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Bureau of Land Management
Pinedale Field Office

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Environmental Assessment for the ASU Year-Round Drilling Demonstration Project, Sublette County, Wyoming



MISSION STATEMENT

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

WY-100-EA05-254

TABLE OF CONTENTS

CHAPTER ONE INTRODUCTION

1.1	Introduction.....	1-1
1.2	Project Location.....	1-2
1.3	Purpose and Need for the Action	1-2
1.4	Summary of Scoping, Public Involvement and Identification of Significant Issues to be Resolved.....	1-2
1.5	Authorizing Actions and Relationships to Statutes and Regulations	1-4
1.6	Decisions to be Made Based on this NEPA Analysis	1-4

CHAPTER TWO ALTERNATIVES

2.1	Introduction.....	2-1
2.2	Proposed Action	2-1
2.3	No Action Alternative.....	2-2
2.4	Alternatives Considered and Eliminated from Detailed Study	2-5
2.5	Comparison of Proposed Action and No Action Alternative.....	2-5
2.6	Applicant-Committed Measures	2-6
2.6.1	Air Emission Reduction	2-6
2.6.2	Reserve Pits	2-6
2.6.3	Drilling Rig Movement and Supplies	2-6
2.6.4	Bus System for Employees	2-7
2.6.5	Access Station.....	2-7
2.6.6	Access Gates	2-7
2.6.7	Public Awareness and Outreach.....	2-8
2.6.8	Crew and Contractor Awareness	2-8
2.6.9	Wildlife Research and Monitoring Projects	2-8
2.6.10	Air Quality Monitoring.....	2-8
2.6.11	Habitat Enhancement and Interim Reclamation	2-8

CHAPTER THREE AFFECTED ENVIRONMENT

3.1	Introduction.....	3-1
3.2	Existing Disturbance in Demonstration Project Area	3-1
3.3	Socioeconomics and Environmental Justice.....	3-1
3.3.1	Demographics	3-2
3.3.2	Economic Activity	3-2
3.3.3	Employment.....	3-3
3.3.4	Environmental Justice	3-3
3.4	Transportation	3-3
3.5	Land Use and Grazing	3-3
3.6	Recreation Resources.....	3-4
3.7	Visual Resources	3-4
3.8	Cultural and Historic Resources.....	3-5
3.8.1	Cultural and Historic Resources.....	3-5
3.8.2	Native American Sites	3-6
3.9	Geology and Geologic Hazards, Minerals and Paleontological Resources.....	3-6
3.10	Water Resources.....	3-6
3.11	Soils.....	3-7
3.12	Vegetation and Noxious Weeds.....	3-7
3.13	Wetland and Riparian Resources	3-8
3.14	Threatened, Endangered, and Sensitive Species.....	3-8
3.14.1	Federally Listed Species.....	3-8
3.14.2	Sensitive Species.....	3-10

3.15	Wildlife and Aquatic Resources	3-13
3.15.1	Big Game	3-13
3.15.2	Upland Game Birds.....	3-16
3.15.3	Migratory Birds	3-18
3.15.4	Aquatic Resources	3-18
3.16	Air Quality and Noise.....	3-19
3.16.1	Air Quality.....	3-19
3.16.2	Noise	3-22

CHAPTER FOUR ENVIRONMENTAL CONSEQUENCES

4.1	Introduction.....	4-1
4.2	Socioeconomics and Environmental Justice.....	4-3
4.2.1	Proposed Action	4-3
4.2.2	No Action Alternative.....	4-4
4.2.3	Cumulative Impacts.....	4-4
4.2.4	PAPA ROD Consistency	4-4
4.3	Transportation	4-4
4.3.1	Proposed Action	4-4
4.3.2	No Action Alternative.....	4-5
4.3.3	Cumulative Impacts.....	4-6
4.3.4	PAPA ROD Consistency	4-6
4.4	Land Use and Grazing	4-6
4.4.1	Proposed Action	4-6
4.4.2	No Action Alternative.....	4-6
4.4.3	Cumulative Impacts.....	4-7
4.4.4	PAPA ROD Consistency	4-7
4.5	Recreation Resources.....	4-7
4.5.1	Proposed Action	4-7
4.5.2	No Action Alternative.....	4-7
4.5.3	Cumulative Impacts.....	4-8
4.5.4	PAPA ROD Consistency	4-8
4.6	Visual Resources	4-8
4.6.1	Proposed Action	4-8
4.6.2	No Action Alternative.....	4-8
4.6.3	Cumulative Impacts.....	4-9
4.6.4	PAPA ROD Consistency	4-9
4.7	Cultural and Historic Resources.....	4-9
4.7.1	Proposed Action	4-9
4.7.2	No Action Alternative.....	4-9
4.7.3	Cumulative Impacts.....	4-10
4.7.4	PAPA ROD Consistency	4-10
4.8	Geology, Geologic Hazards, Minerals and Paleontological Resources.....	4-10
4.8.1	Proposed Action	4-10
4.8.2	No Action Alternative.....	4-10
4.8.3	Cumulative Impacts.....	4-10
4.8.4	PAPA ROD Consistency	4-10
4.9	Water Resources.....	4-11
4.9.1	Proposed Action	4-11
4.9.2	No Action Alternative.....	4-11
4.9.3	Cumulative Impacts.....	4-11
4.9.4	PAPA ROD Consistency	4-11
4.10	Soils.....	4-11
4.10.1	Proposed Action.....	4-11
4.10.2	No Action Alternative.....	4-12
4.10.3	Cumulative Impacts.....	4-12

4.10.4	PAPA ROD Consistency	4-12
4.11	Vegetation and Noxious Weeds	4-12
4.11.1	Proposed Action	4-12
4.11.2	No Action Alternative.....	4-13
4.11.3	Cumulative Impacts.....	4-13
4.11.4	PAPA ROD Consistency	4-14
4.12	Wetland and Riparian Resources	4-14
4.12.1	Proposed Action	4-14
4.12.2	No Action Alternative.....	4-14
4.12.3	Cumulative Impacts.....	4-14
4.12.4	PAPA ROD Consistency	4-14
4.13	Threatened and Endangered Species	4-14
4.13.1	Proposed Action	4-15
4.13.2	Candidate and Other Special Status Species.....	4-18
4.13.3	No Action Alternative.....	4-19
4.13.4	Cumulative Impacts.....	4-19
4.13.5	PAPA ROD Consistency	4-19
4.14	Wildlife and Aquatic Resources	4-19
4.14.1	Proposed Action	4-19
4.14.2	No Action Alternative.....	4-23
4.14.3	Cumulative Impacts.....	4-24
4.14.4	PAPA ROD Consistency	4-24
4.15	Air Quality and Noise.....	4-24
4.15.1	Air Quality.....	4-24
4.15.2	Noise	4-27

LIST OF TABLES

CHAPTER ONE INTRODUCTION

Table 1-1	Federal, State and Local Permits, Approvals and Authorizing Actions Necessary for Construction, Operation, Maintenance and Abandonment of ASU's Proposed Action and Alternatives	1-4
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CHAPTER THREE AFFECTED ENVIRONMENT

Table 3-1	Summary of Existing Disturbance (acres) within the Demonstration Project Area	3-1
Table 3-2	Population Statistics for Lincoln and Sublette Counties	3-2
Table 3-3	Taxes From Oil and Gas Industries In Wyoming During 2003	3-2
Table 3-4	Big Game Species, Hunt Areas, and Seasons in 2005 In the Project Area and Vicinity	3-4
Table 3-6	BLM-Sensitive Vertebrate Species Not Listed Under ESA That Could Occur within the Demonstration Project Area, Habitats, and Other Status Designations	3-11
Table 3-7	BLM-Sensitive Plant Species Not Listed Under ESA That Could Occur within the Demonstration Project Area, Habitats, and Other Status Designations.....	3-13
Table 3-8	Mule Deer Sublette Herd Unit Population, Productivity, and Harvest	3-14
Table 3-9	Pronghorn Sublette Herd Unit Population, Productivity and Harvest	3-15
Table 3-10	Moose Sublette Herd Unit Populations, Productivity, and Harvest	3-16
Table 3-12	Male Sage-Grouse Attendance Averaged For Leks Censused On the Mesa On the Rest of the PAPA, and Off the PAPA Since 1999.....	3-18
Table 3-13	Estimated Current NO _x Emissions from ASU-Operated Rigs within the PAPA.....	3-20

CHAPTER FOUR ENVIRONMENTAL CONSEQUENCES

Table 4-1	Estimated Surface Disturbance (acres) by the Demonstration Project (Proposed Action) Compared to Continued Development under the PAPA ROD (the No Action)	4-2
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Table 4-2 Plant Species Included in Pilot Habitat Seed Mixture.....4-13

Table 4-3 Distances (miles) From Demonstration Project Components To The Closest Bald Eagle Habitat Feature4-16

Table 4-4 Proposed NO_x Emissions from ASU-Operated Rigs on Demonstration Pads During Winter 2005-2006.....4-25

Table 4-5 Proposed NO_x Emissions from All ASU-Operated Rigs During Winter 2005-2006.....4-25

Table 4-6 Estimated NO_x Emissions from All Rigs During Winter 2005-2006.....4-27

LIST OF FIGURES

CHAPTER ONE INTRODUCTION

Figure 1-1 General Project Location1-3

CHAPTER TWO ALTERNATIVES

Figure 2-1 Development Under the Proposed Action2-3

Figure 2-2 Development Under the No Action2-4

LIST OF ABBREVIATIONS

AO	Authorized Office
APD	application for permit to drill
ASU	Anschutz, Shell and Ultra
AUM	animal unit month
BBS	breeding bird survey
BLM	Bureau of Land Management
BTNF	Bridger Teton National Forest
CASTNet	Clean Air Status Trends Network
COA	Condition of Approval
dv	deciview
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ERRP	Erosion Control Revegetation and Reclamation Plan
FWS	U.S. Fish and Wildlife Service
GDP	Gross Domestic Product
GSP	Gross State Product
GTNP	Grand Teton National Park
IMPROVE	Interagency Monitoring of Protected Visual Environment
LAC	level-of-acceptable change
LOC	levels-of-concern
MA	management area
MOA	memorandum of agreement
NAAQS	National Ambient Air Quality Standards
NRHP	National Register of Historic Places
PA	Programmatic Agreement
PAPA	Pinedale Anticline Project Area
PSD	Prevention of Significant Deterioration
RMP	Resource Management Plan
ROD	Record of Decision
SLAMS	State and Local Air Monitoring System
SPCC	Spill Prevention Control and Countermeasure Plan
VRM	visual resource management
USGMA	upland and small game management area
WAAQS	Wyoming Ambient Air Quality Standards
WDAI	Wyoming Department of Administration and Information
WDEQ	Wyoming Department of Environmental Quality
WDOT	Wyoming Department of Transportation
WGFD	Wyoming Game and Fish Department
WOGCC	Wyoming Oil & Gas Conservation Commission
YNP	Yellowstone National Park

CHAPTER ONE INTRODUCTION

1.1 Introduction

Anschutz Pinedale Corporation (Anschutz), Shell Exploration & Production Company (Shell) and Ultra Resources Inc. (Ultra), jointly referred to as ASU, propose the ASU Year-Round Drilling Demonstration Project (the Demonstration Project). The Demonstration Project proposes winter drilling on selected well pads on ASU's leases within the Pinedale Anticline Project Area (PAPA) from November 15, 2005 through July 31, 2006 with well completions commencing May 1, 2006. The U.S. Department of the Interior, Bureau of Land Management (BLM), with the State of Wyoming and Sublette County as cooperating agencies, prepared this Environmental Assessment (EA) to evaluate impacts which could result from winter drilling in big game crucial winter range and in greater sage-grouse breeding and nesting habitats in a portion of the PAPA in Sublette County, Wyoming. ASU has proposed consolidating drilling infrastructure and operations onto fewer pads, resulting in less surface disturbance and a reduction in air emissions. The project seeks to use improved technology, better coordination of facilities and drilling schedules to reduce overall impacts.

BLM completed an Environmental Impact Statement on the Pinedale Anticline Project Area (hereafter, the PAPA EIS) in 2000 that analyzed proposed natural gas exploration and development in the 197,345-acre PAPA (BLM, 1999a and 2000a). BLM (2000b) issued a Record of Decision (ROD) in July, 2000. To date, exploration and development has followed the conditions set forth in the ROD including timing restrictions intended to limit activities that would protect wildlife by minimizing exposure to human activity.

The Demonstration Project would be based on experience gained during the five years following completion of the PAPA EIS, an ongoing evaluation of overall project economics, and recent advances in drilling technology. The Proposed Action would demonstrate the ability of the three leaseholders to work together to reduce disturbance in the PAPA that was projected to occur with development consistent with the PAPA EIS and ROD. Although ASU is currently using pad drilling (multiple wells from one pad) to a limited extent within their leaseholds, the Demonstration Project would implement more extensive use of pad drilling to reduce overall disturbance and resulting habitat fragmentation.

Each operator has selected a demonstration pad in coordination with BLM and Wyoming Game and Fish Department (WGFD). The Anschutz (Mesa 10-35) and Ultra (Mesa 7-34) demonstration pads lie entirely within pronghorn antelope crucial winter range designated by WGFD. The Shell (Mesa 7-29) demonstration pad lies entirely within WGFD-designated mule deer crucial winter range. All three demonstration pads coincide with breeding and nesting habitat for sage-grouse. In 2004, BLM approved limited (i.e., two rigs on each of three pads) year-round drilling for Questar (BLM, 2004a) within mule deer crucial winter range in the northern portion of the PAPA. In addition, BLM has granted exceptions within sage-grouse breeding and nesting habitats during limited periods when BLM biologists determined sage-grouse were not present in the habitat.

The EA does not repeat information contained in the PAPA EIS. Rather, this EA focuses on those resource impacts that are different (either in location, magnitude, or timing) than those described in the PAPA EIS. The Demonstration Project would occur entirely within the geographic area evaluated in the PAPA EIS. Winter drilling under the Demonstration Project affects some resources during a time of year when impacts would otherwise be limited or not occur but also results in less surface disturbance within the project area.

1.2 Project Location

The project area is in Sublette County in west-central Wyoming. Pinedale, the nearest town, is located approximately 80 highway miles southwest of Jackson Hole and 100 miles north of Rock Springs. Other communities/settlements in the general vicinity of the project area include Cora, Daniel, Boulder, Bargerville, Marbleton and Big Piney (see Figure 1-1).

The Demonstration Project is proposed in Sections 29, 34, and 35 of T. 32 N., R. 109 W. Generally, these sections lie 2 to 4.5 miles northeast of the New Fork River and 5.5 to 9 miles east of the Green River. U.S. Highway 191 is east of the Demonstration Project Area and is the primary route for tourist travel to Yellowstone and Grand Teton National Parks and Jackson Hole. State Highway 351 is south of the Demonstration Project Area.

1.3 Purpose and Need for the Action

The purpose of this project is for Anschutz, Shell and Ultra to demonstrate, through coordination of development and improvement of management practices, that reductions to overall disturbance can be accomplished in crucial winter range for years 2005 and 2006. Drilling during winter would allow ASU to minimize surface disturbance by utilizing two drilling rigs each on three separate pads to drill multiple wells during the winter period from November 15, 2005 through May 1, 2006. Additionally, that coordinated and concerted effort would fully develop the natural gas resource within each operator's specific leases in less time than would occur otherwise.

