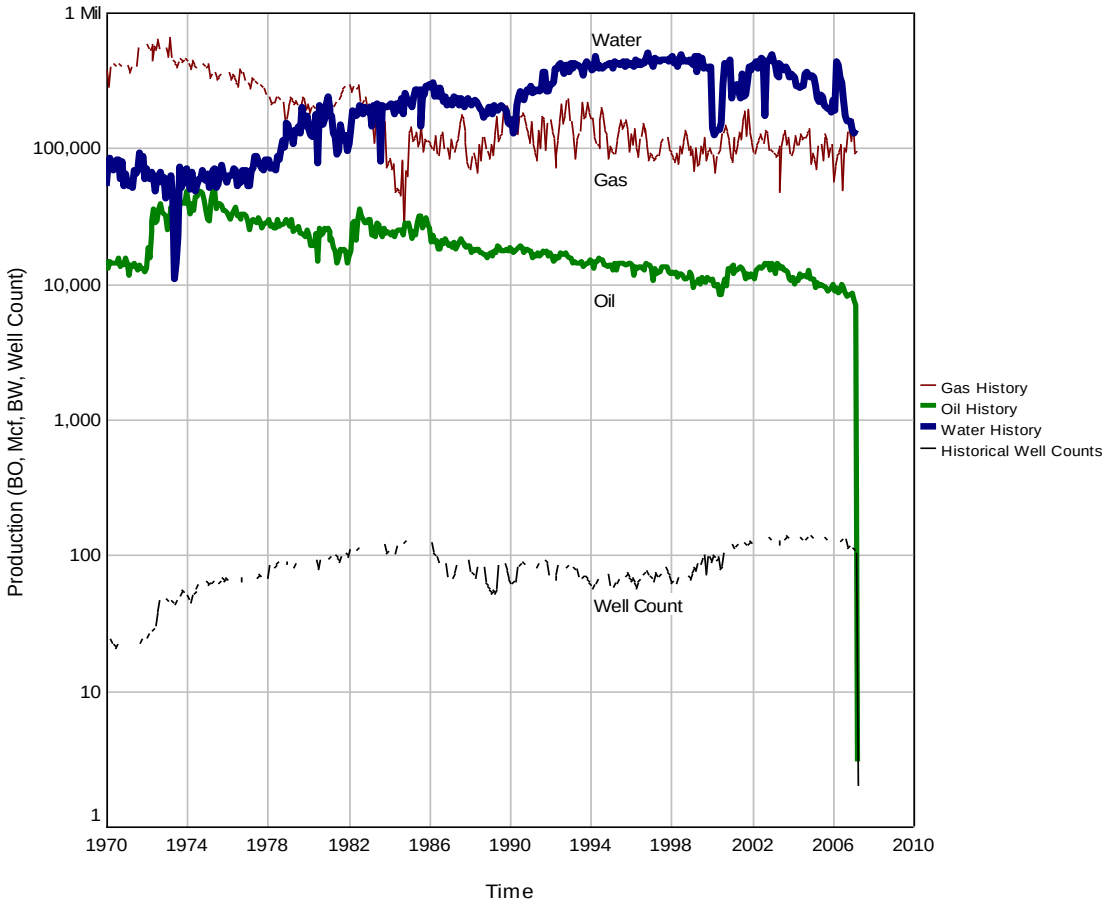
The productive capabilities of wells in Jackson County are relatively small when compared to other parts of Colorado. If the monthly production amounts are divided by the well count, a calculated current rough daily average production rate per well would be three BOPD, 30 Mcfpd, and 33 BWPD.

G. Typical Production Facilities

Typical production facilities for an oil well will include a well head, flowlines, separator, possibly a manifold and heater-treater, production tanks, and water disposal pits. The actual configuration depends on the amount of flow and the disposition of the production. For example, small amounts of produced water may be disposed in a surface pit rather than piped to an injection well. For oil wells in the KFO, the oil production will need to be trucked to a refinery or pipeline, since no direct pipeline exits the North Park Basin.

Typical production facilities for a gas well are analogous to those for an oil well. A wet gas well (i.e. also produces water or condensate) will include the well head, flowlines, separator, possibly a manifold, condensate tanks, metering house, and produced water tanks or water disposal pits, depending on the method of water disposal. The production facilities for a dry gas well require the least equipment of all wells. The facilities consist of a wellhead, flowlines, and a metering house.

Figure 9: Generalized Summary of Jackson County Monthly Production, 1970 to Present Generalized Summary of Jackson County Monthly Production, 1970 to Present



There are no natural gas transportation pipelines out of the North Park Basin. The presence of sufficient quantities of natural gas will need to be established through exploration activities and the corresponding development potential to support construction of a transportation pipeline. Natural gas production in North Park Basin will be limited to local demand with the installation of flowlines, gathering lines, and short distribution pipelines.

H. Directional and Horizontal Drilling Practices and New Technology Drilling and Completion Practices

Almost all the wells in North Park have been drilled vertically and most will continue to be in the future. No demand has surfaced for the drilling of multiple wells from a single pad. Some future drilling may involve a directional well due to topographical constraints. Horizontal drilling may become more prevalent if the reservoir properties and resource productivity justify the effort.

Directional drilling occurs when the well bore is deviated from the vertical. Normally the deviation will involve a slant, like a flattened "J" or a flattened "J" with a vertical drop at the end. The costs of directional drilling are 20 to 40 percent more than vertical drilling operations. The surface expression of a directional well is not any larger than a vertical well. To maintain favorable economics of an operation, a directional well is not used unless necessary.

The only difference between horizontal drilling and directional drilling are the advantages horizontal well bores bring when producing the oil and gas reservoir. The costs for horizontal drilling are a bit more than directional drilling but the productivity of the well is enhanced. This enhancement occurs because a well bore is placed in the reservoir parallel to the lateral plane of the reservoir, like the length of a horizontal cylinder penetrating along the thickness of a flat layer. This serves to open up more of the reservoir for production when compared to a vertical cylinder penetrating perpendicular through the thickness of the flat layer.

The EOG Resources, Inc., Niobrara Formation play around Coalmont will incorporate the horizontal drilling of multiple laterals in one well. These laterals will increase the productivity efficiency and will drain much more area of the reservoir. Lateral drilling will diminish the ultimate number of wells required to produce the reservoir.

I. Oil and Gas Prices, Finding and Development Costs and Revenue Projections

The price of oil and gas has risen dramatically in response to market forces starting in about 2004, and continuing to today (Figures 10 and 11). This increase has led to a corresponding increase in exploration and development activity and has made marginal prospects more attractive. This premise holds true for the oil and gas resources found in the KFO. Although the premise is true more so in the exploratory arena since most existing field development in the KFO has already occurred, the North Park Basin still offers much in the way of acceptable risk based exploration opportunities in CBM, and in the Niobrara play. There are also previously investigated but unexplored regions in Middle Park, such as the Granby Anticline.

The prevailing price of benchmark US light, sweet crudes for June 2008 delivery on the New York Mercantile Exchange is over $112/BO and first purchaser Colorado January 2008 price is around $85/BO. The June 2008, natural gas price is about $10.50 per MMbtu on the New York Mercantile Exchange and at the Henry Hub in Louisiana.