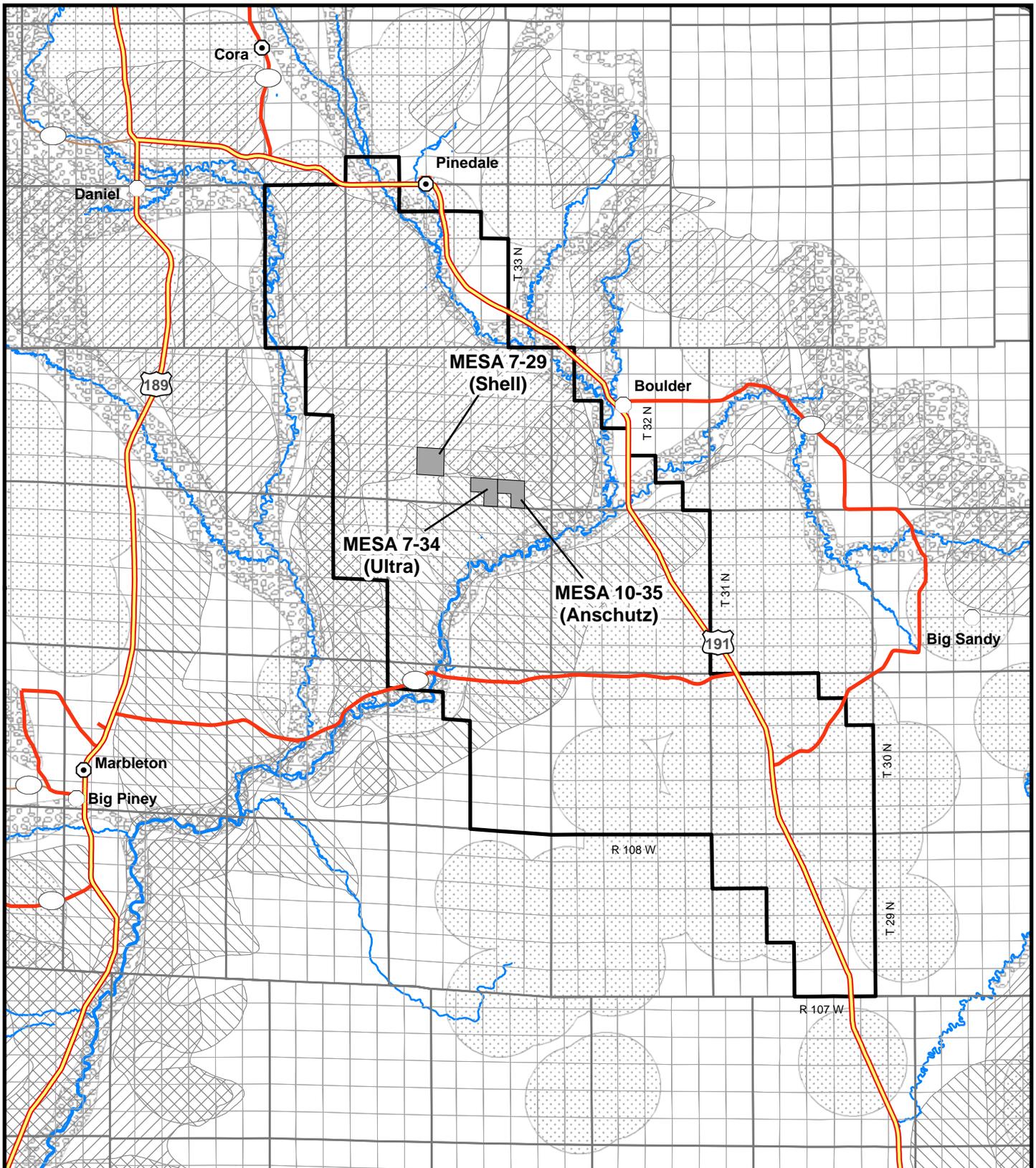
With increased field knowledge of the PAPA and advances in drilling and production techniques, there is a need for operators in the PAPA to improve operational logistics and efficiency of natural gas development to ultimately reduce overall surface disturbance in big game crucial winter ranges and sage-grouse habitats. Due to the unique pattern of lease-hold ownership in the PAPA, it is essential that operators work in partnership in order to reduce surface disturbance, habitat fragmentation, and improve air quality.

1.4 Summary of Scoping, Public Involvement and Identification of Significant Issues to be Resolved

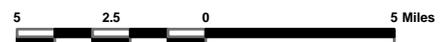
On July 17, 2005 the BLM released a scoping notice by a press release initiating scoping of the proposal. Information was mailed to approximately 600 interested parties and other agencies. On July 26, 2005, the BLM held a public information meeting in Pinedale, Wyoming. BLM received 27 responses from other agencies, interested groups and members of the public. There were suggestions, comments, and concerns expressed about potential effects of the Proposed Action on various resources including socioeconomics, livestock grazing, visual, noise, water quality, traffic, and recreation. Based on the responses however, BLM identified the following key issues associated with air quality and wildlife, the two resources of greatest concern to respondents:

Air Quality:

- Impact of NO_x and VOC by emissions from drilling rigs, flaring operations, separators, dehydrators and other equipment on air quality and visibility in general and during atmospheric inversions in winter in particular and cumulative impact by atmospheric deposition to granite basin lakes of the Wind River Range from natural gas development within the upper Green River Valley;



- PINEDALE ANTICLINE PROJECT AREA (PAPA)
- MULE DEER CRUCIAL WINTER RANGE
- ANTELOPE CRUCIAL WINTER RANGE
- SAGE GROUSE LEKS - 2 MILE BUFFER
- MOOSE CRUCIAL WINTER RANGE



**FIGURE 1-1
GENERAL PROJECT LOCATION
ASU YEAR-ROUND DRILLING DEMONSTRATION PROJECT**

Wildlife:

- Impact to species protected by Federal statutes (Endangered Species Act, Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act), sensitive species, and wetlands/riparian areas (Executive Orders 11990 and 11988, Section 404 of the Clean Water Act) with conservation and protective measures for those resources; and
- Impact to important, seasonally-used wildlife habitats in relation to other factors that adversely affect wildlife (specifically pronghorn, mule deer, sage-grouse, and raptors) using those habitats, cumulative effects to local wildlife populations, and management procedures appropriate to mitigate impact.

1.5 Authorizing Actions and Relationships to Statutes and Regulations

A list of permits, approvals and authorizing actions necessary to construct, operate, maintain and abandon project-related facilities is provided in Table 1-1. The PAPA EIS (BLM, 1999a and 2000a) contains complete descriptions of the regulatory programs listed in Table 1-1 as well as their applicability to oil and gas activities in the PAPA. For additional information regarding these regulatory programs, please refer to the PAPA EIS.

1.6 Decisions to be Made Based on this NEPA Analysis

BLM decision-makers will decide, based on the analysis contained in this EA, whether or not to approve or reject the Demonstration Project as submitted by ASU.

**Table 1-1
Federal, State and Local Permits, Approvals and Authorizing Actions Necessary for
Construction, Operation, Maintenance and Abandonment of ASU's Proposed Action and Alternatives**

Issuing Agency/Permit Name	Nature of Permit/Approval	Authority
Bureau of Land Management Permit to Drill, Deepen or Plug Back (APD/Sundry process)	Controls drilling for oil and gas on Federal onshore lands	Mineral Leasing Act of 1920 (30 U.S.C. 181 <i>et seq.</i>); 43 CFR 3162
Rights-of-way Grants and Temporary Use Permits	Right-of-way grants on Federal lands	Mineral Leasing Act of 1920 as amended (30 U.S.C. 185); 43 CFR 2880
Rights-of-way Grants and Temporary Use Permits	Right-of-way grants on Federal lands	Federal Land Policy and Management Act of 1976 (43 U.S.C. 1761 - 1771); 43 CFR 2800
Antiquities, Cultural and Historic Resource Permits	Issue antiquities and cultural resources use permits to inventory, excavate or remove cultural or historic resources from Federal lands	Antiquities Act of 1906 (16 U.S.C. Section 431-433); Archaeological Resources Public Protection Act of 1979 (16 U.S.C. Sections 470aa - 47011); 43 CFR Part 3; Section 106 of the National Historic Preservation Act.
Approval to Dispose of Produced Water	Controls disposal of produced water from Federal leases	Mineral Leasing Act of 1920 (30 U.S.C. 181 <i>et seq.</i>); 43 CFR 3164; Onshore Oil and Gas Order No. 7
U.S. Army Corps of Engineers Section 404 Permit (Nationwide and Individual)	Controls discharge of dredged or fill materials into waters of the United States.	Section 404 of the Clean Water Act of 1972 (33 USC 1344)
U.S. Fish and Wildlife Service Consultation Process, Endangered and Threatened Species	Biological Assessment/Biological Opinion	Section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. <i>et seq.</i>)
Wyoming Department of Environmental Quality Water Quality Division Notice of Intent - Storm Water Discharge Permit	Controls off-site storm water runoff from construction activities resulting in 1 acre or more of disturbance	Wyoming Environmental Quality Act; Section 405 of the Clean Water Act (40 CFR Parts 122, 123 and 124); WDEQ Water Quality Rules and Regulations, Chapter 18

Table 1-1. Concluded		
Issuing Agency/Permit Name	Nature of Permit/Approval	Authority
Air Quality Division Permits to construct and operate Notice of Installation	Regulates emissions from project components Notification of Potential Emissions from production equipment	Wyoming Air Quality Standards and Regulations WDEQ Rules and Regulations
Wyoming Department of Transportation Oversize and Overlength Load Permits Utility Permit	Permits for oversize, overlength and overweight loads	Chapters 17 and 20 of the Wyoming Department of Transportation Rules and Regulations
Wyoming Oil and Gas Conservation Commission Permit to Drill, Deepen or Plug Back (APD process)	Regulates drilling of all oil and gas wells in the state	Wyoming Oil and Gas Conservation Commission (WOCGG) Regulations Chapter 3, Section 8. W.S. 30-5-104 (d)(i)(C). W.S. 30-5-115.
Well location (part of the APD process).	Regulates downhole well location of all oil and gas wells by reservoir or pool.	WOGCC Rule: Chapter 3 Section 2, W.S. 30-5- 109
Protection of surface waters and productive formations (part of APD process).	Provides general drilling, casing and cementing rules for oil and gas wells.	WOGCC Rule: Chapter 3, Section 22.
Well control (part of APD process).	Provides requirements for blowout preventers.	WOGCC Rule: Chapter 3, Section 23.
Authorization approving drilling and spacing units	Regulates well spacing and pooling of interests by reservoir or pool.	W.S. 30-5-104(d)(ii)(F)(iv). W.S. 30-5-109(a),(b),(c) & (f).
Permit to drill to a nonstandard location	Provides for well relocation while maintaining existing well spacing	WOGCC Rule: Chapter 3, Section 3, W.S. 30-5- 109
Permit to directionally drill	Provides the notification requirements for controlled directional drilling.	WOGCC Rule: Chapter 3, Section 25.
Plugging and abandonment of a well (applies to nonfederal lands)	Provides procedures and regulates the plugging and abandonment of oil and gas wells.	WOGCC Rule: Chapter 3, Section 18, Chapter 4, Section 2. W.S. 30-5-104 (d)(vi)(B)
Measurement of oil and gas production.	Regulates the measurement and reporting of oil and gas production	WOGCC Rule: Chapter 3, Section 30 and 31, W.S. 30-5-104 (d)(vi)(B)
Permit to complete a well in multiple zones or pools. (Commingling)	Regulates the production of oil and gas from more than one pool in one well.	WOGCC Rule: Chapter 3, Section 35.
Authorization to flare or vent gas	Regulates the safe venting or flaring of gas to prevent waste.	WOGCC Rule: Chapter 3, Section 40.
Permit to use an earthen pit (applies to nonfederal lands)	Regulates construction, use and closure of noncommercial reserve, production and emergency pits on drilling and producing locations.	WOGCC Rule: Chapter 4, Section 1, W.S. 30-5- 104 (d)(vi)(A)
Spills and fires	Requires notification, with a prevention and cleanup plan, of accidental deaths, fires or releases of 10 or more barrels of nonpotable fluids which enter or threaten the waters of the State.	WOGCC Rule: Chapter 4, Section 3.
Workmanlike operations	Regulates the safety and environmental protection of well production facilities.	WOGCC Chapter 4, Section 4.
Permit underground disposal of water	Regulates the noncommercial underground disposal of nonpotable water and oil field wastes.	WOGCC Chapter 4, Section 5, W.S. 30-5-104 (d)(vi)(B)
Permit to close a natural gas processing facility	Regulates closure of infield gas gathering and processing facilities.	WOGCC Rule: Chapter 4, Section 13 (b).
Wyoming Department of Employment Workers Safety and Compensation Division	Provides the rules and regulations governing the health and safety of employees and employers of oil and gas drilling and servicing, includes equipment spacing, lighting requirements, hours of operation and other items pertinent to pad size and design.	W.S. 27-11-105
Wyoming State Lands and Investments	Right-of-way and easements on state lands	W.S. 36-9-118

¹ This list is intended to provide only an overview of key regulatory requirements that would govern project implementation. Additional approvals, permits and authorizing actions could be necessary.

CHAPTER TWO ALTERNATIVES

2.1 Introduction

In addition to the Proposed Action, the BLM considered and evaluated one alternative, the No Action Alternative. A description of two other alternatives considered and eliminated from further analysis is also provided in this chapter. The reader is encouraged to review the information contained in Chapter 2 of the PAPA EIS (BLM, 1999a and 2000a) for additional technical descriptions regarding drilling techniques, construction of access roads, and other relevant aspects of natural gas development. The PAPA EIS is incorporated into this document by reference.

2.2 Proposed Action

ASU has submitted a proposal to BLM to develop portions of their leases differently than would otherwise occur under the PAPA ROD. The Demonstration Project would include drilling on selected sites within ASU's existing leases in Township 32 North, Range 109 West from November 15, 2005 through July 31, 2006 with completions beginning after May 1, 2006. The Proposed Action would demonstrate the ability of the three operators to work cooperatively to jointly plan and employ infrastructure, and implement new methods and technologies specifically by using consolidated drilling pads on which multiple wells would be drilled simultaneously.

The Demonstration Project involves three well pads, one selected by each operator in coordination with the BLM and WGFD. Each well pad has been strategically located to allow multiple wells to be drilled from the single pad while minimizing new construction of roads. Each of the selected pads is within sage-grouse nesting habitat (and potentially brood rearing and wintering habitat) and big game crucial winter range. The Shell pad is located in mule deer crucial winter range and the Anschutz and Ultra pads are located in pronghorn antelope crucial winter range. ASU is requesting that BLM not apply seasonal restrictions to permit approvals that would normally limit actions within big game crucial winter range and sage-grouse nesting and early brood rearing habitat and winter concentration areas.

Drilling multiple wells from a single well pad necessitates increasing the size of the well pad to accommodate activities, equipment and facilities associated with a multiple well bore pad. Centralizing the well surface locations on a single pad eliminates the need to construct additional roads to multiple pads with single well sites. ASU is currently utilizing pad drilling within the demonstration sections and would continue to utilize pad drilling even if development were to continue under the PAPA ROD. Pad drilling necessitates directional drilling technology to achieve bottom hole well spacing authorized by WOGCC. Under the Proposed Action, ASU would demonstrate placement of bottom holes up to 2,740 feet laterally from a surface location. The Proposed Action with pad drilling during the winter is expected to decrease the total time required for each operator to fully develop their leases within the Demonstration Project Area.

Anschutz is proposing to construct the Mesa 10-35 well pad in Section 35, Township 32 North, Range 109 West as their demonstration pad. Up to 9 wells (20-acre bottom hole spacing) would be drilled from this single pad using two drilling rigs operating simultaneously. Because the Mesa 10-35 pad would be a new pad, a new road would be required to access the pad. Disturbance for the pad is estimated to be 10.2 acres and disturbance for the new access road is estimated to be 1.1 acres (0.3 miles). A gathering system of pipelines would parallel the

access road. The disturbance for the pipeline system is estimated at 1.8 acres for a total disturbance of 13.1 acres.

Shell is proposing to use its existing Mesa 7-29 pad located in Section 29, Township 32 North, Range 109 West as their demonstration pad. Two rigs would be operating simultaneously to drill up to 20 wells (bottom hole spacing) from this existing pad. A new road would not be required for access to this existing pad. The existing Mesa 7-29 well pad is 10.9 acres and the existing access road is 1.41 acres for a total existing disturbance of 12.3 acres. Following implementation of the Demonstration Project (if approved), Shell believes that one additional well pad (8 acres) and one road (0.7 acres) would be required to fully develop their lease in Section 29 with 20-acre bottom hole spacing (as authorized by WOGCC). Surface disturbance by this well pad and road, although considered a consequence, is not considered a part of the Proposed Action for winter drilling in 2005-2006.