There does not seem to be, even considering a possible economic recession, an easing of the hydrocarbon pricing. Hydrocarbons are a fungible global commodity with current supply and demand running close to one another. Prices are determined by the demands of a few large users and the regulated supply by a few large producers. The expected future prices will continue to rise at an assumed escalation of five percent per year.

Figure 10: Energy Information Administration (EIA), U.S. Department of Energy – Historical Colorado Crude Oil Wellhead Acquisition Price by First Purchasers

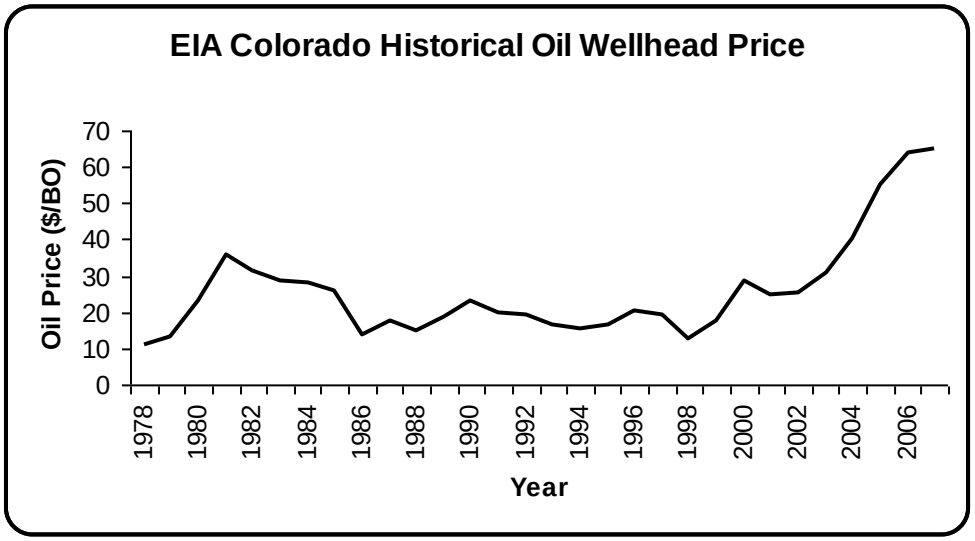
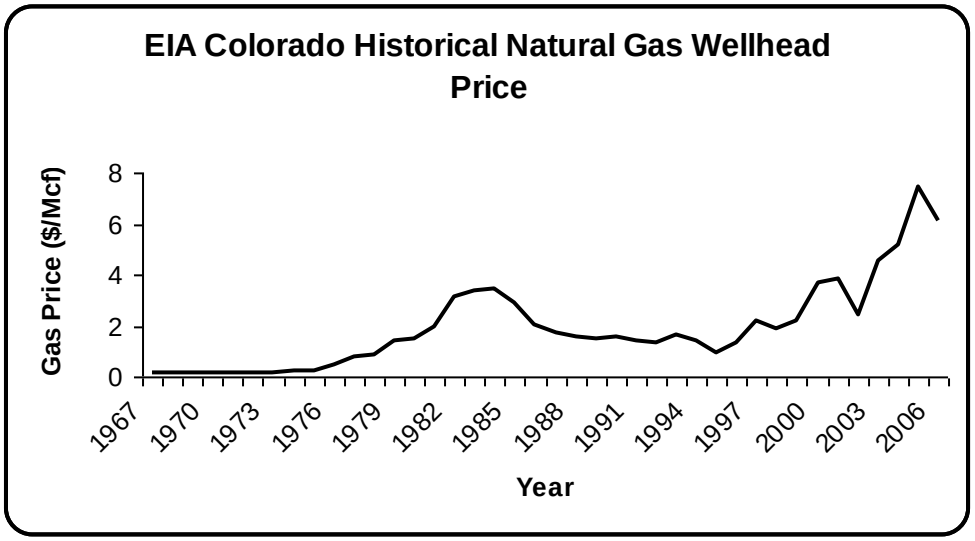


Figure 11: Energy Information Administration (EIA), U.S. Department of Energy – Historical Colorado Natural Gas Wellhead Price



Drilling costs have risen as much, if not more than prices (Figure 12). Considering an average well depth in the KFO of about 4,000 feet (Figure 13), 2008 drilling costs ($268/ft. in 2004 inflated at 10 percent /year) would run about $1.6 million per well ($392/ft. x 4,000 ft.). This is in contrast to the $6 million EOG Resources, Inc., spent on a 7,500-foot well with a 4,000-foot lateral extension. Horizontal drilling is much more

costly than normal vertical drilling. In this example, the extra drilling and equipping costs over that for a vertical well for the EOG Resources, Inc., well, expressed as a percentage, would be about 28 percent (100 x (($6 million/ ((7,500 + 4,000) x 392)+181,500)-1)).

Figure 12: Energy Information Administration (EIA), U.S. Department of Energy – Drilling Costs

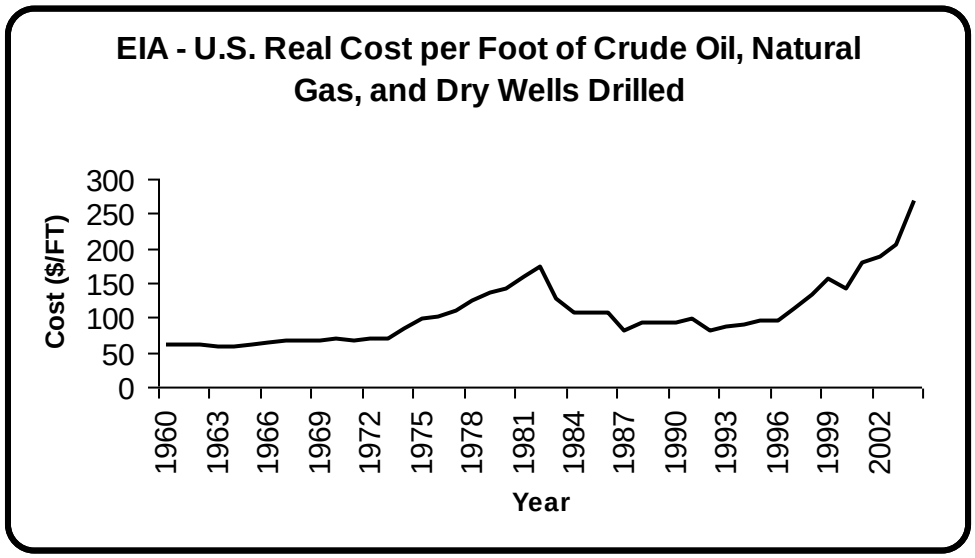
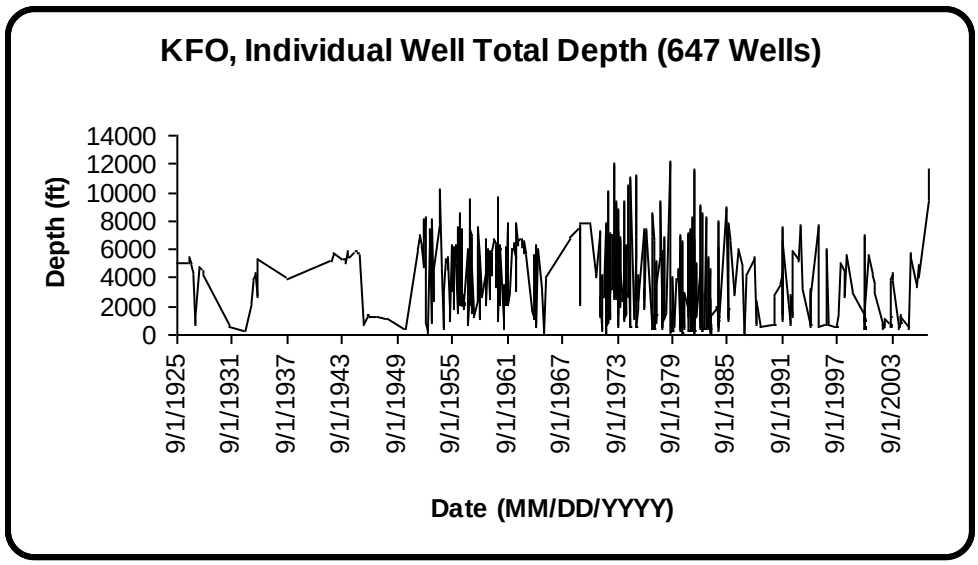


Figure 13: Kremmling Field Office Well Depths 1925 to Present



Development costs have not risen as quickly as prices or drilling costs, but still factor greatly in the economics of a prospect. To equip and operate on an annual basis a 4,000-

foot oil well on rod pump would cost about $181,500 (EIA $150,000 in 2006, escalated at 10 percent/year) and $31,460 (EIA $26,000 in 2006, escalated at 10 percent/year), respectively (Figures 14 and 15). The initial equipment costs include most everything needed, such as tubing, rods, pumps, manifolds, flowlines, separators, treaters, tanks, and disposal systems. The direct annual operating costs include overhead, labor, auto, chemicals, equipment use and repair, and workover and remedial services.

Figure 14: Energy Information Administration (EIA), U.S. Department of Energy – Equipment and Operating Costs, Oil Well

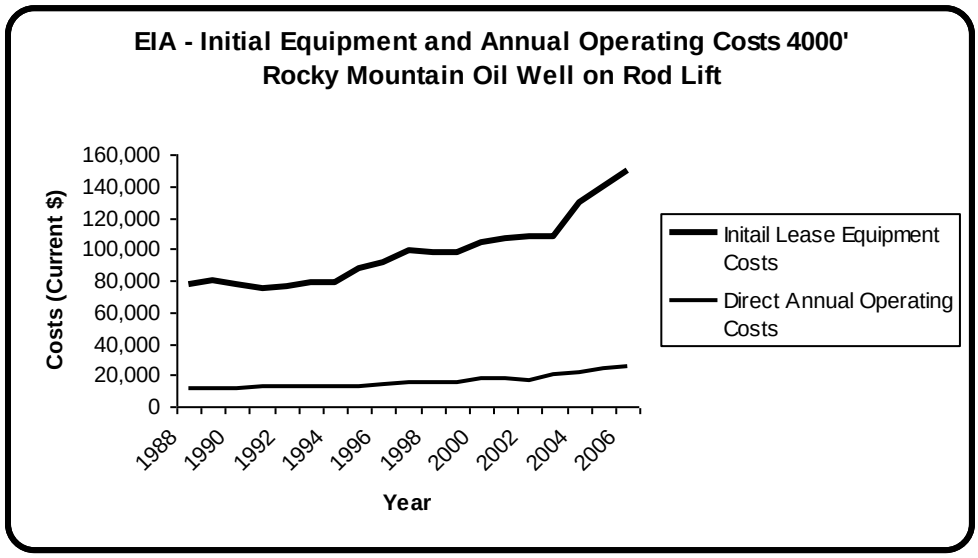
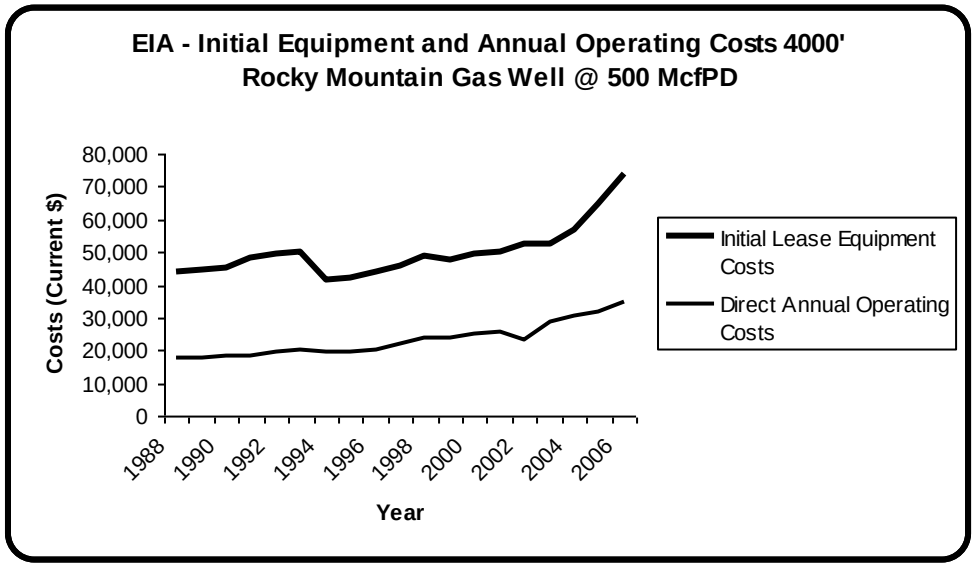


Figure 15: Energy Information Administration (EIA), U.S. Department of Energy – Equipment and Operating Costs, Gas Well



Using the following economic parameters and assumptions, in order to drill an economic oil well at today's costs and prices with reasonable escalations and an expected rate of return of 10 percent, a 4,000-foot well would need to produce at an initial rate of approximately 15.6 BOPD and continue production, at a 10 percent annual decline rate over a 20-year period, until cumulative production reaches 47,560 BO.