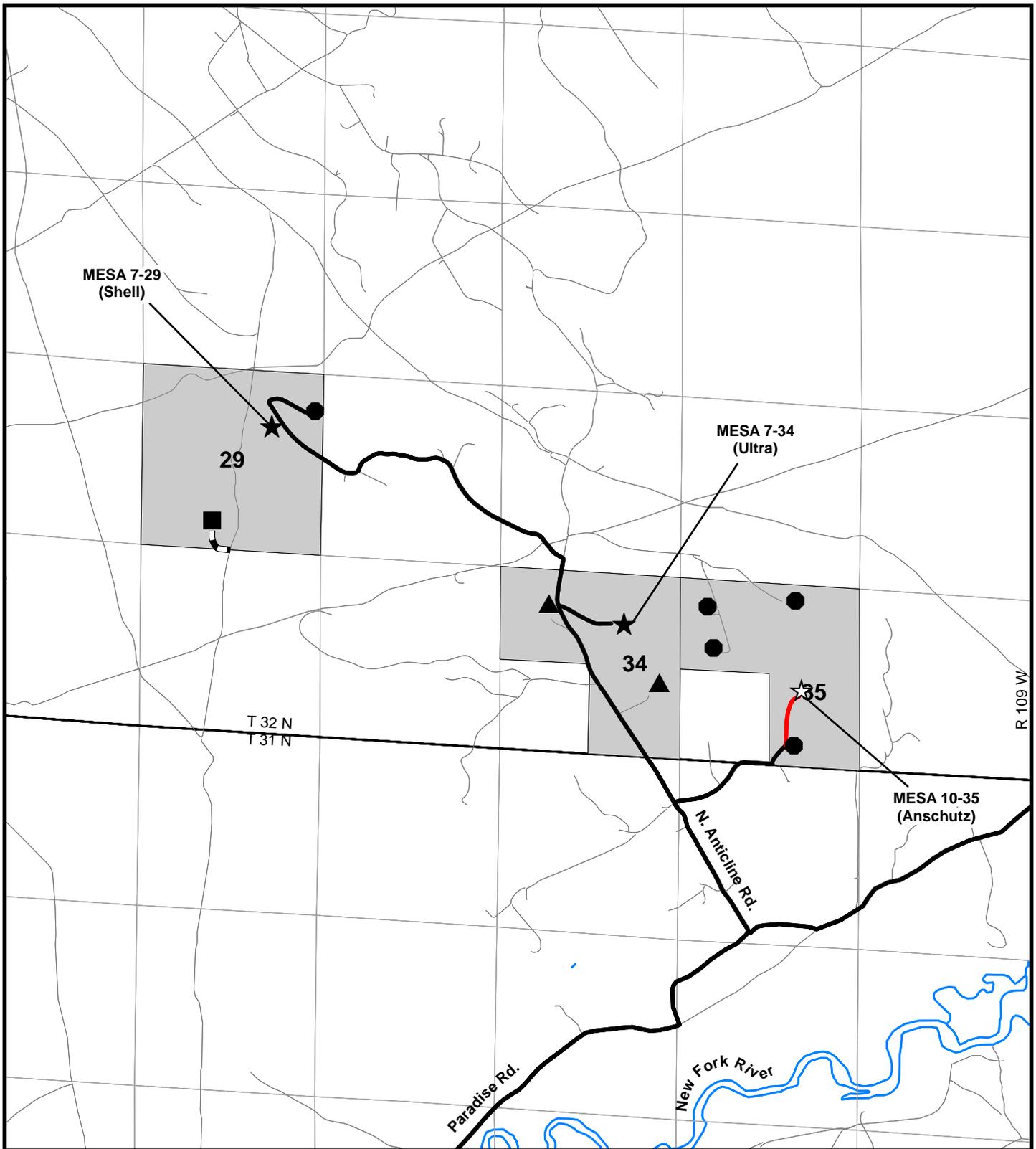
Ultra is proposing to expand their existing Mesa 7-34 well pad in Section 34, Township 32 North, Range 109 West which currently has one producing well. Up to 15 additional wells would be drilled on the expanded pad from two rigs operating simultaneously. It is estimated that the additional surface disturbance required for Ultra's well pad would be 11 acres (5.0 acres existing) for a total of 16.0 acres. This pad is larger than the other demonstration pads because it would be built off of an existing 5 acre pad. Due to the terrain, the pad must be expanded in a step-like rectangular shape increasing the acreage. This pad would be expanded to the east rather than disturb the tall sage brush to the west. Following implementation of the Demonstration Project (if approved), Ultra believes that expansion of two pads (11 acres each) would be required to fully develop their lease in Section 34 with 10-acre bottom hole spacing (as authorized by WOGCC). Surface disturbance by expansion of these two pads, although considered a consequence, is not considered a part of the Proposed Action for winter drilling in 2005-2006.

2.3 No Action Alternative

Within the Anschutz lease in Section 35, total disturbance to date has been 22.3 acres (see Table 3-1). According to Anschutz, continued development of their leases in Section 35 (20-acre bottom hole spacing) under the PAPA ROD with pad drilling would require construction of two 8-acre pads and associated access roads (approximately 2.4 acres) for a total of 18.4 acres of disturbance (see Figures 2-1 and 2-2 and Table 4-1). Implementation of the Demonstration Project rather than continued development under the PAPA ROD with pad drilling would result in a reduced disturbance of 7.1 acres (see Figures 2-1 and 2-2 and Table 4-1).

Total disturbance to date within Shell's lease in Section 29 is 27.5 acres (see Table 3-1). For Shell to continue to develop their leases in Section 29 under the PAPA ROD (with pad drilling), an additional 3 pads (8 acres each) and 3 roads (4.0 acres) would be required with an estimated disturbance of 28.0 acres (see Figures 2-1 and 2-2 and Table 4-1). The Mesa 7-29 pad would also be used if Shell continued development of their leases under the PAPA ROD (with pad drilling). By implementing the Demonstration Project rather than continued development under the PAPA ROD with pad drilling, surface disturbance in Section 29 would be reduced by 19.3 acres (see Figures 2-1 and 2-2 and Table 4-1).

Within Ultra's lease in Section 34, total disturbance to date has been 26.9 acres (see Table 3-1). Continued development of Ultra's leases in Section 34 under the PAPA ROD with pad drilling would require construction of an additional 9 pads (6-acres each) and 8 roads (4.7 acres



- WINTER ACCESS ROADS
- NEW ACCESS ROAD FOR DEMONSTRATION PROJECT
- NEW ACCESS ROAD REQUIRED TO FULLY DEVELOP LEASE SECTION *
- EXISTING WELL PAD
- ★ PROPOSED WINTER DRILLING WELL PAD (EXISTING)
- ☆ PROPOSED WINTER DRILLING WELL PAD (NEW)
- ADDITIONAL WELL PAD REQUIRED TO FULLY DEVELOP LEASE SECTION *
- ▲ EXISTING WELL PAD TO BE EXPANDED TO FULLY DEVELOP LEASE SECTION *

* NOT PART OF 2005-2006 WINTER DRILLING DEMONSTRATION PROJECT

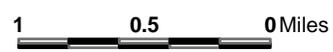
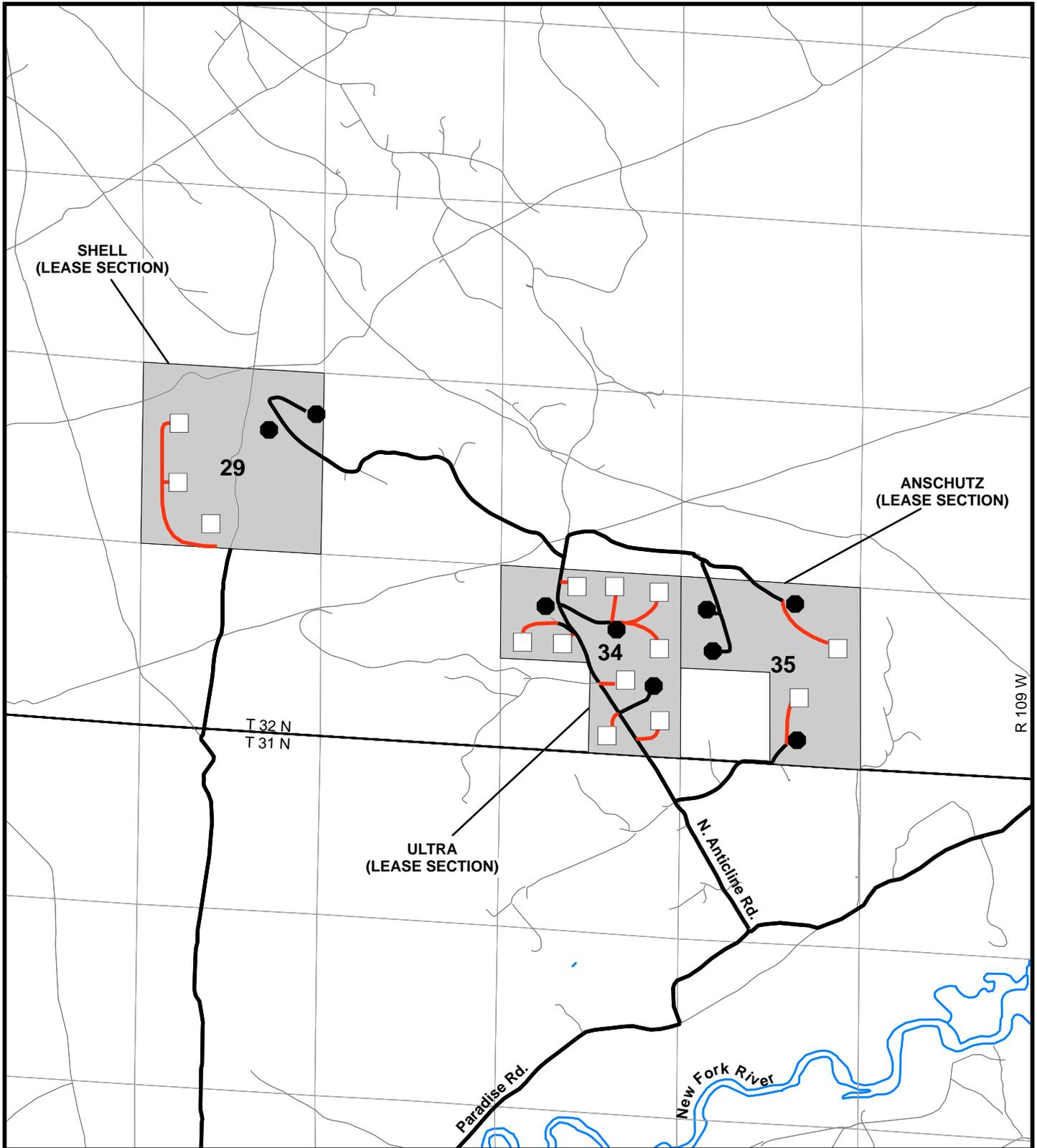


FIGURE 2-1
ASU YEAR-ROUND DRILLING DEMONSTRATION PROJECT (PROPOSED ACTION)



- NEW ACCESS ROADS
- EXISTING WELL PAD
- ADDITIONAL WELL PAD REQUIRED TO FULLY DEVELOP LEASE SECTION

1 0.5 0 Miles



FIGURE 2-2
ASU DEVELOPMENT UNDER PAPA ROD (NO ACTION ALTERNATIVE)

assuming 30-foot road width) for a total disturbance of 58.7 acres. If ASU is allowed to proceed with the Demonstration Project, surface disturbance in Section 34 would be reduced by 25.7 acres over that required for continued development under the PAPA ROD with pad drilling (see Figures 2-1 and 2-2 and Table 4-1).

In accordance with Council on Environmental Quality regulations, the No Action Alternative is evaluated to provide a base from which to compare impacts associated with the Proposed Action. If the No Action Alternative were implemented, seasonal restrictions would be attached to any approved permit, as applicable. The Authorized Officer may grant exceptions to seasonal restrictions as described in the PAPA ROD on a case-by case-basis. ASU would continue to develop their leases under the PAPA ROD with pad drilling. The applicant-committed measures (described in Section 2.6, below) would not be implemented.

2.4 Alternatives Considered and Eliminated from Detailed Study

Two additional alternatives were considered but not analyzed in detail for the reasons listed below:

Alternative 1. This alternative is the same as the Proposed Action, however, it would include a pipeline gathering system for transport of condensate and water from existing producing wells and concomitant reduction of traffic on the PAPA during the winter of 2005-2006. Under this alternative, the reduction in truck traffic within and off the PAPA could reduce potential impacts to wildlife. Alternative 1 was considered but not analyzed in detail because there is not sufficient time for the operators to obtain approvals, build the gathering system pipelines, and infrastructure (phase separator, natural gas liquids stabilizer, water handling facility, valve assemblies) prior to the winter of 2005-2006. It is important to note that there would be no condensate or water being trucked from the wells drilled as part of the Proposed Action during the winter of 2005-2006 because the wells would not be completed until May of 2006.

Alternative 2. This alternative includes all the same elements as the Proposed Action, however, seasonal restrictions would be attached, as applicable to all approvals. No exceptions to seasonal restrictions would be granted, therefore winter drilling during the 2005-2006 season would not be allowed. ASU would be required to reduce disturbance by placing multiple wells on one pad and by utilizing directional drilling as they would under the Proposed Action but they would not be allowed to drill during the winter of 2005-2006. This alternative was considered but not analyzed in detail because of the potential longer time required to fully develop the lease. Implementation of this alternative would significantly extend the time for ASU to develop their leases within the sections included in the Proposed Action, thereby extending future potential impacts to wildlife.

2.5 Comparison of Proposed Action and No Action Alternative

Under the Demonstration Project and those additional pads/roads (not a part of the Proposed Action), required to fully develop the leases within the selected sections, an additional 54.8 acres of surface disturbance would be required (although not all the disturbance would occur during winter 2005-2006). Continued development under the PAPA ROD (with limited pad drilling) would require an additional 105.1 acres to complete the leases within the selected sections (see Table 4-1). This equates to an overall reduced disturbance of 50.3 acres or 48 percent less disturbance for development under the demonstration (the Proposed Action) rather than continued development under the PAPA ROD (the No Action Alternative).

2.6 Applicant-Committed Measures

To offset potential impacts caused by winter drilling, ASU has voluntarily agreed to implement measures and activities or actions discussed below. The impact analysis contained in this EA is based on the assumption that all of these measures would be implemented.

2.6.1 Air Emission Reduction

ASU is committing to demonstrate new technologies to reduce emissions from the drilling rig engines. As a part of the demonstration, ASU would attempt to achieve EPA Tier 2 equivalent emissions for NO_x. ASU is also committing to implement a monitoring program to determine the effectiveness of the new technologies in achieving EPA Tier 2 equivalent emission levels for NO_x. Shell is committing to demonstrate the use of catalytic aftertreatment technology in order to achieve EPA Tier 2 emission levels for NO_x by applying this technology to their existing Tier 1 compliant rig engines. As part of the monitoring program, Shell would monitor their Tier 1 drilling rig engine emissions and then monitor again with catalytic aftertreatment technology installed to determine the effectiveness of the catalytic technology in achieving EPA Tier 2 emissions for NO_x.

Anschutz and Ultra are committing to demonstrate the use of bi-fuel technology in an attempt to achieve EPA Tier 2 equivalent emission levels for NO_x. As part of their monitoring program, Anschutz and Ultra would monitor drilling rig diesel fuel emissions at their existing locations, move the rigs to the winter locations, switch to bi-fuel technology and monitor the bi-fuel emissions.

If monitoring shows that emissions with either catalytic technology or bi-fuel technology are not EPA Tier 2 equivalent for NO_x, ASU would assess the difference between actual emissions and the Tier 2 emissions level. They would then determine the type of technology and/or change in fuel mixtures and/or engine adjustments that could be done to improve emissions and would take steps immediately to resolve.

2.6.2 Reserve Pits

Current practices within the PAPA includes the use of reserve pits during drilling operations which are installed as part of the initial pad construction and are typically 0.25 to 0.75 acres for a single reserve pit and up to 2 acres for multiple pits at a multiple well location. The reserve pits are used to contain drilling fluids and cuttings and extend the reclamation of the pad because the contents of the pit must be allowed to dry prior to reclamation.

Shell and Ultra propose to eliminate their existing reserve pits at the Mesa 7-29 and Mesa 7-34 well pads, respectively. Shell is able to eliminate the reserve pit because it would be using a closed water-based mud system for a portion of the well and an oil-based drilling mud for the deeper remaining portion of the well. Ultra is able to eliminate the reserve pit because it would be using a semi-closed water-based mud system. Elimination of the reserve pit would allow for reclamation to be conducted earlier. Anschutz has designed the Mesa 10-35 well pad to include a water-based drilling mud reserve pit at a pad size comparable to the Shell and Ultra demonstration pads.

2.6.3 Drilling Rig Movement and Supplies

ASU is committing to moving all six drilling rigs to their winter drilling locations prior to November 15, 2005. This would eliminate traffic associated with rig movement and set up during the demonstration winter season. In addition, Shell is committed to delivering pipe and storing it along with other supplies on an adjacent pad prior to November 15, 2005. Anschutz and Ultra are committed to delivery of as many supplies as possible (depending on available space on the pad) prior to November 15, 2005.

2.6.4 Bus System for Employees

ASU is committing to use an employee bus system to minimize traffic and associated impacts during 2005-2006 winter drilling as well as during the spring of 2006. Buses would be used to transport rig crews to and from the drilling rigs. One bus would be assigned to a specific pad. Three buses would be necessary because the buses would be operated by the individual drilling companies. The buses would be loaded from Marbleton (2 buses) and Boulder (1 bus), travel to the designated well pad and return to Marbleton and Boulder. Each bus would make two round trips per day at shift change and would accommodate 10-15 passengers and gear. This equates to 42 total round trips per week for ASU's Demonstration Project operations compared to more than 500 weekly round trips without busing.

2.6.5 Access Station

ASU is committing to fund hosted workers to the BLM Pinedale Office to operate an access station. The hosted workers would be located in a small trailer on BLM land off the North Anticline Road in Section 2, Township 31 North, Range 109 West (near Ultra's Riverside 5-2 pad location) to create a traffic access station to the Demonstration Project locations. The North Anticline Road, also known as the Anticline Crest Road, is the only authorized access route to the project sites. The hosted workers would be trained by and report to the BLM Pinedale Field Office. The station would be open 24 hours a day seven days a week from November 15, 2005 through April 30, 2006.