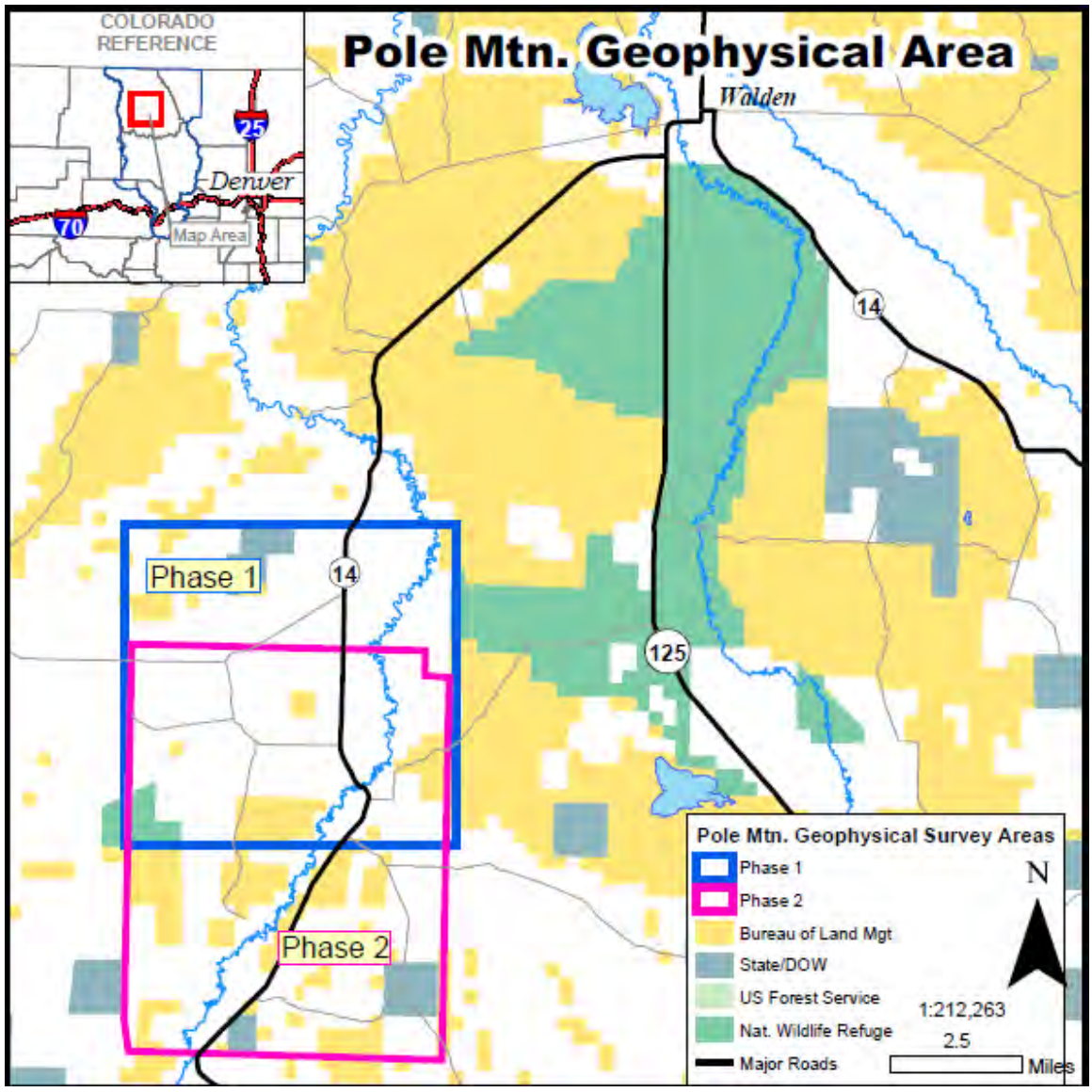
Economic Assumptions	
Well Depth	4,000 feet
Well Type	Oil only, no methane, no water
Oil Price	$85 per BO, escalated at five percent per year
Drilling Cost	$1,568,000
Initial Equipment Cost	$181,500
Monthly Operating Cost	$2,622, escalated at 10 percent per year
Taxes, Total	10 percent
Plugging Cost	$50,000, estimated at a 20-year future cost
Working Interest	100 percent
Net Revenue Interest	87.5 percent
Initial Production Rate	474 BOPM, 10 percent per year exponential decline rate
Cumulative Production	47,558 BO
Payout	6.67 years
Rate of Return	10 percent
Well Life	19 years, 11 months
Economic Limit	59 BOPM

J. Geophysical Activities

The following paragraphs and maps for this section were modified from two geophysical proposals submitted by Green River Energy Resources (GRER).

GRER conducted an exploratory, three-dimensional (3D), two phase, geophysical survey of the Pole Mountain 3D project area (Map 10). The project area covered approximately 80 square miles (51,120 acres) in total, 35 square miles (22,700 acres) in Phase I and 44 square miles (28,400 acres) in Phase II. The survey was conducted in T.s 6-8 N. and R.s 80-81 W. in Jackson County. This survey will provide data to develop a 3D image of the geologic structure and stratigraphy underlying the project area. The survey area includes federal lands administered by the BLM (13 square miles), State lands (2.4 square miles), USFWS-administered lands (1.5 square miles) and private fee lands (63 square miles).

Map 10: Pole Mountain Geophysical Area (Green River Energy Resources, Inc., 2007)



The data generated from this survey will significantly enhance evaluation of the potential mineral resources under federal lease, thus reducing the potential for non-productive wells and associated construction of new roads, well pads, pipelines, etc. Administrative activities associated with downstream oil and gas actions would also be significantly reduced by virtue of the increased accuracy of drilling objectives facilitated by this 3D seismograph survey.

V. Oil and Gas Occurrence Potential

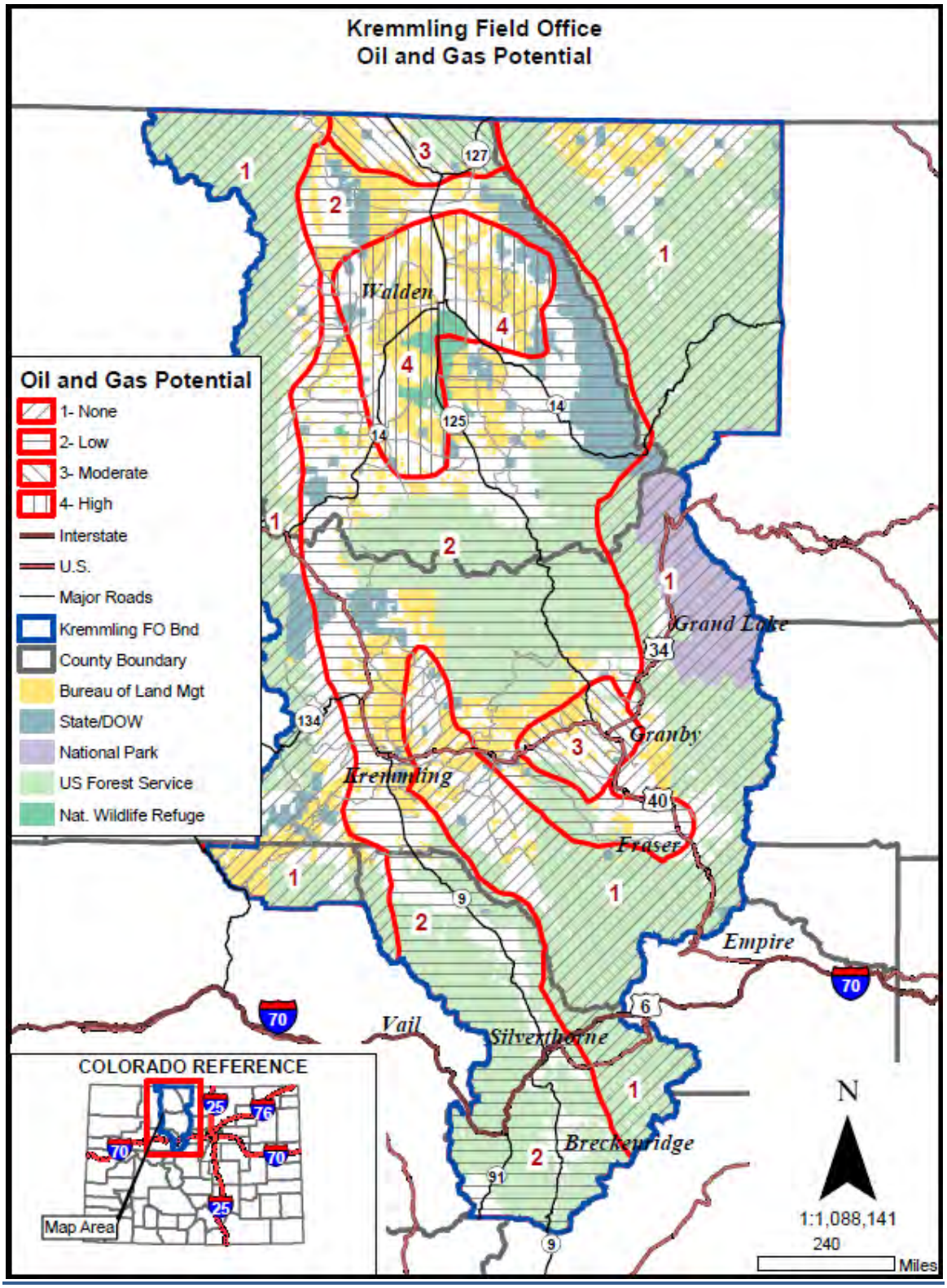
There are no USGS Assessments or EPCA Study Resource estimates for North and Middle Park Basins. To forecast oil and gas potential, the Kremmling RFD scenario from the 1991Colorado Oil and Gas Leasing EIS (Appendix B-19 through B-31) was used as a baseline. In addition, new activity from 1991 to present was considered, as well as new leasing interests during this time period. Additional information about potential came from two 2001 open file reports by the Colorado Geological Survey. These open file reports are:

- Open-File Report 01-06: Evaluation of Mineral and Mineral Fuel Potential of Grand and Summit Counties State Mineral Lands Administered by the Colorado State Land Board By James Cappa, H. Thomas Hemborg, and Rachel G. Coursey.
- Open-File Report 01-15: Evaluation of Mineral and Mineral Fuel Potential of Jackson County State Mineral Lands Administered by the Colorado State Land Board By James Cappa, Nicole V. Koenig, and Rachel G. Coursey.

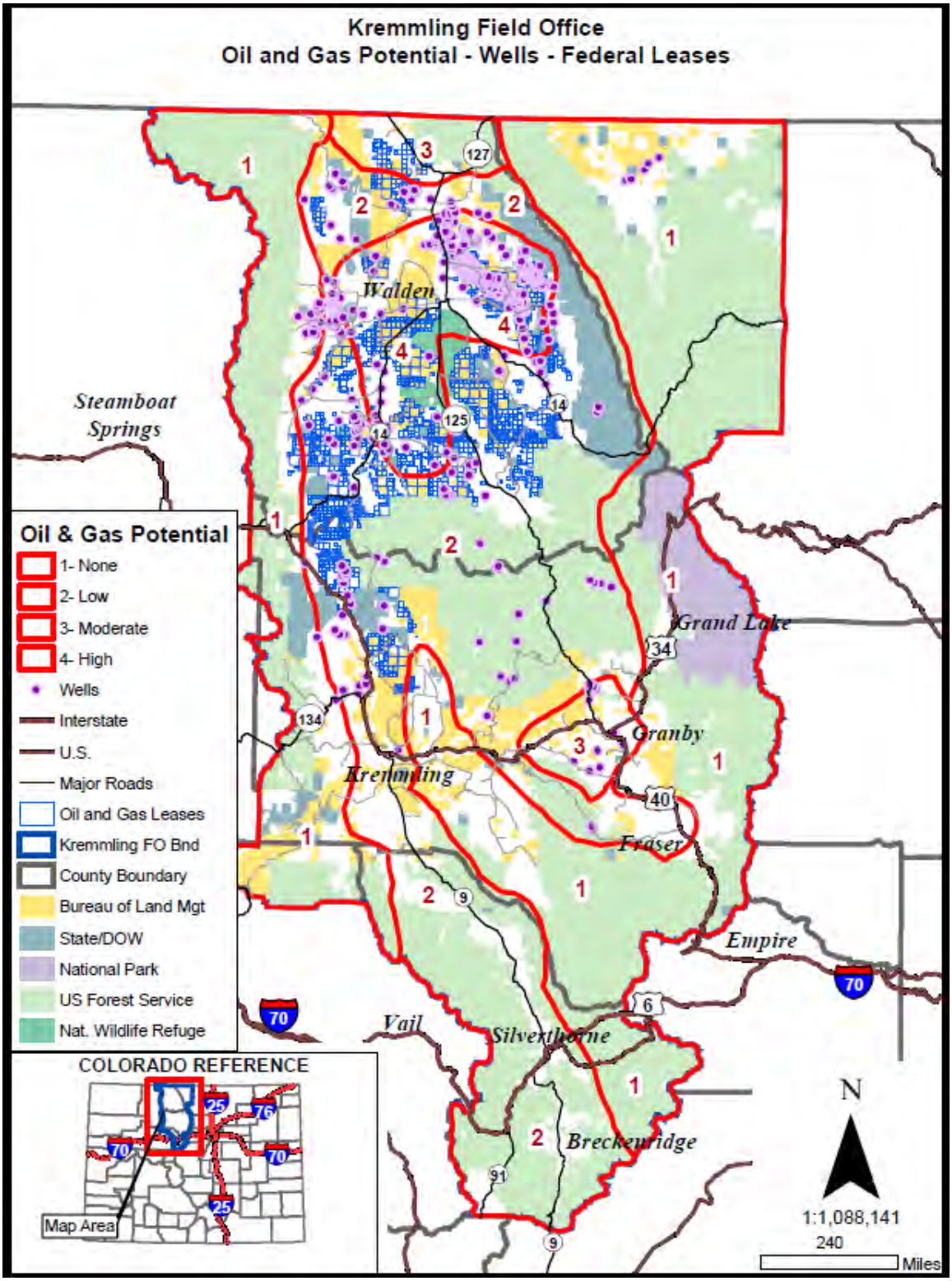
Evidence of oil and gas potential include oil seeps, oil or gas shows in well tests, and past or present production that constitute direct evidence of oil and gas potential. Indirect evidence may include seismic information, similarity with known producing rocks, or acceptable levels of thermal maturation. Either direct or indirect evidence may be used in classification. Oil and gas potential rating values of 1 through 4 (Maps 11 and 12) are based on the following criteria.