The purpose of the station would be to monitor essential traffic to the pads and encourage non-essential traffic and motorists to obey the existing crucial winter range restrictions and traffic restrictions lessening human disturbance on wildlife.

There would be space available to allow vehicles to turn around and leave the area. By turning back non-scheduled contractors, there would be a reduction in non-essential traffic to the demonstration pads lessening potential impact to wildlife. By informing the public on current travel restrictions, most would voluntarily comply with the restrictions thereby reducing human disturbance to wildlife.

ASU would also fund signage located at the intersection of Paradise Road and the North Anticline Road (indicating that there is an access station ahead on the North Anticline Road), on the approach leading to the station, and prominently on the trailer. All signs would list the existing big game crucial winter range traffic restrictions.

The hosted workers would compile traffic counts to delineate between essential development activity and non-essential and public traffic and between traffic associated with drilling activity on the demonstration pads and that associated with normal producing well operations addressed in the PAPA ROD (BLM, 2000b). This would provide actual data on the amount of and what type of traffic would occur in the area during the demonstration period (November 15, 2005 through July 31, 2006).

2.6.6 Access Gates

In consultation with BLM and the WGFD, ASU is committing to install up to ten gates and supply other needed material in the big game crucial winter range area to lessen the potential for human disturbance and potential impact to wildlife by encouraging compliance with the existing crucial winter range traffic restrictions. The gates (made of steel pipe) would be maintained by BLM after installation and access to gate keys would be managed by BLM. ASU would assist BLM with signage to be placed on or near the gate explaining existing traffic restrictions.

2.6.7 Public Awareness and Outreach

ASU is committing to fund development and printing of informational cards explaining the existing crucial winter range traffic restrictions to encourage compliance with the regulations with the intent of lessening human disturbance to wildlife in the crucial winter range area. These informational cards would be developed in conjunction with the BLM. The cards would be available at the BLM Pinedale Field Office and public places in the Pinedale area such as community facilities, libraries, schools, and interested businesses. ASU has also committed to fund ads in the local newspapers that provide the information from the cards that can be printed monthly in the local newspapers during the travel restriction period.

2.6.8 Crew and Contractor Awareness

ASU is committing to train rig crews on behaviors appropriate for minimizing disturbance to wildlife and would most likely occur during the pre-spud meetings. The training would be consistent with current documents on such conduct and would be reviewed with BLM and WGFD wildlife experts for their concurrence.

A laminated sheet providing the code of conduct for contractors and employees during winter drilling activity would be required to be carried in each contractor and vendor vehicle. The sheets would also provide instruction on the types of human activity that create stress in wildlife. The document would be consistent with current documents on such conduct and would be reviewed with BLM and WGFD wildlife experts for their concurrence.

All vendors would be advised personally and by mail of traffic and activity restrictions and rules of conduct including behaviors appropriate for minimizing disturbance to wildlife while on the Mesa.

2.6.9 Wildlife Research and Monitoring Projects

ASU is sponsoring two wildlife research projects, one of which focuses on impact by natural gas development to pronghorn in the Sublette Herd Unit (conducted by The Wildlife Conservation Society) while the other is designed to document sage-grouse habitat use of the PAPA and adjacent habitats (conducted by Wyoming Wildlife Consultants, LLC). Both wildlife research projects have been developed in consultation with the BLM and WGFD and are in progress. Results from either project are not available for analysis in this document but resulting understanding of impact to these species is expected to lead to effective mitigation in the future.

2.6.10 Air Quality Monitoring

In cooperation with the Wyoming Department of Environmental Quality (WDEQ), Shell installed the first air monitoring station to monitor ambient air quality and collect meteorological data in the Pinedale Anticline field. The station is located near Boulder, off of Paradise Road. The cost of the monitoring station is shared by Shell and WDEQ.

2.6.11 Habitat Enhancement and Interim Reclamation

During the Demonstration Project, ASU is committing to continue to return disturbed acreage to its non-disturbed state as quickly as possible. In consultation with BLM and WGFD, Shell would continue in its second year of piloting a new habitat seed mixture of native grasses, shrubs, and forbs and application methods. The objective of this pilot project is to accelerate reclamation by providing for more forbs and shrubs and reduce the current dominance of grass species on reclaimed surfaces. The pilot is not being done on the demonstration sections but is in close proximity to the demonstration sections. Information on the seed mix is available in Chapter 4.

CHAPTER THREE AFFECTED ENVIRONMENT

3.1 Introduction

Human and natural environmental resources that could be affected by the Proposed Action are described in this chapter without repeating information contained in the PAPA EIS. The affected environment description in the PAPA EIS for activities proposed for the Demonstration Project is relevant to the Proposed Action to conduct winter drilling for most resources.

Since the ROD was issued in 2000, natural gas development in the PAPA has progressed and disturbance has occurred – particularly along the Pinedale Anticline Crest. Surface disturbance from roads and well pads on the Mesa portion of the PAPA were described in the Questar Year-Round Drilling EA (BLM, 2004a).

3.2 Existing Disturbance in Demonstration Project Area

Table 3-1 provides a summary of the existing disturbance within the Demonstration Project Area. Existing disturbance within the selected sections (29, 34 and 35) is 76.7 acres (see Table 3-1). Pad drilling would be used under both alternatives to completely develop the leases in those sections. Anschutz was approved for 20-acre bottom hole spacing by the Wyoming Oil and Gas Conservation Commission (WOGCC) prior to May 2005 while Shell and Ultra have recently obtained pilot approval from the WOGCC for 20-acre and 10-acre bottom hole spacing, respectively. ASU proposes to demonstrate the use of multiple drilling rigs operating simultaneously on a single pad during the winter which would reduce the time required to develop their leases within big game crucial winter range and sage-grouse habitats in the selected sections over that required for development under the PAPA ROD with pad drilling (the No Action Alternative).

**Table 3-1
Summary of Existing Disturbance (acres) within the Demonstration Project Area**

Operator/Section	Pad Disturbance	Road Disturbance	Total Disturbance
Anschutz/Section 35	19.1	3.2	22.3
Shell/Section 29	22.6	4.9	27.5
Ultra/Section 34	20.3	6.6	26.9
Total	62.0	14.7	76.7

3.3 Socioeconomics and Environmental Justice

The Demonstration Project would be located in Sublette County. Cities and communities in closest proximity to the Demonstration Project Area are Cora, Daniel, Pinedale, Boulder, Bargerville, Marbleton and Big Piney (see Figure 1-1). Sublette County is primarily rural with an economy tied to traditional natural resource-based industries. Agriculture provided the basis for community development during the nineteenth century; however, its importance has recently diminished. Mineral extraction industries, particularly oil and gas, now provide much of the area's economic base.

3.3.1 Demographics

The population of Sublette County is more than 50 percent male and is 97 percent Caucasian. Sublette County contains very small populations of Native Americans, Hispanics, and other minorities (US Census Bureau, 2005a and 2005b). The County's population has remained fairly level during the 1990s and has since grown annually by 3.0 percent since 2000 (Table 3-2).

Specific demographics associated with the PAPA gas field workforce are largely unknown. The Pinedale Anticline Working Group (PAWG) was established under the PAPA ROD (BLM, 2000b) to involve citizens and professionals in an adaptive environmental management process (the AEM process) which depends on resource-specific task groups. The SocioEconomic Task Group (2005) has proposed a data gathering plan for all operators within the PAPA to help determine and anticipate future demographics associated with natural gas development.

**Table 3-2
Population Statistics for Lincoln and Sublette Counties**

Region	Population Census Estimates			Population % Change 1990-2000	Annual % Change 1990-2000	Population % Change 2000- 2004	Annual % Change 2000-2004
	1990	2000	2004				
Wyoming	453,588	493,782	501,242	8.9	0.9	2.6	0.6
Sublette County	4,843	5,920	6,654	22.2	2.0	12.4	3.0

US Census Bureau, 2005a and 2005b Wyoming Department of Administration and Information, 2004.

3.3.2 Economic Activity

Wyoming's economy reached a minimum level during an economic "bust" in 1987. Since then it has begun to recover. The primary industries in Sublette County are oil and gas, government, transportation, and manufacturing. Oil and gas is the largest revenue-producing industry. In terms of Gross State Product (GSP), which is the state equivalent to Gross Domestic Product (GDP), oil and gas contributed 24 percent in 2000. Nationwide, the mining industry (including oil and gas) contribution to the GDP was only 1.4 percent for the same year (WDIAI, 2003).

Wyoming's oil and gas industry has demonstrated strong growth since 2000. Contributions to state and local governments in the fiscal year 2003 from oil and gas industries are itemized in Table 3-3. Total revenue would be comparable to a direct payment of nearly \$1,500 for each person living in Wyoming.

**Table 3-3
Taxes From Oil and Gas Industries In Wyoming During 2003**

Tax Source	Revenue (millions of dollars)
Property Taxes	228.5
Severance Taxes	198.9
Federal Royalties	220.8
State Royalties	57.9
Sales and Use Taxes	38.0
Conservation Mill Levy	3.6
Total For State	747.7

Petroleum Association of Wyoming, 2004

In Sublette County in 2004, 95.6 percent of the property tax was paid by the oil and gas industry. The 2004 County's assessed valuation of \$1.88 billion more than doubled since 2000 due to high natural gas prices (Sublette County Assessor, 2005). In 2001, Sublette County instituted a 3 percent lodging tax. Since 2001, lodging taxes have risen considerably, contributing to the County's revenue tax (SocioEconomic Task Group, 2005).

3.3.3 Employment

Between July 2004 and July 2005, employment in the natural resource and oil and gas sectors in Wyoming increased 10.2 percent (Wyoming Department of Employment, 2005). In 2000, the largest employment sectors in Sublette County were Services and Professional (48 percent) and Government (17 percent). Oil and Gas made up 7.8 percent of the total jobs in Sublette County (WDAI, 2000).

According to the Regional Economic Information System, from 1995–2002, Sublette County full-time and part-time employment has grown by 22 percent, with most of that growth occurring from 1999 through 2002. This correlates with increased gas field development, and so this growth in employment is most likely a result of increased gas development (SocioEconomic Task Group, 2005).

The unemployment rate in Wyoming is not expected to exceed 4.5 percent through 2012, remaining lower than the projected national average (WDAI, 2003). Sublette County's unemployment rate was 2.0 percent in July 2005, the lowest among Wyoming's 23 counties (Wyoming Department of Employment, 2005).

3.3.4 Environmental Justice

Federal agencies are required to conduct their programs, policies and activities that substantially affect human health or the environment in a way that ensures that no person is excluded from participation therein, denied the benefit of, or subjected to discrimination due to race, color or national origin. Executive Order 12898 requires Federal agencies to assess their projects to ensure they do not result in disproportionately high and adverse environmental, health or safety effects to minority or low-income populations.

3.4 Transportation

Vehicle traffic in the PAPA and vicinity has increased since 2000 with the increase in natural gas development. Traffic volume prior to and during those developments through 2002 had not been consistently documented but was reported in the Questar Year-Round Drilling EA (BLM, 2004a) and clearly shows an increasing trend. No traffic data within the PAPA has been recorded during the winters in any year.

Recently, Wyoming Department of Transportation collected traffic data on various roads within the PAPA including Paradise Road. Traffic on the west end of Paradise Road, north of State Highway 351 was estimated at 738 vehicles/24 hours (with 325 trucks/24 hours) in October of 2003. Estimated traffic on this same road segment in May of 2005 was 1,038 vehicles/24 hours (with 476 trucks/24 hours). Traffic on the north end of Paradise Road near Boulder was estimated at 548 vehicles/24 hours (with 104 trucks/24 hours) in October of 2003. Estimated traffic on this same road segment in August of 2005 was 709 vehicles/24 hours with 136 trucks/24 hours (Wiseman, 2005).

3.5 Land Use and Grazing

Where development activity has been concentrated along the Pinedale Anticline Crest, oil and gas development is now the principal land use in the PAPA. Sublette County is primarily rural and is tied to traditional natural resource-based industries. Agricultural and mineral extraction industries, particularly oil and gas, are principal land uses. The proposed project in Sublette County is zoned as resource/conservation (BLM, 1999a).

Grazing is the primary agricultural use of the lands in the vicinity of the Proposed Action. The Demonstration Project would be located within the Mesa Common Allotment managed by BLM

for livestock grazing. In the Mesa Common Allotment, 57,649 acres (or 5,003 AUMs) are available for cattle and horse use from May 1 through November 15 as described in Section 3.7 and 3.17 of the PAPA EIS (BLM, 1999a and 2000a).

Recently the BLM (2004b) released a final environmental impact statement that proposes revisions to grazing regulations for public lands. The revisions would require, among other actions, a consistent approach to assess and monitor resource conditions to help evaluate the grazing use applicable for each managed allotment (BLM, 2004b). Yearly grazing uses (animal unit months – AUMs – and season of use) of the Mesa Common Allotment are based on biological assessments and biological evaluations (BLM, 2004b), and therefore are subject to change.

3.6 Recreation Resources

Lands within and adjacent to the Demonstration Project Area support a variety of recreational activities, such as hiking, camping, mountain biking, fishing, boating, swimming, sight-seeing, hunting, and wildlife watching (Tyrrell, 2000; Sublette County Visitor's Center, 2005). Recreation resources within and around the Demonstration Project Area that are located on Federal land are managed to prevent or mitigate environmental degradation that could result from recreation and/or other land uses (BLM, 1987). The focus is mainly on recreation management areas although none coincide with the Demonstration Project Area. South of the Demonstration Project Area are two undeveloped BLM-managed sites located along the New Fork River. Further downstream is a BLM-developed campground where the New Fork River crosses Highway 351. A fishing access site maintained by WGFD on the New Fork River is adjacent to the town of Boulder, which is located five to seven miles north and east of the Demonstration Project Area (BLM, 1987). Access to the Demonstration Project Area would be along Paradise Road which passes by both of these sites.

The New Fork River, within 2 miles east and south of the Demonstration Project Area, and the Green River, farther west, offer excellent opportunities for trout fishing (Sublette County Visitor's Center, 2005). In addition, hunters pursue numerous game species near the Demonstration Project Area including antelope, mule and white-tailed deer, elk, moose, upland game, and waterfowl (WGFD, 2005; Tyrrell, 2000). Big game species, hunt areas, and hunting season for each species within and adjacent to the Demonstration Project Area are listed in Table 3-4. The Proposed Action would begin after all big game hunting seasons end.

**Table 3-4
Big Game Species, Hunt Areas, and Seasons in 2005 In the Project Area and Vicinity**

Species	Hunt Area	Hunting Season
Antelope	87, 90	September 10 – October 31
Mule/White-tailed Deer	138, 139, 140	September 15 – November 7
Elk	96, 97, 98	September 20 – November 15
Moose	4	September 20 – October 31
WGFD, 2005		

3.7 Visual Resources

Since 2000, there has been substantial natural gas development concentrated along the Pinedale Anticline Crest. The viewshed within the Demonstration Project Area is dominated by well pads, drilling rigs, roads, gathering pipeline disturbances and production facilities all associated with natural gas development.

The Demonstration Project would occur within VRM sensitivity Class IV. The objective of VRM sensitivity Class IV provides for management activities that may result in major modifications to the existing character of the surrounding landscape; however, the change should replicate the basic elements of form, line, color, and texture of the surrounding landscape (BLM, 1998).

None of the proposed demonstration pads fall within the Sensitive Viewshed as described in Section 3.9 of the PAPA EIS (BLM, 2000a).

3.8 Cultural and Historic Resources

Cultural and historic resources throughout the PAPA have been recorded and identified under several inventory projects over the past 20 years, and are ongoing. These resources and site types are described in Section 3.10 of the PAPA EIS. In most cases, specific detail about cultural sites on public land is proprietary to archaeologists and other researchers in order to prevent vandalism, damage and theft and is not available as public record.

Cultural History Overview

In the Upper Green River Basin, the prehistoric period extends back to approximately 12,000 years before Euro-American intervention. Historic human presence extends back to the pre-settlement period of the 1840s (BLM, 1999a).

Management practices on public lands administered by BLM follow guidelines in the National Historic Preservation Act of 1966, Native American Graves Protection and Repatriation Act, the Archaeological Resources Protection Act of 1979 and various Executive Orders. Specifically, BLM management plans in the PAPA focus on identifying and protecting cultural and historical sites, as well as resolving conflicts between cultural/historic and other resource uses (BLM, 1987 and 1999a).

Numerous cultural sites have been discovered with progression of natural gas development following the PAPA ROD. Average cultural site density was estimated to be about 1 per every 12 acres in the PAPA (BLM, 1999a), but there are now approximately 500 sites recorded on the PAPA (Vlcek, 2005). These include prehistoric campsites and house pits; human burials; animal kill sites; lithic procurements (stone tool and weapon pieces composed mainly of chert rock); sacred sites; various rock alignment sites (tipi rings, medicine wheels and cairns); emigrant trails; pioneer settlements and townsites; and early ranching structures and remnants (BLM, 1999a).