- High (4): There is the demonstrated existence of: (a) source rock, (b) thermal maturation, and (c) reservoir strata possessing permeability and/or porosity, and (d) traps; OR the area is part of an oil and gas play as defined by the USGS. (Open File Report 88-373 or related publication).
- Moderate (3): There is a geophysical or geological indication that the following are present: (a) source rock, (b) thermal maturation, and (c) reservoir strata possessing permeability and/or porosity, and (d) traps.
- Low (2): There are specific indications that one or more of the following are not present: (a) source rock, (b) thermal maturation, and (c) reservoir strata possessing permeability and/or porosity, and (d) traps.
- None (1): The absence of source rock, thermal maturation or reservoir rock prohibits the occurrence of oil and/or gas.

Map 11: Oil and Gas Occurrence Potential Map Kremmling Field Office



Map 12: Oil and Gas Potential With Wells and Federal Leases

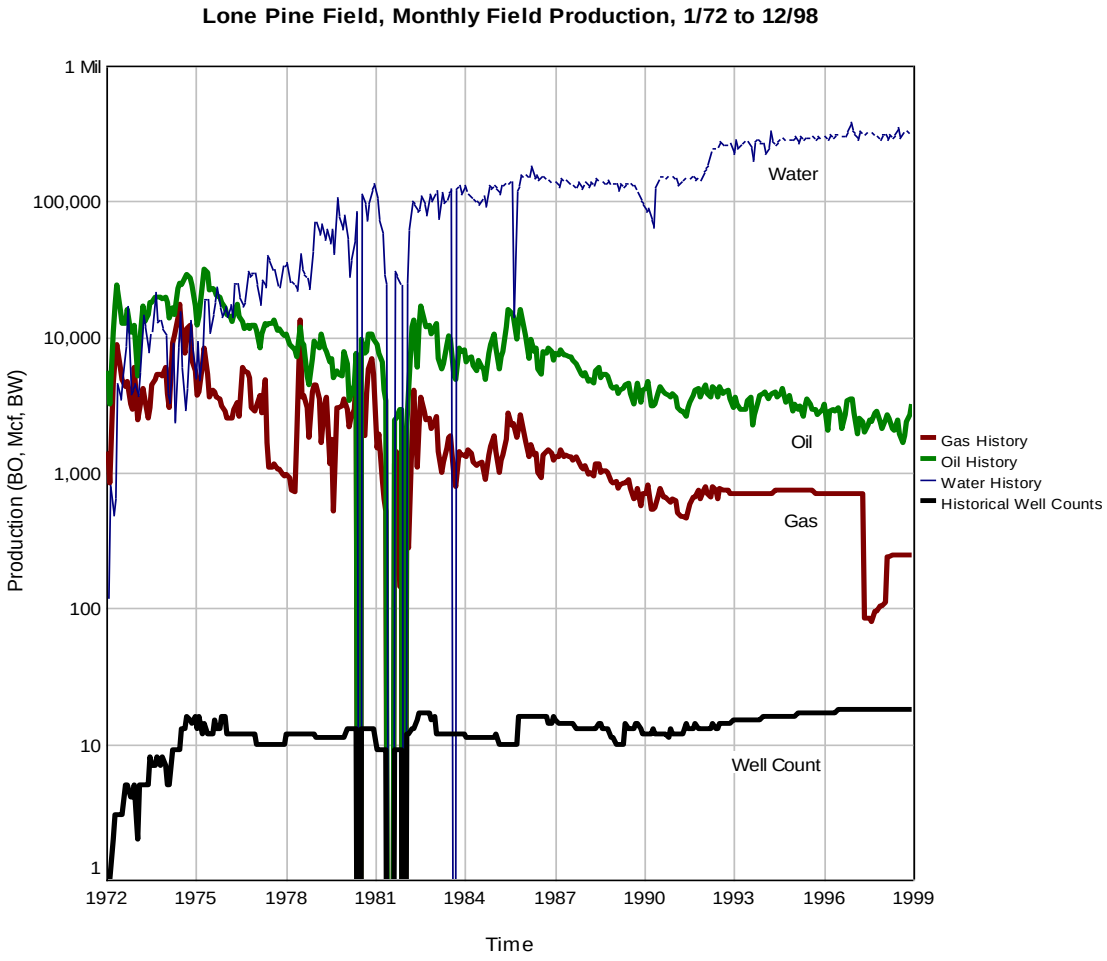


VI. Existing Fields and Remaining Development Potential

Most of the existing oil and gas fields have been developed to the greatest extent possible given the current situation. In other words, without gas and, to a certain extent, oil pipelines out of the North Park Basin, enhanced CO_2 processing capability or market, existing fields have been fully developed. There are some additional wells planned but the number is low (See Section IV, Past and Present Oil & Gas Exploration and Development Activity).

Aside from the remaining CO_2 potential in the McCallum and South McCallum fields, the rest of the fields in the KFO are in decline, have been for many years, and most are reaching their ultimate life. The recent increases in oil and gas prices have served to extend the economic limits of these fields and in some cases, like the Pierre Formation in the McCallum Field, resulted in additional drilling. For example, as shown in Figure 16, the Lone Pine Field began its decline in the middle 1980s and the recent increase in oil price has served to bring some of the wells in the field back online.

Figure 16: Lone Pine Field, Monthly Field Production, January 1972 to December 1998



VII. RFD Baseline Scenario Forecast, Assumptions, and Discussion

A. RFD Assumptions and Forecast Methodology for Number of Wells

The following assumptions are made to arrive at a forecast for the number of wells to be drilled and abandoned in the KFO.

- All potentially productive areas are open under standard lease terms
- The economic state of the oil and gas industry and support industries will remain relatively unchanged and the future costs and pricing will experience escalation by about the same amount.
- Drill rig availability is sufficient.
- Produced water handling, fresh water needs, availability of service company services, and experienced drilling and service company personnel are not constrained.
- Topography constraints for well location will not be much of a factor.
- City and county infrastructure will be able to accommodate the forecast activity without a great deal of upgrade or increased capacity.
- Pipeline take-away capacity is a factor for future gas development and to a certain degree oil development, and may become a large factor for the future.
- New drilling and completion technologies will serve to drive the Niobrara Formation and CBM plays.
- No hydrogen sulfide is present and impurities and inerts are marginal.

Historical trends, USGS estimates, present activity, and professional judgment were the key ingredients in formulating the reasonably foreseeable development scenario for oil and gas activity in KRA. Future oil and gas activity is difficult to predict. However, a sudden increase in the demand for oil and gas and the resulting price increases have triggered a larger exploration and development program. Evaluation of past and present activity and professional judgment indicates that it is reasonable to expect this current cycle of increased activity to last over the next 20 years.

B. RFD Scenario

Table 5 is a summary of the text following the table.

Table 5: Future Anticipated Drilling Activity by Situation

Situation	Total Wells	Federal Wells
Coalmont Niobrara	234	140
CBM	40	10
Granby Anticline	16	12
McCallum and South McCallum Field Infill	40	15
Other North and Middle Park Basin Field Infill	20	5
Rank Wildcats	20	10
Total	370	192

1. Industry Proposed Infill Development

McCallum and South McCallum

The operator of the McCallum and South McCallum fields is the most prevalent player in future infill development activities. Of the approximately 70 wells drilled in the KFO since 2000, about 57 of those were drilled by this single operator and most of the 57 were drilled as development wells in the McCallum Field. The remaining wells were drilled by about six other operators as infill, exploratory, or core holes, with a few of those operators drilling only one well each.

Proposals for infill development in the McCallum and South McCallum fields are anticipated to average about two wells per year or 40 new wells over the next 20 years. However, the operator estimated that almost an equal number of wells would be abandoned. Since both of these fields are under federal unit agreement supervision, federal involvement will occur with all the development wells. Full BLM involvement on the federal mineral leases, including drilling and surface use approvals, will occur for about 15 of these wells.

Infill development for the other fields in the KFO is expected to result in about half as many wells as that for the McCallum and South McCallum fields, or about 20 new wells over the next 20 years. None of these fields are under federal unit jurisdiction and little federal mineral estate lands occur in these fields. Approximately five wells will be drilled on the federal mineral estate.

The development well total is 60 wells over 20 years, with about 20 of these wells drilled on the federal mineral estate.

Production facilities for the infill development wells will be consistent with the existing facilities on other similar wells in the field. Power sources and flowlines will be added to connect the wells to the existing gathering infrastructure.

2. Other Development

Niobrara

A Niobrara Formation play for crude oil located in North Park is in the early stages of exploration and actual production information from the operator is limited. The Niobrara play is characterized by an Upper Cretaceous, tight, unconventional reservoir occurring in an area located about three miles southeast of the town of Coalmont. Current exploration activities are an extension of past drilling information and the use of new drilling techniques. The completion of a recent multi-leg horizontal lateral well may determine the potential development capacity of the Niobrara in this area. The exploration company has received from the COGCC the designation of ten drilling and spacing units sized to accommodate future multi-leg horizontal well bore systems.

Early reports from the Oil and Gas Journal (February 29, 2008) are that a 4,000-foot lateral well encountered an average sustained production rate of 320 BOPD over a 30-day period. Exploratory activity in the Niobrara Formation will be marginal at first due to the nature of the reservoir and the lack of an oil pipeline out of North Park, but may well increase depending on the outcome of recent exploration activities.

To arrive at the potential well drilling activity for the loosely defined 26-Township Niobrara Formation play area in Potential Area 4, the acreage was summed, amounting to 599,000 acres, and then divided by the current anticipated 640-acre spacing unit size for a well. This division amounted to 936 wells. As in all early potential plays, the economic drilling area is refined over time. The sweetest spots are initially determined and drilled, and ensuing drilling areas refined and redefined. Most of the time these sweet spots of economic viability constitute only a portion of the original play area, especially given the nature of the Niobrara Formation shale reservoir and the current high cost of using new technology. Therefore, a development factor of 25 percent was applied to the well total resulting in 234 wells during the 20-year life of this forecast. It is assumed that all these wells will be drilled over the 20-year period.

For the Niobrara Formation play, it is anticipated that about 10 wells will be drilled per year for the first five years and the remaining 184 wells drilled over the next 15 years, or 234 wells over the 20-year forecast. Initially, these wells will be drilled in and around the Coalmont area and may expand to other areas in North Park. Considering the federal mineral estate acreage position in the sweetest portion of the Niobrara Formation play area, 60 percent of the total wells, or 140 wells, will be drilled to the federal mineral estate or involve the federal mineral estate within a drilling and spacing unit.

Production facilities for the Niobrara Formation play will consist of separators, treaters, onsite flow lines, and production tanks. The size of the production tanks will depend on the oil production volumes and method of disposal of the produced waters.

Coalbed Methane

The KFO also has extensive coal with the potential for CBM development. There has been some targeted CBM development within the KFO although nothing promising has been encountered. The restricting factors for CBM development are insufficient coal gas content, pipeline take-away capacity and, if extensive volumes of water are found, the disposal capability for this water.

Exploration activities for CBM will usually involve a tight cluster of wells necessary to adequately evaluate the dewatering and productive capability of the coals. This cluster should mimic a five-spot box pattern. Exploration will occur sporadically with about two pilot projects of five wells each for every five years over the life of this forecast, resulting in about 40 wells. These wells will be drilled in areas where the Coalmont Formation is shallow and thick, namely in the North Park area in Jackson County. The amount of CBM drilling on the federal mineral estate is anticipated to be roughly 10 wells.

Production facilities for CBM wells are usually simple in design since gas production does not involve much equipment. However, if large volumes of water are produced and the disposal methods for this are water limited, the pad size will increase. Pad sizes may range from less than an acre to over four acres if water tanks and produced water hauling are required.

Granby Anticline

A few decades ago, wells were drilled around the area of Granby on the Granby anticline. Gas was discovered in the Niobrara and Frontier formations, but at the time was determined to be uneconomic. Times and economics have changed and the possibility exists for these resources to again be rediscovered. It is anticipated that if the leasing of federal minerals is allowed to proceed, then additional wells will be drilled. It is estimated that approximately four wells every five years may be drilled, for a total of 16 wells over the life of this forecast. About 12 of these wells will be drilled on the federal mineral estate. Production facilities for wells drilled in and around Granby will be typical for gas wells with minimal produced water handling requirements.

Wildcat Wells

Exploratory (wildcat) activities for crude oil and natural gas found in the Pierre Shale, Frontier, Muddy, Dakota, Lakota, and Morrison formations will occur in unidentified areas within the boundaries of the KFO. Oil and gas shows have been recorded in most parts of the KFO area, but the extent of these resources is unknown. It is anticipated that approximately one rank wildcat well per year will

be drilled (20 wells), with half of these wells drilled on the federal mineral estate (10 wells).

Very limited drilling is expected to occur on USFS lands due to the low potential for hydrocarbons occurring in these portions of the KFO and the lack of hydrocarbon shows and success in past drilling activities.

A major difficulty in the thorough development of any gas resource in the North and Middle Park areas is the lack of pipeline take-away capacity. If ample oil and gas resources are discovered by a number of operators on sufficient acreage, then it would not be difficult for these operators to develop the necessary pipeline capacity with numerous interstate pipelines existing nearby in southern Wyoming. Considering the projected moderate productive capability of natural gas wells in the North and Middle Park basins, a significant number of natural gas wells would be required to justify installation of a pipeline.

If installation of a transmission pipeline is determined feasible, the infrastructure may include a pipeline of approximately 65 miles (Walden, Colorado to Laramie, Wyoming; 22 miles in Colorado) out of the North Park Basin, connecting to the existing southern Wyoming pipelines, a compressor station, and a small gas plant, depending on the constituents of the produced gas. A compressor station includes scrubbers, strainers, separators, compressors, cooling towers, and metering equipment. A typical compressor station may occupy approximately five acres, including an access road. A small gas plant may require about another five acres, including an access road.

The overall range of potential exploration and development activity within the KFO for the period 2008 to 2027 could fall within a range of between no wells and 370 wells. Of the 370 wells, 192 would be drilled in the federal mineral estate, but 10 of those wells would be drilled from private surface. The upper range forecast encompasses all activity, including wildcat, exploratory, and development wells on private, state, and federal mineral estates; the assumption that minimum protection for other resources will be imposed on federal leases; and all potentially productive lands (sans those off-limits to leasing) are leased and developed to the maximum possible extent. This is done to ensure an adequate analysis in the RMP of the tradeoffs between enhanced protections for other resources and the corresponding impacts to oil and gas extraction.