3.8.1 Cultural and Historic Resources

The proposed Demonstration Project lies within the physiographic provenance known as the Mesa. This north-central portion of the Mesa is thought to have high cultural/historic site potential overall (Crume, 2005).

Recent inventories for the Pinedale Anticline Pipeline Corridor documented previously unknown sites and individual artifacts. The Pinedale Anticline Pipeline Corridor includes the North Anticline Road and multiple natural gas pipelines including Questar's condensate pipeline (BLM, 2004a and Vlcek, 2005) and passes diagonally through Ultra's lease in Section 34. Of the sites discovered throughout the corridor, 35 were recommended eligible and 125 were recommended not eligible for nomination to the National Register of Historic Places (NRHP-Vlcek, 2005). Additionally, approximately 72 sites are documented for the sections surrounding the Demonstration Project Area.

Class III inventories were conducted on some areas within the Demonstration Project Area with approximate area surveyed and number of cultural sites recorded noted in Table 3-5.

Table 3-5
Class III Inventory Acres and Cultural Sites in the Selected Sections
for the Demonstration Project Area

Relevant Site Location	Acres Surveyed ¹	Number of Sites
Shell Mesa 7-29	170	1
Ultra Mesa 7-34	205	7
Anschutz Mesa 10-35	210	2
¹ Figures are approximate Crume, 2005		

Elsewhere within the PAPA, the Lander Cutoff of the Oregon Trail is a NRHP-eligible property and the viewshed of the trail is classified as a Visual Resource Management Area. However, the Demonstration Project Area lies beyond the 3 mile-wide corridor outlined in the PAPA EIS.

3.8.2 Native American Sites

Most of the cultural sites inventoried in the PAPA are associated with Native Americans. Regional tribes, including the Eastern Shoshone, Bannock, Northern Ute and Arapahoe, as well as prehistoric peoples not culturally affiliated with modern day Native American tribes, frequently used the lands within and surrounding the Demonstration Project Area (BLM, 1999a). There is a high potential for discovery of sites of interest, as well as sensitive and sacred sites, to modern Native Americans in the proposed winter drilling area. The most common probable sites consist of prehistoric and historic Native American subsistence and procurement activities. These include mainly camp sites, lithic procurements, and rock alignments (Vlcek, 2005). Consultation with affected Native Americans concerning the identification and management of cultural resources began in earnest in 1998 and is ongoing (BLM, 1999b).

3.9 Geology and Geologic Hazards, Minerals and Paleontological Resources

Geologic resources, minerals, geologic hazards and paleontological resources in the PAPA are described in the PAPA EIS in Section 3.12. Geological outcrops in the vicinity of the Demonstration Project include the Wasatch, Green River, and Fort Union formations, all of which are Tertiary sedimentary deposits. No geologic hazards are of concern in the Project Area. Oil and gas are the principal mineral resources in the area although limited quarrying has been conducted for aggregate materials associated with alluvium deposits (BLM, 1999a).

A variety of paleontological resources are potentially present, primarily in early to mid-Eocene deposits of the Wasatch and Green River formations. The fossils recorded in these strata include plants, invertebrate, and vertebrates, especially fish (Green River River) and mammals (Wasatch Formation). Scientifically significant finds have been reported in both formations (BLM, 1999a).

3.10 Water Resources

The Demonstration Project Area and PAPA are within the Green River Basin. Portions of five perennial streams and rivers flow through the PAPA including Duck Creek, East Fork River, Green River, New Fork River and Pine Creek. The majority of the PAPA is drained by intermittent and ephemeral streams (BLM, 1999a).

The Wyoming Environmental Quality Council pursuant to W.S. 35-11-101 through 1304 has promulgated regulations for quality standards for Wyoming surface waters. The objectives of

the Wyoming pollution control program are specifically designed to maintain the best possible quality of waters commensurate with the designated use. In the PAPA, the Green River has been designated Class 1 which means that no further water quality degradation by point source discharge other than from dams would be allowed (WDEQ, 2001). The New Fork River is designated as Class 2, supporting or capable of supporting game fish.

Section 303(d) of the Clean Water Act requires states to identify waters which are not supporting their designated uses. The Green River and New Fork River are not on the State of Wyoming's 2004 303(d) list (WDEQ, 2004).

3.11 Soils

Soils in the PAPA are described in Section 3.15 of the PAPA EIS. The Demonstration Project generally coincides with Group 2 soils – Pediment, Alluvial Fans, and Low Terrace Soils (BLM, 1999a). These soils formed from deposition of erosional deposits or developed in residuum (i.e., weathered from rock in place) and their depth ranges from shallow to deep generally depending on their topographic position. These soils are gently to steeply sloping. Most of these soils are characterized as non-sensitive with moderate to high reclamation potential. However, soils on steep slopes have high runoff potential that limits their moisture-holding capacity and reclamation potential.

3.12 Vegetation and Noxious Weeds

The Demonstration Project and vicinity is dominated by Wyoming big sagebrush – mixed grassland steppe dominates the landscape (Merrill *et al.*, 1996). Principal species include Wyoming big sagebrush, mountain big sagebrush, black sagebrush, Gardner saltbush, greasewood, and cushion plants. Other associated species often found in mixed-grasslands include western wheatgrass, needle-and-thread grass, Sandberg bluegrass, threadleaf sedge, needleleaf sedge, junegrass, Indian ricegrass, pricklypear cactus, scarlet globemallow, fringed sagewort, and Hood's phlox. These species are adapted to arid soils and drought conditions (BLM, 1986; Knight, 1994).

High density Wyoming big sagebrush with shrub canopy cover of more than 35 percent and big sagebrush occupying at least 80 to 90 percent covers most of the Demonstration Project Area (BLM, 1986; Merrill *et al.*, 1996). The rest of the area (10 to 20 percent) is covered by mixed grasslands in dispersed patches, generally where soils are much shallower (Merrill *et al.*, 1996; Knight, 1994). The Demonstration Project Area and vicinity are considered vital habitats by WGFD (2004a) and include big game crucial winter ranges and sage-grouse nesting and brood-rearing habitat. Shrublands provide a higher nutrient content during the winter than other forage available for wintering pronghorn (Lee *et al.*, 1998) and provide habitat components for sage-grouse (WGFD, 2004a).

Noxious weeds are competitive, persistent, pernicious, and often non-native and considered injurious to other land uses (public health, agriculture, recreation, or wildlife). Invasive species are plants introduced into an environment with no natural enemies, such as insects or other plants, to limit their reproduction and spread. They frequently invade areas with disturbance, displacing and/or competing with natural vegetation (Gurevitch *et al.*, 2002). Noxious plants found in the Demonstration Project Area include black henbane, Canada thistle, field birdweed, hoarycress, houndstongue, leafy spurge, musk thistle, oxeye-daisy, perennial pepperweed, perennial sowthistle, Russian knapweed, and toadflax (BLM, 1986).

3.13 Wetland and Riparian Resources

Section 3.18 of the PAPA EIS describes wetland and riparian resources found in the PAPA. Riparian habitat is a highly valued vegetation community found along or around streams, lakes, ponds and other open water (both perennial and intermittent). Wetlands are lands where at least periodic inundation or saturation with water (either from the surface or subsurface) is the dominant factor determining the nature of soil development and the types of plant and animal communities living there. These include the entire zones associated with streams, lakes, ponds, springs, canals, seeps, wet meadows, and some aspen stands. No riparian or wetlands habitats are within the Demonstration Project Area although access to the Demonstration Project along Paradise Road requires winter traffic through the riparian/wetland complex associated with the New Fork River.

3.14 Threatened, Endangered, and Sensitive Species

3.14.1 Federally Listed Species

Some Federally-listed threatened and endangered species that potentially occurred on the PAPA and in the vicinity of the Demonstration Project Area were addressed in Section 3.19 of the PAPA EIS (BLM, 1999a and 2000a). At the time the PAPA EIS was prepared, Ute ladies'-tresses, black-footed ferrets, bald eagles, whooping cranes, and four species of Colorado River fish were considered potentially vulnerable to development on the PAPA. Canada lynx and mountain plover were species proposed for listing and swift fox was a candidate species for listing under the Endangered Species Act (ESA) in 2000. Since then, Canada lynx have been listed as threatened (FWS, 2000) while the proposal to list mountain plovers as threatened was withdrawn (FWS, 2003a). Though they were addressed in the PAPA EIS, whooping cranes (endangered) are not included since the last surviving crane in the Greys Lake population died in 2002 (Whooping Crane Conservation Association, 2004).

Species and habitats discussed in this section include those that have been listed and are under protection of the ESA. Those species are the Kendall Warm Springs dace (endangered), black-footed ferret (endangered), bald eagle (threatened), grizzly bear (threatened), Canada lynx (threatened), Ute ladies'-tresses (threatened), gray wolf (experimental population), and Colorado River fish (endangered), identified by the U.S. Fish and Wildlife Service (FWS, 2005a) in a written communication to BLM (see Appendix B).

Kendall Warm Springs Dace. This species is restricted to Kendall Warm Springs, an aggregation of thermal seeps and springs that eventually flow into the Green River. The population is limited to approximately 980 feet of pools and stream segment, all within the Bridger-Teton National Forest (FWS, 1982) approximately 30 miles north of Pinedale.

Black-footed Ferret. There is historical evidence that black-footed ferrets occurred in the Green River Basin. Ferrets are closely associated with prairie dog colonies, including those in sagebrush-grasslands (Cerovski *et al.*, 2004).

FWS (2004a) evaluated the potential for prairie dog colonies in Wyoming to support black-footed ferrets. As a result, FWS has determined there are many areas in the State not likely to be inhabited by the species, based on the quality of habitat and likelihood that ferrets, if ever they were present, are now extirpated in the areas. FWS (2004a) determined that approximately 64 square miles of the PAPA (all or portions of Townships 29 North through 31 North, and Ranges 109 West through 111 West) are within the Big Piney prairie dog complex in which surveys for black-footed ferrets are recommended. The remainder of the PAPA including the Demonstration Project Area have been cleared for any further need to conduct surveys for the species (FWS, 2004a). There are no white-tailed prairie dogs present within or adjacent to

Section 29 (Shell's Mesa 7-29 pad) but prairie dog colonies (BLM, 2004c) are within Section 34 (Ultra's Mesa 7-34 pad) and adjacent to Section 35 (Anschutz' proposed Mesa 10-35 pad).

Bald Eagle. FWS proposed to remove the bald eagle from the list of endangered and threatened wildlife in 1999 (FWS, 1999), but delisting has not yet occurred and they remain a threatened species. Bald eagles nesting in northwestern Wyoming have been increasing steadily since 1978 (Patla *et al.*, 2003). Bald eagles nest in trees, including cottonwoods in riparian zones associated with large lakes and streams (Cerovski *et al.*, 2004).

In 2004 and 2005, there were 2 active bald eagle nests within the PAPA, each producing 2 young (Patla, 2005). One of the nests was discussed in the PAPA EIS and was active in 1999 but is approximately 3.2 miles from Anschutz' proposed Mesa 10-35 pad, the closest of any ASU project component. The other active nest is also farther than one mile from the Demonstration Project Area. In Wyoming, bald eagle eggs hatch around May 1 and young fledge about July 10 (Johnsgard, 1986). However, nest building may be initiated during February (Call, 1978; FWS, 2005a). Once fledged, juvenile bald eagles may remain in the nest vicinity for a month, often through August (Isaacs *et al.*, 1983; FWS, 2005a).

Wintering bald eagles regularly occur in western Wyoming generally from November 1 through April 15 (FWS, 2005a). Observations of bald eagles and other wintering birds are reported by the Audubon Society from their Christmas Bird Counts. Christmas counts were made in the vicinity of the PAPA during December 1984 and 1987. Only one bald eagle was reported in each year. During February 2005, BLM conducted a winter ground survey of bald eagles within the Pinedale Resource Area. A total of 54 eagles were counted, most of them along the Green River and tributaries although 10 eagles were documented along the New Fork River between Boulder and its confluence with the Green River. Most bald eagle observations were associated with forest-dominated riparian cover.

Grizzly Bear. The entire PAPA is outside of the outer boundary for grizzly bear occupancy established in the Wyoming Grizzly Bear Management Plan (Moody *et al.*, 2002). In the plan, WGFD's policy is to limit bear occurrence outside of the boundary on an individual basis with the intent to exclude them from becoming reestablished in other areas of the state. Among other food sources, grizzlies feed on winter-killed big game carrion that are often encountered on big game winter ranges including those on the PAPA. Otherwise suitable habitat for the species is not present in the vicinity of the Demonstration Project.

Canada Lynx. A reproducing population of Canada lynx has been documented near Merna where they prey on snowshoe hares (Laurion and Oakleaf, 1998). Lynx are generally associated with dense coniferous forests (Englemann spruce-subalpine fir) at high elevations (Cerovski *et al.*, 2004). Suitable habitats are not present in the vicinity of the Demonstration Project.

Ute Ladies'-tresses. In Wyoming, Ute ladies'-tresses has been found on old oxbows or floodplain terraces associated with small streams on sites that remain moist (meadow plant communities) throughout the summer, whether due to seasonal flooding or subirrigation (Fertig, 2000). All 4 of the known populations in the State occur in the eastern half; searches conducted in western Wyoming (Jackson Hole, National Elk Refuge and Green River Basin) during the 1990s were unsuccessful (Fertig, 2000) and, given the ranges of elevation and precipitation regimes associated with site occurrence, the species' presence within the PAPA is unlikely. FWS (2004b) is undertaking a 5-year status review of Ute ladies'-tresses to determine if delisting the species is warranted.

Gray Wolf. Since reintroduction of 31 animals in Yellowstone National Park (YNP) during 1995 and 1996, the current gray wolf population in the Greater Yellowstone Recovery Area includes

approximately 89 animals in Wyoming inhabiting areas outside of YNP (FWS *et al.*, 2005). Those animals are classified as a nonessential experimental population (FWS, 2005a). Gray wolves inhabit coniferous forests as well as shrub and grasslands in mountains and foothills where they feed on big game as well as smaller prey species (Cerovski *et al.*, 2004).

Packs have become established outside of YNP including two in the vicinity of the PAPA: the Green River Pack east of the PAPA in the upper Green River Basin in 2002 and the Daniel Pack northwest of the PAPA in 2003 (FWS *et al.*, 2004). Since their establishment, both wolf packs have preyed on cattle and sheep and pack members in both have been killed in control actions. Wolves also dispersed to the Pinedale/Cora area and were subsequently killed after repeated livestock depredations (FWS *et al.*, 2005).

Colorado River Fish. The FWS (2005a) has indicated that the bonytail, Colorado pikeminnow, humpback chub and razorback sucker may inhabit the Colorado River System downstream from the PAPA in the Green River. Prior to construction of Flaming Gorge Reservoir, pikeminnows and bonytails may have had viable populations in the Green River though they are now extirpated (Baxter and Stone, 1995).

3.14.2 Sensitive Species

3.14.2.1 Species Identified by U.S. Fish and Wildlife Service

Currently, yellow-billed cuckoo is a candidate species for listing under ESA while greater sage-grouse and pygmy rabbits have been identified as sensitive by FWS (2005a).

Yellow-billed Cuckoo. This species was petitioned for listing in 1998. Following a status review, FWS (2001) found that listing the western distinct population segment of yellow-billed cuckoos (including those in Wyoming) as threatened was warranted but precluded and the species is currently a candidate for listing (FWS, 2005a). The species is found in eastern Wyoming where it is associated with deciduous woods and thickets along riparian zones (Dorn and Dorn, 1990 and Cerovski *et al.*, 2004).

No yellow-billed cuckoos have been documented in the upper Green River Basin although breeding may have occurred southeast of the basin (Cerovski *et al.*, 2004). There are 9 National Biological Survey Breeding Bird Survey (BBS) routes in the upper Green River area, some of which have been surveyed since 1980 though none with continuous records since then. Yellow-billed cuckoos have not been reported in any of the BBS surveys in the PAPA vicinity. Further, breeding bird surveys conducted in 2002 on BLM lands that included the PAPA did not detect the species (McGee *et al.*, 2002).

Greater Sage-Grouse. The eastern subspecies of greater sage-grouse was petitioned for listing as endangered in 2002. Wyoming is included within the subspecies' range. However, the FWS determined that evidence was lacking to distinguish the eastern subspecies as a valid subspecies and therefore a distinct population segment applicable under the ESA (FWS, 2004c). A similar evaluation was rendered on a petition to list the western subspecies in 2003.

The FWS completed a status review of the greater sage-grouse and determined that it does not warrant protection under the ESA throughout its range, including Wyoming (FWS, 2005b). Sage-grouse are managed as an upland game bird in Wyoming and the species is discussed in Section 3.14.2 of this EA.