3. Assessment of Reasonable Development

The RFD for the KFO is a reasonable estimate considering the nature of the region with minimal gradation between mature developed and high risk exploration areas. Most new oil and gas activity will be exploration with maintenance and some additional drilling in existing fields.

C. Surface and Mineral Estate Ownership

This section is intended to identify the surface and subsurface mineral estates under various ownerships (federal, state, private), the estimates of activity likely to occur on these lands, and the associated surface disturbance for each ownership combination. In most documents of this kind, split estate lands (i.e. private surface and federal minerals) are a consideration in determining the amount of management, participation, and authority by the BLM in surface disturbing activities. However, in the KFO the amount of split-estate lands in Potential Areas 3 and 4, where almost all of the exploration and development is expected to occur, is very low, approximating five percent of the federal mineral estate in these Potential Areas. Rather than confuse the reader with minor changes in the acreage of surface disturbance associated with various surface and subsurface ownership combinations, we will assume that federal surface overlies the federal mineral estate, and private and state surface overlies the private and state mineral estate, respectively.

VIII. Surface Disturbance Resulting From Oil and Gas Activity

The amount of disturbance caused by oil and gas activity is calculated using estimated disturbances in acres taken from a variety of sources. Recent APDs, seismic survey applications, industry estimates, and disturbance estimates from the Colorado Oil and Gas Development and Leasing EIS were used. Average disturbances per well for the KFO are estimated at eight acres, or four acres for a drill pad, two acres for roads, and two acres for all other infrastructure (i.e. "on lease" pipelines, central facilities, treatment facilities, etc.). "Off lease" transmission lines and pipelines are authorized as rights-of-way and as such are permitted as realty actions separate from oil and gas operations. These actions will be considered separately in the RMP Revision.

Oil and gas drilling and production activity in the KFO dates back to the early 1920s, with 675 wells being drilled to date. Using an average of eight acres per well, it is estimated that over time 5,400 acres of disturbance has occurred. However, over time, old wells are plugged and areas are reclaimed. Current estimates indicate that about 75 percent of surface disturbance associated with oil and gas development within the KFO has been reclaimed. Existing surface disturbance is estimated at 1,350 acres (Table 6). The anticipated surface disturbance is expected to rise from a base level in 2008 of approximately 1,350 acres to about 4,310 acres in 2027. The total additional surface disturbance over 20 years would be about 2,960 acres (Table 7), substantially less than one percent of the surface administered by the KFO. Approximately five percent of surface disturbance would occur on private surface overlying federal minerals.

Table 6: Kremmling Field Office Net Surface Disturbance

Development Type	Gross Existing Disturbance (675 wells)	Reclamation to Date (acres)	Existing Net Disturbance (acres)
Well pads	2,700	2025	675
Access Roads	1,350	1012	338
Central Facilities	1,350	1012	338
Total	5,400	4,049	1,351

Table 7: Total Future Anticipated Surface Disturbance

Situation	Total Wells	*Associated Surface Disturbance (Acres)
Coalmont Niobrara	234	1,872
CBM	40	320
Granby Anticline	16	128
McCallum and South McCallum Infill	40	320
Other North and Middle Park Field Infill	20	160
Rank Wildcats	20	160
Total	370	2960

*** Assumptions for Estimating RFD Associated Surface Disturbance:**

Assumptions are based on BLM experience from historical exploration and development in the KFO and from industry input.

Well pad = 4 acres

Average road disturbance per well = (.55 miles * 30 feet wide) = 2 acres

Central facilities (compressors and injection), treatment facilities, flowlines, gathering lines and power lines that are approved as a lease or unit action are included as disturbance in this RFD. [Note: Pipelines that require right-of-way approval are realty actions not oil and gas operations and as a result are not included in this RFD.] = 2 acres per well

Total Disturbance per well = 8 acres

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(Figure 3: Schematic Cross-section of Lower North Park)
(Figure 4: Schematic Cross-section of Upper North Park)

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(Table 3: Oil and Gas Fields of Jackson County)
(Map 4: Oil and Gas Fields of Jackson County)
(Map 5: Oil and Gas Fields of North Park with Wells)
(Map 6: Federal Units in the KFO)

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(Map 3: Geologic Basins and Ranges of the KFO)

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(Figure 10: EIA – Historical Colorado Crude Oil Wellhead Acquisition Price by First Purchasers)
(Figure 11: EIA – Historical Colorado Natural Gas Wellhead Price)
(Figure 12: EIA – Drilling Costs)
(Figure 14: EIA – Equipment and Operating Costs, Oil Well)

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(Map 10: Pole Mountain Geophysical Area)

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(Figure 5: KFO, Wells Drilled Per Year)
(Table 4: Oil and Gas Production by Field, 1999-2006)
(Figure 9: Generalized Summary of Jackson County Monthly Production, 1970 to Present)
(Figure 13: KFO Well Depths 1925 to Present)

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(Figure 2: Structure Map on the Dakota Formation – Middle and North Parks)
(Figure 6: Cross-section, Granby Anticline)
(Figure 7: Granby Anticline, Dakota Structure Map)

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XI. Appendix

Abbreviations

Bcf - Billion standard cubic feet of gas
BLM - Bureau of Land Management
BOE - Barrels of oil equivalent
BOPD - Barrels of oil per day
BOPM - Barrels of oil per month
BWPD - Barrels of water per day

CO_2 - Carbon Dioxide
COA - Conditions of Approval
COGCC - Colorado Oil and Gas Conservation Commission

DST drill-stem test

° F - degrees Fahrenheit

GOR - Gas-oil ratio

KRCRA - Known Recoverable Coal Resource Area

Mcfpd - Thousand standard cubic feet of gas per day
MMBO - Million barrels of oil
MMCF - Million standard cubic feet of gas
MMcfpd - Million standard cubic feet of gas per day

N. - North

Psi - pounds per square inch

R. - Range
R.s – more than one Range
RFD - Reasonably foreseeable development
RMAG - Rocky Mountain Association of Geologists
R_o - Vitronite reflectance values

SCF/BO - Standard cubic feet of gas per barrel of oil

T. – Township
T.s – more than one Township
TOC - Total organic carbon

W. - West
WSA – Wilderness Study Area

RFD Preparation and Review:

This RFD was prepared by Hank Szymanski, Petroleum Engineer, CSO, and Marion Malinowski, Geologist, CSO (retired). The RFD was presented to Cooperating Agencies as a draft executive summary, prior to finalizing alternatives, at a meeting held on May 18, 2008. A peer review of the RFD was conducted by Karl S. Osvald, Geologist at the Wyoming State Office, and completed on April 19, 2009. In his review summary, Karl recommended further work on the RFD, particularly in the area of graphics, illustrations, and maps. Additional internal reviews were conducted by the individuals listed below. Based on these reviews, the Field Office staff completed a number of edits and updated the document. This RFD will be released in accordance with Instruction Memorandum No. CO-2008-036.

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