Pygmy Rabbit. Pygmy rabbits in the Columbia Basin of Washington were listed as endangered in 2003 (FWS, 2003b) but that listing does not apply to the species in Wyoming. Pygmy rabbits have been designated as a sensitive species by BLM (BLM, 2001) as well as by FWS. Surveys conducted during spring and summer 2002 revealed their presence in tall, dense sagebrush at several locations within the PAPA (McGee *et al.*, 2002). A recently initiated study through the

University of Wyoming has documented a more widespread population of pygmy rabbits on the Pinedale Mesa. Once completed, the species' distribution and habitat requirements in the Demonstration Project Area and vicinity should be better defined (Purcell, 2005).

3.14.2.2 Other Special Status Species

BLM has identified additional sensitive species (BLM, 2001) within the Pinedale Resource Area, some of which are known within or potentially occur in the Demonstration Project Area. Sensitive species known to occur within the vicinity of the Demonstration Project Area include ferruginous hawk, burrowing owl, sage thrasher, Brewer's sparrow, sage sparrow, and white-tailed prairie dog (Table 3-6). Other species' occurrences are judged as possible, unlikely, or highly unlikely based on their habitat requirements and known distributions (Baxter and Stone, 1980; Baxter and Stone, 1995; Cerovski *et al.*, 2004).

Though not classified as a BLM-Sensitive Species (BLM, 2001), mountain plovers had been proposed for listing under ESA though subsequently withdrawn (FWS, 2003a). Mountain plovers have been documented on the National Biological Survey Seedskadee BBS route, but only once in 1998. None have been reported on other BBS routes in the project vicinity. The species is a neotropical migrant and classified as NSS4 by WGFD (see footnote to Table 3-6).

**Table 3-6
BLM-Sensitive Vertebrate Species Not Listed Under ESA That Could Occur within the
Demonstration Project Area, Habitats, and Other Status Designations**

Common Name Scientific Name	Habitat (BLM, 2001)	Potential Occurrence	State Rank ¹	WGFD Status ²
Fish				
Roundtail chub <i>Gila robusta</i>	Colorado River drainage in large rivers, streams and lakes	possible	S3	NSS1
Leatherside chub <i>Gila coperi</i>	Green River drainage in clear, cool streams and pools	highly unlikely	S1	NSS1
Bluehead sucker <i>Catostomus discobolus</i>	Green River drainage, all water types	possible	S3	NSS1
Flannelmouth sucker <i>Catostomus latipinnis</i>	Colorado River drainage in large rivers, streams and lakes	possible	S3	NSS1
Colorado River cutthroat trout <i>Oncorhynchus clarki pleuriticus</i>	Colorado River drainage, clear mountain streams	unlikely	S1	NSS2
Amphibians				
Northern leopard frog <i>Rana pipiens</i>	Beaver ponds, permanent water in plains and foothills	possible	S3	none
Spotted frog <i>Rana pretiosa</i>	Ponds, sloughs, small streams	unlikely	S3	none
Boreal toad <i>Bufo boreas boreas</i>	Pond margins, wet meadows, riparian areas	possible	S1	none
Birds				
White-faced ibis <i>Plegadis chihi</i>	Marshes, wet meadows	possible	S1B	NSS3
Trumpeter swan <i>Cygnus buccinator</i>	Lakes, ponds, rivers	possible	S2	NSS2
Northern goshawk <i>Accipiter gentilis</i>	Conifer and deciduous forests	highly unlikely	S3	NSS4
Ferruginous hawk <i>Buteo regalis</i>	Basin-prairie shrub, grasslands, rock outcrops	present	S5N	NSS3
Peregrine falcon <i>Falco peregrinus</i>	Tall cliffs in most habitats	possible	S2	NSS3

Greater sage-grouse <i>Centrocercus urophasianus</i>	Basin-prairie shrub, mountain-foothills shrub	present	S4	game bird
Long-billed curlew <i>Numenius americanus</i>	Grasslands, plains, foothills, wet meadows	possible	S3B	NSS3
Yellow billed cuckoo <i>Coccyzus americanus</i>	Open woodlands, streamside willow and alder groves	highly unlikely	S1	NSS2
Burrowing owl <i>Athene cunicularia</i>	Grasslands, basin-prairie shrub	present	S3	NSS4
Loggerhead shrike <i>Lanius ludovicianus</i>	Basin-prairie shrub, mountain-foothills shrub	possible	S3	none
Sage thrasher <i>Oreoscoptes montanus</i>	Basin-prairie shrub, mountain-foothills shrub	present	none	NSS4
Brewers sparrow <i>Spizella breweri</i>	Basin-prairie shrub	present	none	NSS4
Sage sparrow <i>Amphispiza belli</i>	Basin-prairie shrub, mountain-foothills shrub	present	S3	NSS4
Mammals				
Dwarf shrew <i>Sorex nanus</i>	Mountain-foothills shrub	unlikely	none	NSS3
Long-eared myotis <i>Myotis evotis</i>	Conifer and deciduous forests, caves and mines	possible	none	NSS2
Pygmy rabbit <i>Brachylagus idahoensis</i>	Prairie-basin shrub and riparian shrub	present	S1	NSS3
White-tailed prairie dog <i>Cynomys leucurus</i>	Grasslands, basin-prairie shrub	present	S3	NSS3
Idaho pocket gopher <i>Thomomys idahoensis</i>	Shallow stony soils	highly unlikely	S2	NSS3

BLM, 2001, Keinath *et al.*, 2003; Cerovski *et al.*, 2004

¹ State Rank: Assigned by WNDD and reflects status of species within political borders of the State of Wyoming:

S1 = Extremely rare, S2 = Very rare, S3 = Rare, S4 = Apparently secure, but may be rare in portions of its range, S5 = Secure under present conditions. "B" following state rank indicates breeding status; "N" indicates non-breeding status.

² WGFD Status = Wyoming Game and Fish Department Status:

NSS1 = Species with ongoing significant habitat loss, populations greatly restricted or declining, and extirpation appears possible.

NSS2 = Species 1) whose habitat is limited or vulnerable, but no recent or significant loss has occurred and populations are greatly restricted or declining; or 2) with ongoing significant loss of habitat and populations are declining or restricted in numbers and distribution, but extirpation is not imminent.

NSS3 = Species in which 1) habitat is not limited, but populations are greatly restricted or declining and extirpation appears possible; 2) habitat is limited or vulnerable, although no significant recent loss has occurred and populations are declining or restricted in numbers or distribution, but extirpation is not imminent; or 3) significant habitat loss is ongoing, but the species is widely distributed and population trends are thought to be stable.

NSS4 = Populations greatly restricted or declining, extirpation possible; habitat stable and not restricted - OR- Populations declining or restricted in numbers or distribution, extirpation not imminent; Species widely distributed, population status or trends unknown but suspected to be stable; habitat restricted or vulnerable but no recent or on-going significant loss; species likely sensitive to human disturbance -OR- Populations stable or increasing and not restricted in numbers or distribution; on-going significant loss of habitat.

BLM (2001) has indicated the following special status plant species may occur within the Pinedale Resource Area: Cedar Rim thistle, large-fruited bladderpod, Beaver Rim phlox, and tufted twinpod (Table 3-7). Trelease's racemose milkvetch could occur if suitable habitat is present.

**Table 3-7
BLM-Sensitive Plant Species Not Listed Under ESA That Could Occur within the Demonstration Project Area, Habitats, and Other Status Designations**

Common Name Scientific Name	Habitat (BLM, 2001)	Potential Occurrence	State Rank¹
Meadow pussytoes <i>Antennaria arcuata</i>	Moist, hummocky meadows, seeps or springs surrounded by sage/grasslands 4950-7900' elevation	highly unlikely	S2
Trelease's racemose milkvetch <i>Astragalus racemosus var. treleasei</i>	Sparsely vegetated sagebrush on shale or limestone outcrops, barren clay slopes, 6500-8200' elevation	possible	S2
Cedar Rim thistle <i>Cirsium aridum</i>	Barren, chalky hills, gravelly slopes, fine textured sandy-shaley draws, 6700-7200' elevation	likely	S2
Large-fruited bladderpod <i>Lesquerella macrocarpa</i>	Gypsum-clay hills, benches, clay flats, barren hills, 7200-7700' elevation	likely	S2
Beaver Rim phlox <i>Phlox pungens</i>	Sparsely vegetated slopes on sandstone, siltstone, limestone substrates, 6000-7400' elevation	likely	S2
Tufted twinpod <i>Physaria condensata</i>	Sparsely vegetated shale slopes, ridges, 6500-7000' elevation	likely	S2
BLM, 2001; Keinath <i>et al.</i> , 2003.			
¹ State Rank: assigned by WYNDD and reflects status of species within political borders of the State of Wyoming: S1 = Extremely Rare S2 = Very Rare S3 = Rare S4 = Apparently secure, but may be rare in portions of its range S5 = Secure under present conditions			

3.15 Wildlife and Aquatic Resources

Scoping issues identified by interested groups and the public directly or indirectly focused on habitat function that could be affected by the Demonstration Project. Pronghorn, mule deer, and sage-grouse were species most often identified. Habitat function is defined as “the arrangement of habitat features, and the capability of those features to sustain species, populations, and diversity of wildlife over time” and is central to recent recommendations for impact analysis and conservation of wildlife and habitat during oil and gas development in Wyoming (WGFD, 2004a).

Wildlife habitats and their functions on the PAPA, whether as wintering, breeding or nesting habitats, were described in detail in the PAPA EIS (see Section 3.20) and supporting documents. Since 2000, there have been several wildlife studies completed and in progress that provide information which was unavailable when the ROD was issued.

3.15.1 Big Game

Mule Deer. Much of the PAPA, including the Shell Mesa 7-29 pad, coincides with crucial winter range utilized by mule deer in the Sublette Herd Unit and is described in the PAPA EIS. Mule

deer that summer in mountainous terrain surrounding the PAPA to the west (Salt River Range and Wyoming Range), north (Snake River Range and Gros Ventre Range), and east (Wind River Range) migrate to winter ranges on the PAPA and Pinedale Front complex, traveling up to 60-100 miles (Sawyer and Lindzey, 2001). A few mule deer appear to be yearlong residents of the Pinedale Mesa (Sawyer and Lindzey, 2001).

Depending on snow conditions, mule deer may begin arriving on winter ranges on the Mesa during late October (Sawyer and Lindzey, 2001), later during mild winters. Deer may move northwest, to the vicinity of Cora Butte, during winter if conditions are mild (Sawyer *et al.*, 2003). Most migratory mule deer wintering on the Mesa begin movements to summer range in late March or early April; again, the timing of movements depends on weather conditions (Sawyer and Lindzey, 2001).

Since 1995, the population has increased from approximately 27,000 to over 37,000 in 2001, declined to 33,000 animals in 2002 and further decreased in 2004 (Clause, 2005; see Table 3-8). After winter 1992-1993, the population was at a recent all-time low and WGFD eliminated or greatly reduced doe and fawn harvest (harvest of any deer) to accelerate population growth (Smith, 2003). Harvest of all sex and age groups was further reduced during 2003 and 2004 (Clause, 2005). The estimate of fawns per doe, adjusted for harvest (Table 3-8), can be used to compare fawn production in years with no does harvested to production in years with harvest (Ayers *et al.*, 2000). Fawn productivity since winter 1992-1993 increased through 1997 but has been erratic since then. Productivity declined from 2003 to 2004 (Table 3-8). Depressed fawn production observed since 2000 has been attributed to drought conditions (Smith, 2003).

Table 3-8
Mule Deer Sublette Herd Unit Population, Productivity, and Harvest

Year	Postseason Population Estimate	Unadjusted Fawns per Doe Postseason	Fawns per Doe Adjusted for Harvest	Harvest			
				Bucks	Does	Fawns	Total
1995	26,893	0.605	0.605	1,286	0	0	1,286
1996	26,389	0.727	0.727	1,454	0	0	1,454
1997	24,950	0.841	0.840	1,083	17	0	1,100
1998	27,516	0.705	0.705	1,852	0	0	1,852
1999	32,594	0.795	0.794	2,478	23	10	2,511
2000	36,564	0.819	0.810	2,991	226	22	3,239
2001	37,358	0.704	0.694	2,787	372	64	3,223
2002	32,949	0.644	0.618	2,742	817	71	3,630
2003	34,022	0.782	0.769	1,946	305	35	2,286
2004	26,633	0.684	0.672	1,689	302	38	2,029

Over-winter mortality of fawn and adult mule deer in the Sublette Herd Unit has been estimated since 1993 (see Wildlife Technical Report, Appendix C). Throughout the period of data collection, adult over-winter mortality rates have been low, ranging from 26 percent mortality (74 percent survival) in 2002-03 to 3 percent mortality (97 percent survival) in 1998-1999. Fawn over-winter mortality rates have been higher than adult deer mortality rates in any given year and significantly higher than adult mortality since winter 2001-2002.

On the PAPA and other winter ranges in the Sublette Herd Unit, over-winter fawn mortality is directly related to total snowfall during November through March. In addition, drought or wet conditions on the winter range during previous years' growing seasons strongly influence fawn over-winter mortality by ameliorating or exacerbating the influence of winter snowfall. For example, a 65 percent fawn mortality rate during winter 2003-04 was associated with

approximately 50 inches of snowfall, November-March and only 15 inches of total precipitation during the two previous growing seasons. Approximately 41 inches of snow fell during winter 2004-05 but there was 21 inches of total precipitation during the two years prior. Fawn mortality in winter 2004-05 was only 31 percent.

Wildlife population growth depends on birth and death rates but also on immigration and emigration of animals into and out of the population. Results of the Sublette Mule Deer Study (Phase II) have shown a consistently declining wintering mule deer population on Mesa crucial winter ranges (Sawyer *et al.*, 2005). Deer density has decreased from 77 deer per square mile in winter 2001-02 to 41 per square mile in 2004-05. No such trend was observed on crucial winter ranges unaffected by natural gas developments and used as a control in the study. While mortality may not be affecting the wintering population, emigration from the Mesa has occurred. Coincidental with the declining wintering population, use of habitats on the Mesa by wintering mule deer is lowest where well pads have been developed (Sawyer *et al.*, 2004).

Pronghorn. The PAPA covers several seasonal ranges utilized by pronghorns in the Sublette Herd Unit. Those ranges were described in the PAPA EIS. Winter ranges on the PAPA are occupied by pronghorn that migrate from distant summer ranges in Grand Teton National Park (GTNP) and Bridger Teton National Forest (BTNF). Animals captured and equipped with radio telemetry collars there may begin migrating to the PAPA as early as October in some years, as late as December in others, taking approximately one month to complete the trek (Sawyer and Lindzey, 2000). There are numerous obstacles, man-made and natural, along pronghorn migration routes that were described in the Questar Year-Round Drilling Proposal EA (BLM, 2004a). Pronghorn returning to GTNP may begin moving in April or earlier, depending on snow conditions (Sawyer and Lindzey, 2000). Pronghorn movements from crucial winter ranges on the southern slopes of the Mesa begin by shifting their distribution to the top of the Mesa, subsequently continuing north on the top and western edge of the Mesa (Sawyer and Lindzey, 2000).

Long-term fawn production data (1978 to 2003) indicates an overall significant decline in the numbers of fawns per doe counted before harvest (BLM, 2004a Appendix E). However, fawn production increased from 0.60 fawns per doe in 2003 to 0.74 fawns per doe in 2004 (Table 3-9). The population decreased to 42,460 animals in 2004, in part due to low fawn production the year before (Frost, 2005).

**Table 3-9
Pronghorn Sublette Herd Unit Population, Productivity and Harvest**

Year	Postseason Population Estimate	Preseason Fawns per Doe	Harvest			
			Bucks	Does	Fawns	Total
1999	44,191	0.763	2,909	2,113	374	5,396
2000	42,097	0.570	3,447	2,492	343	6,282
2001	43,348	0.619	2,245	1,053	373	3,671
2002	43,630	0.615	2,467	1,477	212	4,156
2003	44,239	0.597	2,435	1,585	161	4,181
2004	42,460	0.740	2,444	1,544	239	4,227

Annual adult doe survival rates, estimated from animals radio-collared in GTNP and BTNF, have been high, ranging from 97 percent survival in 1998-1999 to 84 percent survival in 1999-2000 (Sawyer and Lindzey, 2000). A study is underway to document pronghorn movements, habitat use, and responses to habitat alterations and disturbances including natural gas developments on the PAPA (Berger *et al.*, 2004). Once completed, study results are expected

to provide insight about effects of natural gas developments on pronghorn population phenomena such as survival, migration, and fecundity.

Moose. The Demonstration Project is within the Sublette Moose Herd Unit although project components are not in habitats occupied by moose. Crucial winter-yearlong habitat is present within the riparian zone associated with the New Fork River. The Sublette Herd Unit population has declined recently and the production of calves per cow (adjusted for harvest) has significantly declined from 1994 through 2003 (Table 3-10).

**Table 3-10
Moose Sublette Herd Unit Populations, Productivity, and Harvest**

Herd Unit and Year	Postseason Population Estimate	Unadjusted Calf per Cow Postseason	Calf per Cow Adjusted for Harvest	Harvest			
				Bull	Cow	Calf	Total
1994	5,688	0.561	0.537	271	156	22	449
1995	6,017	0.475	0.462	271	143	28	442
1996	5,841	0.387	0.378	282	140	28	450
1997	5,524	0.385	0.375	283	148	27	458
1998	5,743	0.502	0.480	279	145	22	446
1999	5,817	0.427	0.405	306	171	21	498
2000	5,967	0.458	0.435	332	172	28	532
2001	5,665	0.344	0.337	352	160	39	551
2002	3,726	0.417	0.406	362	144	35	541
2003	4,028	0.350	0.334	339	161	18	518

3.15.2 Upland Game Birds

WGFD has records of 52 sage-grouse leks within the PAPA and 14 others within 2 miles of the boundary. Not all leks reported by WGFD are active but there are currently 6 active leks within the Mesa. In the PAPA EIS, sage-grouse nesting habitat was assumed to include areas within a 2-mile radius around each active and inactive lek, even though distances from leks to nests in the region can be quite variable (Heath *et al.*, 1997 and Lyon, 2000). Each Demonstration Project well pad is within 2 miles of an active lek.

The PAPA is within Upland and Small Game Management Area (USGMA) 3 (Bridger) north of the New Fork River and in USGMA 7 (Eden) south of the river. WGFD has documented harvest data, including total hunters, total recreation-days, and total sage-grouse harvested on both USGMAs since 1982. With data from both areas combined, there have been significant declining trends in numbers of hunters, total recreation-days spent hunting, and total sage-grouse harvested during the past two decades (Table 3-11 and BLM, 2004a Appendix E). There has been a significant increasing trend in the number of recreation-days spent per hunter during that time and at the same time, the total number of sage-grouse harvested per recreation-day has significantly declined, indicative of declining sage-grouse abundance (Table 3-11).

Annual census of sage-grouse leks has been used to track changes in the breeding population (Connelly *et al.*, 2004), particularly if leks are censused repeatedly within a given year so that the peak in male attendance can be determined (Jenni and Hartzler, 1978). Leks attended by male sage-grouse on numerous leks in the vicinity of and within the PAPA have been intensively monitored between 1999 and 2004 (Holloran and Anderson, 2004 and 2005). The studies indicate that male counts on leks heavily impacted by gas wells (>15 wells within a 3.1-mile radius) declined 51 percent from 1 year prior to well development through 2004. Two of those heavily impacted leks are on the Mesa and within 2 miles of each of the Demonstration Project well pads. Before development in 2001, average counts on each lek exceeded 15

**Table 3-11
Sage-Grouse Harvest Data (Total Hunters, Total Recreation Days,
and Total Harvest) and Derived Statistics in Upland and Small Game
Management Areas (USGMA) 3 and 7, Combined**

Year	Hunters	Hunter Days	Harvest	Days per Hunter	Days per Harvest	Harvest per Day
1982	3,504	7,260	11,496	2.07	0.63	1.58
1983	4,054	10,181	17,686	2.51	0.58	1.74
1984	4,491	10,009	16,579	2.23	0.60	1.66
1985	4,194	9,393	14,400	2.24	0.65	1.53
1986	3,804	9,202	14,172	2.42	0.65	1.54
1987	3,833	9,191	16,083	2.40	0.57	1.75
1988	4,271	9,541	15,199	2.23	0.63	1.59
1989	3,564	8,142	12,073	2.28	0.67	1.48
1990	3,056	7,303	12,133	2.39	0.60	1.66
1991	3,225	8,549	12,901	2.65	0.66	1.51
1992	2,548	7,455	9,955	2.93	0.75	1.34
1993	2,830	7,939	9,195	2.81	0.86	1.16
1994	2,235	6,105	7,745	2.73	0.79	1.27
1995	1,521	4,523	4,637	2.97	0.98	1.03
1996	1,354	3,735	4,063	2.76	0.92	1.09
1997	1,152	3,428	3,393	2.98	1.01	0.99
1998	1,431	3,628	4,793	2.54	0.76	1.32
1999	1,764	5,316	5,867	3.01	0.91	1.10
2000	1,936	4,540	5,562	2.35	0.82	1.23
2001	1,177	3,632	3,137	3.09	1.16	0.86
2002	502	1,553	793	3.09	1.96	0.51
2003	665	1,850	1,484	2.78	1.25	0.80
2004	1,312	4,319	3,636	3.29	2.77	0.84

males but only one male was observed only once on each lek in 2005. Indeed, average male attendance at all leks on the Mesa declined from 2001 through 2004 (Table 3-12). Average male attendance did increase overall on the Mesa during 2005, possibly due to increased juvenile survival with increased precipitation during 2004. Male attendance at other leks on the PAPA show a similar trend to those on the Mesa but male attendance at leks off the PAPA increased or remained relatively constant during the same period (Table 3-12).

Sage-grouse also winter on the PAPA. Sage-grouse movements to winter ranges can take some time and may occur between late August and December. For example, most radio-telemetered sage-grouse were on the PAPA and vicinity by November 1998 but arrived later in the PAPA in 1999, possibly due to mild weather that year (Lyon, 2000). Wintering sage-grouse depend, in part, on sagebrush extending above the snow and Lyon (2000) documented numerous wintering sage-grouse on the Mesa and some within the PAPA south of the New Fork River. Likewise, distributions of sage-grouse winter fecal pellet groups surveyed by Wyoming Wildlife Consultants (BLM, 2004d) from 2001 through 2003 indicate wintering grouse are present on the PAPA, north and south of the New Fork River.

**Table 3-12
Male Sage-Grouse Attendance Averaged For Leks Censused On the Mesa
On the Rest of the PAPA, and Off the PAPA Since 1999**

Year	Total Leks Censused in Year			Maximum Males Counted per Lek			Average Males Counted per Lek		
	Leks on Mesa	Other Leks on PAPA	Leks off PAPA	Leks on Mesa	Other Leks on PAPA	Leks off PAPA	Leks on Mesa	Other Leks on PAPA	Leks off PAPA
1999	1	3	6	43.0	59.7	62.3	24.0	43.2	45.8
2000	2	3	6	39.0	62.3	49.8	35.4	48.6	39.5
2001	5	5	7	45.0	57.2	66.1	36.4	42.4	45.9
2002	6	6	6	33.2	42.2	64.3	27.9	31.7	56.5
2003	6	7	8	34.8	32.1	62.5	25.5	24.5	54.6
2004	6	6	8	30.5	31.5	66.8	24.5	25.3	53.5
2005	6	6	7	41.3	38.2	83.3	32.1	32.7	75.2

3.15.3 Migratory Birds

Data compiled for 9 National Biological Survey BBS routes in the upper Green River area reveal 150 bird species have been observed on one or more routes since 1980 (Sauer *et al.*, 2005). Of those, 107 species are listed as Nearctic-Neotropical migratory birds by FWS, Division of Bird Habitat Conservation, pursuant to the Neotropical Migratory Bird Conservation Act.

Not all species on BBS routes are migrants though, and data for many of the migratory species is sparse, limited to only a few observations some years on a few routes. BBS data for 23 migratory species in the region allowed estimation of trends over the period 1994 through 2003, reported by BLM (2004 in Appendix E). Only two of the routes were surveyed in 2004, an inadequate sample to include in further analysis. Trends of abundances for 6 migratory species appear to be declining. Four of those nest on or close to the ground (killdeer, common nighthawk, rock wren and sage thrasher) but nest in a variety of habitats. Three declining species inhabit wetland and/or riparian habitats (killdeer, yellow warbler and red-winged blackbird). Abundance of other species that utilize riparian or other moist habitats appears to be increasing (tree swallow, bank swallow, barn swallow and song sparrow) although those species nest above ground level. Other species that appear to be increasing include western meadowlark, Brewer's blackbird and brown-headed cowbird; the latter two species have some affinity for human-altered habitats and western meadowlarks are often associated with agriculture (Cerovski *et al.*, 2004).

Many common raptor species are known to nest, migrate, and seasonally reside, in the general vicinity of the PAPA. These include golden eagle, red-tailed hawk, ferruginous hawk, great horned owl, bald eagle, Swainson's hawk, northern harrier, prairie falcon, American kestrel, merlin, and osprey. Sharp-shinned hawk, Cooper's hawk, northern goshawk, burrowing owl and long-eared owl may also be present in the area during the summer months. Birds that may winter in the area include golden eagle, red-tailed hawk, rough-legged hawk and great horned owl as well as other less common species (Call, 1978).

3.15.4 Aquatic Resources

Aquatic resources in the PAPA are described in Section 3.20 of the PAPA EIS. The Green River is classified as 2AB fisheries (WYDEQ, 2001). The Green River and Fontenelle Reservoir support brown, rainbow, and cutthroat trout and provide spawning habitat for Kokanee salmon. Spawning occurs in October (BLM, 1995). Common nongame fish include mountain sucker,

speckled dace, mottled sculpin, and fathead minnow. Fisheries resources in the New Fork River are known to support rainbow and brown trout (BLM, 2004a). The condition of the riparian component of aquatic habitat along the New Fork River is a concern. Recruitment of mature riparian trees, principally willows and cottonwoods, appears limited by browsing big game (WGFD, 2003). Riparian trees provide shade, instream detritus, and streambank stability, all of which are important to sustain aquatic resources.

3.16 Air Quality and Noise

3.16.1 Air Quality

3.16.1.1 Current Status of Air Quality

Current (2006) air quality conditions in the Pinedale region have undergone recent analysis in the Jonah Infill Drilling Project Draft EIS - Air Quality Impact Analysis Supplement (BLM, 2005). Components of air quality include concentration (the amount of air pollutant in a volume of air), visibility (the capacity to perceive color and texture over a distance) and atmospheric deposition (the processes by which air pollutants are deposited on terrestrial and aquatic ecosystems). This section describes actual air quality monitored near the Pinedale area, and potential air quality estimated in the Jonah Infill DEIS (BLM, 2005).

Concentrations. Ozone and sulfur dioxide concentrations monitored by CASTNet (Clean Air Status Trends Network) near Pinedale, available from 1989 through 2003, are below applicable guidelines and standards. Nitrogen dioxide and particulate matter concentrations monitored by SLAMS (State and Local Air Monitoring System) near Pinedale, available from late 2004 through the present, are below applicable standards.

Potential concentrations of nitrogen dioxide, particulate matter and sulfur dioxide from cumulative sources are below Wyoming Ambient Air Quality Standards (WAAQS) and National Ambient Air Quality Standards (NAAQS) (BLM, 2005).

Potential concentrations of nitrogen dioxide, particulate matter and sulfur dioxide from cumulative sources are less than applicable PSD (Prevention of Significant Deterioration) increments (BLM, 2005). A comparison of potential concentration to PSD increments does not constitute a regulatory PSD Increment Consumption Analysis.

Visibility. Visibility monitored by IMPROVE (Interagency Monitoring of Protected Visual Environment) near Pinedale, available from 1989 through 2003, shows a steady trend (neither improving nor degrading) of the 20 percent haziest days over the monitoring period. Potential visibility impairment is significant in several Class I areas and communities in the Pinedale region (BLM, 2005).

Atmospheric Deposition. Total nitrogen and sulfur deposition monitored by NADP (National Atmospheric Deposition Program) and CASTNet, available from 1989 through 2003, are below applicable levels-of-concern (LOC). Precipitation pH monitored by NADP near Pinedale, available from 1987 through 2003, shows slight acidification from 1987 through 1998.

Potential deposition from cumulative sources are below current levels-of-concern for nitrogen and sulfur at PSD Class I areas (BLM, 2005). The US Forest Service and the National Park Service are concerned that the current LOCs are set too high and so are re-evaluating the LOC's. Potential changes to lake chemistry are below levels-of-acceptable-change (LAC) for lakes.

3.16.1.2 ASU Current NO_x Emissions from Drilling Rigs

Projected air pollutant emissions from construction and operation of the Pinedale Anticline development project were based upon the analysis assumptions contained in the Pinedale Anticline EIS and Technical Report (BLM, 1999b). Actual emissions from production operations in the PAPA are expected to be the same as that predicted in the PAPA EIS (the number of operating wells has not exceeded those analyzed in the PAPA EIS). However, emissions from construction have exceeded those predicted in the PAPA EIS. For example, the PAPA EIS assumed that there would be eight drilling rigs operating in the PAPA at any one time. In the summer of 2004 there were 32 rigs operating in the PAPA. In addition, drilling rig horsepower exceeds that assumed in the PAPA EIS for a single rig. The PAPA EIS assumed that a single drilling rig would require 1,000 horsepower and it is now estimated that a single drilling rig averages 3,500 horsepower.

The main pollutant of concern with drilling rig emissions is nitrogen oxides (NO_x). Table 3-13 provides an estimate of current daily NO_x emission from rigs currently operated by ASU in the PAPA. The PAPA EIS predicted drilling rig NO_x emissions of 221 tons/year assuming eight rigs operating in the PAPA at any one time (BLM, 2004a) although a daily rate of NO_x emissions was not predicted. ASU currently has 18 drilling rigs operating in the PAPA (1 rig is operated by Anschutz, 7 rigs are operated by Shell and 11 rigs are operated by Ultra). Of these 18 rigs, Shell operates three rigs that are using EPA Tier 1 emissions control technology. The other 15 rigs operated by ASU within the PAPA currently have uncontrolled emissions. The average combined horsepower per rig for all engines is 3,500. The current daily total NO_x emissions currently emitted in the PAPA by the 18 operating drilling rigs is shown in Table 3-13, below. This table shows that current daily NO_x emission from ASU drilling operations is 8.88 tons. Although daily estimates of NO_x emissions were not provided in the PAPA EIS, with a daily NO_x emission of 8.88 tons, it would only take 25 days of operation to reach the 221 annual tons of NO_x predicted in the PAPA EIS.

It is important to note that the current daily NO_x emissions reported in Table 3-13 are theoretical estimates based on standard emission factors and average horsepower. Actual measured NO_x emissions may be lower than the theoretical numbers reported in Table 3-13. In any case, it can be seen that the current level of NO_x emissions exceeds that predicted in the PAPA EIS.

**Table 3-13
Estimated Current NO_x Emissions from ASU-Operated Rigs within the PAPA**

Control Technology	NO _x Emission Factor (g/hp-hr)	Daily NO _x Emissions per rig (tons)	No of rigs	Total Daily NO _x Emissions (tons)	Estimated Annual NO _x Emissions (tons)
None	14.07 ¹	0.54	15	8.10	2,956.5
Tier 1	6.81 ²	0.26	3	0.78	284.7
Total			18	8.88	3,241.2
¹ (EPA, 1996), ² (EPA, 2005)					

3.16.1.3 Tracking Nitrogen Oxide Emissions

In 1997, WDEQ and BLM entered into an agreement for tracking changes in nitrogen oxide emissions from new abandoned, or modified sources within the BLM Rock Springs, Kemmerer and Pinedale Field Office areas.

In the Questar Year-Round Drilling Proposal EA (BLM, 2004a), it was disclosed that drilling rigs contribute a larger amount of NO_x emissions than analyzed in the PAPA EIS (BLM, 1999a). The PAPA ROD set an "analysis level" for NO_x emissions:

“If activity and corresponding emission assumptions and/or impacts exceed those identified in the Pinedale Anticline EIS (376.59 tons/year of NO_x emission from compressors or 693.5 tons/year NO_x emission from the combination of construction/drilling, well production, and compression), the BLM, in cooperation and consultation with Wyoming Department of Environmental Quality-Air Quality Division (WDEQ-AQD), EPA Region VIII, USDA-Forest Service, and other affected agencies, will undertake additional cumulative air quality environmental review as required by CEQ regulations 40 CFR 1502.9 (c) (1) (ii).”

A comment letter received during scoping requested information on the 2004 NO_x tracking report so that the current NO_x emissions in the area could be accurately assessed and to make a determination if additional air quality modeling of potential impacts to sensitive wilderness areas is necessary. According to BLM (Caplan, 2005) the 2004 NO_x Tracking Report is not available for inclusion in this EA.

3.16.1.4 VOC and HAPs Emissions Within the PAPA

The primary source of volatile organic compounds (VOCs) and hazardous air pollutants (HAPs) is wellhead production equipment including three-phase separation, triethylene glycol dehydration and condensate storage. Reported emissions (to WDEQ) from operators in and adjacent to the PAPA show that the actual emissions on a per well basis are less than those analyzed in the PAPA EIS (BLM, 2004a). The reductions in VOCs and HAPs are partially due to the application of BACT (discussed below) which is now required within the Pinedale Anticline Field by WDEQ. It is expected that VOC emissions would be reduced even further in the PAPA during winter 2005-2006 and beyond because the Questar condensate gathering system will be in operation. In addition, the PAPA EIS analyzed for 700 wells and to date there have been less than 350 wells drilled within the PAPA.

3.16.1.5 State Required BACT

In an effort to improve Wyoming's air quality, the Best Available Control Technology (BACT) process is applied to new sources under the Wyoming Department of Environmental Quality – Air Quality Division (Division) New Source Review (NSR) Program's permitting process. The BACT process could be defined as the elimination of pollutants from being emitted into the air whenever technically and economically feasible to do so.

The Division has a program to ensure that all oil and gas production units are permitted and that BACT is utilized to control or eliminate emissions from both major and minor sources. To guide oil and gas producers through the NSR permitting process, the Division developed the *Oil & Gas Production Facilities Chapter 6, Section 2 Permitting Guidance* that includes Notice of Installation and “Presumptive BACT” permitting processes. The “Presumptive BACT” process controls VOC emissions associated with dehydration units as well as flashing losses from pressure vessels and storage tanks at new facilities. To address the increased activity and emission levels within the Jonah and Pinedale Anticline Gas Fields, the emission control requirements and permitting process were revised effective July 28, 2004 and are described in *Jonah and Pinedale Anticline Gas Fields - Additions to Oil and Gas Production Facility Emission Control and Permitting Requirements*. The revised emission control requirements and permitting process result in more emissions being controlled earlier in the life of the well for single well facilities and control on startup of all wells at multiple well or pad facilities (Potter, 2005).

A comment letter received in response to scoping requested that this EA provide an estimation of the effects of State required BACT on the reductions of VOCs and NO_x in the PAPA. Actual numbers of the reductions of VOCs and NO_x in the PAPA are not available. However, according to Potter (2005), the application of BACT in the minor source permitting program has

resulted in minimized emissions in the State as a whole and will continue to do so as the Division continues to receive NSR permit applications for new and modified sources.

3.16.2 Noise

The PAPA ROD described that background noise within the PAPA is similar to EPA's category "Farm in Valley". The background noise levels for this category are 39 dBA daytime and evening and 32 dBA nighttime. Local conditions such as traffic, topography and frequent high winds characteristic of the region can alter background noise conditions. There are also greater than 30 drilling rigs within the PAPA that were not present at the time of the PAPA ROD contributing to noise levels within the PAPA.

Noise-sensitive areas were identified in the vicinity of the PAPA including: sage-grouse leks, crucial big game habitat during crucial periods; residences within and adjacent to the project area; areas adjacent to the Lander Trail; ranches along both the New Fork and Green rivers; raptor nest sites when occupied; and recreation areas (BLM, 1999a).

CHAPTER FOUR ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

This chapter describes the environmental consequences of BLM approval of the Proposed Action and alternatives described in Chapter 2. Both adverse impacts and benefits associated with the Proposed Action and the alternatives are discussed. Like the other EA chapters, this chapter does not repeat information contained in the PAPA EIS.

For some resources, particularly wildlife, winter drilling would result in additional impacts that were not analyzed in the PAPA EIS. Potential impact to wildlife was a common topic in comment letters received during scoping (see Section 1.4 in Chapter 1). Some impacts to other PAPA resources from winter drilling would be less than those described in the PAPA EIS because surface disturbance would be reduced.

ASU is committing to a number of measures to offset impacts from the Proposed Action. These measures are described in Section 2.6 and their benefits explained in this chapter. One of the more important aspects is ASU's proposal to drill multiple wells from individual well pads beyond current practices with pad drilling, which would reduce overall surface disturbance necessary to develop the sections included in the Demonstration Project. According to ASU, this level of concentrated pad drilling is economically attractive only if winter drilling is allowed. The PAPA EIS anticipated as many as 16 well pads/section in ASU's lease area (MA 5). The Demonstration Project would result in development of the selected sections with fewer well pads than anticipated by the PAPA EIS or than would be under current practices with pad drilling.

Under the Demonstration Project and additional pads/roads required to fully develop the lease sections, an additional 54.8 acres of surface disturbance (3 demonstration pads, expansion of 2 pads and one new pad) would be required (although not all the disturbance would occur during winter 2005-2006). Continued development under the PAPA ROD (with limited pad drilling) would require an additional 105.1 acres (12 new pads and expansion of others) to complete the leases within the selected sections (see Table 4-1). This equates to an overall reduced disturbance of 50.3 acres or 48 percent less disturbance for development under the demonstration (the Proposed Action) rather than continued development under the PAPA ROD (the No Action Alternative).

It is also important to recognize that the No Action Alternative would only preclude winter drilling in big game winter range and sage-grouse breeding and nesting habitat during periods identified in the PAPA ROD. This alternative would not preclude ASU from continuing development of their lease area in big game winter range or sage-grouse breeding and nesting habitat. Development of these areas was approved by the PAPA ROD and will go forward regardless of the alternative selected by BLM. Consequently, if the No Action Alternative is selected, the impacts to resources discussed in Chapter 4 of the PAPA EIS would still occur.

Section 3 of the PAPA ROD contains specific administrative requirements and conditions of approval (COAs) designed, in large part, to protect environmental resources in the PAPA. Where such requirements and COAs are resource-specific, consistency of each with ASU's proposal to drill during winter 2005-2006 is discussed.

Constructing additional well pads and expanding existing well pads is authorized by Section 2 of the PAPA ROD (BLM, 2000b). However, winter drilling on these well pads is not authorized by the ROD. Section 3 of the ROD precludes activities or surface use on big game crucial winter

range from November 15 through April 30. The ROD allows BLM to grant exceptions to the seasonal stipulation if conditions warrant.

**Table 4-1
Estimated Surface Disturbance (acres) by the Demonstration Project (Proposed Action) Compared to Continued Development under the PAPA ROD (the No Action)**

Operator Pad Location	New Disturbance Required for the Proposed Action ¹		Additional Disturbance Required to Fully Develop Leases in Section		Total Disturbance from Proposed Action and Additional Pad/Road Disturbance	Total Disturbance under Continued PAPA ROD Development	Reduced Disturbance Proposed Action and Additional Pad/Road vs. Continued PAPA ROD Development
	Pad	Road & Pipeline	Pad	Road			
Anschutz Mesa 10-35	10.2	2.9	0.0 ²	0.0	13.1	18.4 ⁵	5.3
Shell Mesa 7-29	0.0	0.0	8.0 ³	0.7	8.7	28.0 ⁶	19.3
Ultra Mesa 7-34	11.0	0.0	22.0 ⁴	0.0	33.0	58.7 ⁷	25.7
Total	24.1		30.7		54.8	105.1	50.3(48%)

¹ Anschutz proposes to build new demonstration pad and associated road (1.1 acres) and pipeline (1.8 acres). Ultra proposes to expand an existing pad and a new access road would not be required.
² Anschutz would be able to finish development of their leases in Section 35 with 20-acre spacing using the demonstration project development scenario during the winter 2005-2006 with construction of the Mesa 10-35 pad and associated access road.
³ Shell would need to construct one additional pad (in addition to the existing Mesa 7-29 pad) to finish development of their lease in Section 29 (and some bottom holes in Section 32) using the demonstration project development scenario. The additional Shell pad in Section 29 would not be constructed as part of the winter 2005-2006 demonstration. Disturbance includes 8 acres for one new pad and 0.7 acres for an access road.
⁴ Ultra would need to expand two existing pads (in addition to the expansion of the Mesa 7-34 pad) to finish development of their lease in Section 34 using the demonstration project development scenario. The expansion of the two additional pads in Section 34 would not occur as part of the winter 2005-2006 demonstration. Disturbance for these two pad expansions includes 22.0 acres, no additional access road would be necessary.
⁵ Includes two 8-acre pads and 2.4 acres for roads (assumes 30-foot road width).
⁶ Includes three 8-acre pads and 4.0 acres for roads (assumes 30-foot road width).
⁷ Includes nine 6-acre pads and 4.7 acres for new roads (assumes 30-foot road width).

Similarly, winter drilling would not be consistent with BLM's General Conditions of Approval protecting sage-grouse breeding, nesting, and early brood rearing habitats within two miles of an occupied lek, or in identified sage-grouse nesting and early brood rearing habitat outside the two-mile buffer, from March 15 to July 15. Further, disturbance and disruptive activities are prohibited in sage-grouse winter concentration areas (winter habitats) from November 15 through March 14. If the Demonstration Project is approved, surface use and disturbance would likely occur in one or more of these habitats during the restricted periods. Restricted periods, however, do not apply to activities associated with well production.

The PAPA EIS (BLM, 1999a and 2000a) and ROD (2000b) designated the area included within ASU's Demonstration Project area as Management Area (MA) 5. Existing well pads developed on the sections where the demonstration is proposed have been consistent with the MA objectives and restrictions/limitations contained in the ROD.

The objective and restrictions/limitations within MA 5 are provided below:

MA 5 - Big Game Crucial Winter Range and Sage Grouse Strutting and Nesting Habitat. This MA includes overlapping deer winter and crucial winter ranges and sage-grouse strutting and nesting habitat on the top of the Mesa and slopes west toward the Green River and south/southeast to the New Fork River. This MA also includes an area of overlapping deer and

antelope winter and crucial winter ranges and sage-grouse strutting and nesting habitat south/southeast of the New Fork and East Fork rivers. The management objectives are to protect this area against excessive surface disturbance and increased human activities which could displace deer and antelope from winter ranges and sage-grouse from strutting and nesting habitat resulting in mortalities and reduced population levels; protect cultural/Native American sacred sites; and continue maintenance of livestock grazing and trailing operations.

The PAPA ROD (BLM, 2000b) placed limitations/restrictions on development within MA 5. With the exception of seasonal restrictions to protect big game winter range and sage-grouse breeding and nesting habitat, ASU's proposal would comply with the ROD limitations/restrictions placed on MA 5. The ROD allowed 212 well pads to be developed in this MA. To date, 132 well pads have been constructed in MA 5. One additional pad would be added as part of the Demonstration Project as discussed above.

4.2 Socioeconomics and Environmental Justice

4.2.1 Proposed Action

If the Proposed Action is implemented, ASU would drill during the winter of 2005-2006 in big game crucial winter range and sage-grouse breeding and nesting habitat. ASU would also continue to drill during the winter in areas outside of the Demonstration Project on State and private lands and on Federal land outside of big game crucial winter range and sage-grouse nesting and breeding habitat. Impacts to socioeconomic resources from winter drilling are expected to be mostly positive and short-term because the Demonstration Project is only for the period of November 15, 2005 through July 31, 2006.

Currently, drilling within ASU's lease areas primarily occurs between May and November (although drilling occurs year-round in other portions of the PAPA). Drilling is generally prohibited in MA 5 during the winter months, although BLM recently approved limited year-round drilling in Questar's lease area (BLM, 2004a). There is also winter drilling within State sections 16 and 36, T. 32 N., R. 109 W. The result of the current winter drilling restriction on ASU's lease area is an annual cycle of intensive summer drilling activity followed by lesser winter activity. Although difficult to quantify, some local businesses suffer from an annual "boom and bust" cycle which affects their cash flow and ability to retain workers. If the Demonstration Project is approved allowing additional drilling during winter 2005-2006 (within big game crucial winter range and within sage-grouse nesting and breeding habitat), some of this fluctuation may be alleviated.

Drilling crews are managed by the rig operators and most crew members for these rigs currently reside at "man camps" in Marbleton and Boulder. It is expected that the crew workers that would be employed for the Demonstration Project are already residing in the man camps. Other housing may be required to accommodate all crew members but it is likely that those crews already have housing outside of the man camps.

The Demonstration Project may help stabilize school enrollment in the project area for the 2005-2006 school year, because most rig workers already reside in the project area. However, it is difficult to determine what effect, if any, would occur at this time.

Sublette County does not have a high proportion of minority or low income populations. Therefore, there would be no disproportionate socioeconomic impacts (i.e., environmental justice concerns).

4.2.2 No Action Alternative

Under this alternative, none of the potential socioeconomic benefits described above would occur. Development of ASU's lease areas would continue under the PAPA ROD (BLM, 2000b). However, socioeconomic information within the PAPA EIS is no longer current with the increase in development within the PAPA over the last six years (SocioEconomic Task Group, 2005).

4.2.3 Cumulative Impacts

The Demonstration Project would not result in significant changes to the cumulative impacts for socioeconomic resources within the vicinity of the PAPA, although some positive changes would potentially occur. Current winter drilling within the PAPA on BLM-managed lands (outside of big game crucial winter range and sage-grouse nesting and breeding habitat), State sections, and private land already contributes to socioeconomic stability in the vicinity of the PAPA. The Demonstration Project would be for winter 2005-2006 and spring 2006 only, and therefore, impacts (both positive and negative) would be short term.

4.2.4 PAPA ROD Consistency

Potential adverse impacts of seasonally-limited drilling on socioeconomic resources are addressed in the PAPA ROD COAs (BLM, 2000b). The ROD states "BLM will work with the Operators to plan proposed development operations such that seasonal restrictions do not impact the associated workforce. BLM will work with the Operators to facilitate year round drilling where unnecessary and undue impacts to wildlife or other resources would not occur". Consideration of the Proposed Action is consistent with the ROD COAs.

4.3 Transportation

4.3.1 Proposed Action

ASU has prepared a Transportation Plan for the Demonstration Project (Appendix A) which outlines the proposed travel routes to the Demonstration Project as well as measures that ASU proposes to control traffic within MA 5 (big game crucial winter range and sage-grouse nesting and breeding habitat).

Access to the Demonstration Project would be from either U.S. Highway 191 on the east side of the PAPA or from the west side of the PAPA on U.S. Highway 189 to State Highway 351. State Highway 351 runs east-west through the middle of the PAPA and is south of the Demonstration Project Area (see Figure 1 in Appendix A). From State Highway 351, traffic would enter onto Paradise Road (a county road) to the North Anticline Road (also known as the Anticline Crest Road). From North Anticline Road, the individual demonstration well pads would be accessed by either existing or new resource roads.

The demonstration pads selected by Shell and Ultra (because they are existing pads) would be accessed by existing resource roads. As part of the Demonstration Project, Anschutz would construct a new 0.3 mile resource road leading to their selected demonstration pad (Mesa 10-35).

Implementation of the Demonstration Project would cause an increase in traffic within MA 5 in during the winter 2005-2006. Increased traffic volumes are expected on all area routes during winter 2005-2006 including Paradise Road, North Anticline Road and resource roads necessary to access the Demonstration Project wells pads within big game crucial winter range and sage-grouse nesting and breeding habitat. Under the PAPA ROD, ASU would not be allowed to drill during the winter in this area due to seasonal restrictions. However, there would be some existing traffic in MA 5 because Questar was approved for year-round drilling by BLM in 2004

(BLM, 2004a) and drilling is also allowed in State sections. This traffic would not be subject to the seasonal winter restrictions.

Implementation of the Proposed Action could cause a decrease in traffic on U.S. Highway 191, U.S. Highway 189, State Highway 351 and Paradise Road. A decrease in traffic on these roads would be a result of ASU's applicant-committed measure to bus rig crews for the Demonstration Project from man camps in Marbleton and Boulder. Details of the proposed bussing is provided in Appendix A. ASU is currently operating 18 drilling rigs in the PAPA and would continue to operate those rigs on State and private lands as well as Federal lands that are not subject to winter drilling restrictions. Busing the rig crews from the man camps in Marbleton and Boulder could reduce traffic by an estimated 458 round trips per week.

During drilling, the increased traffic within MA 5 is estimated to be 90 round trips per day or about 30 round trips to each pad or about 15 trips per rig, based on traffic estimates provided in ASU's Transportation Plan (Appendix A). Each of the 6 rigs would require approximately 600 round trips during the 35 to 40 days required to drill the well, or approximately 15 round trips per day per rig.

Traffic required to complete the proposed 45 wells associated with the Demonstration Project would commence on May 1, 2006 which would be done outside of big game winter restrictions. By holding completions activities until May, an inventory of wells would be created and traffic required for completion could move from one well to another on a single pad, thereby eliminating traffic that would be required to move completion operations from one pad to another. ASU estimates that traffic volumes for completions would be reduced by 74 percent compared to traffic required to complete 45 wells under a single well, single pad completion scenario.

- ASU is committing to several measures to reduce traffic volumes associated with the Demonstration Project. These are described in detail in their Transportation Plan in Appendix A and include:
- Bussing of rig crews to the demonstration pads from Marbleton and Boulder;
- Funding of hosted worker to man an access station;
- Training rig crews on appropriate behavior to minimize impacts to wildlife;
- Funding signage stating winter traffic restrictions;
- Installation of gates (in coordination with BLM) in crucial winter range to restrict human disturbance and potential impact to wildlife;
- Storing equipment and bulk supplies on demonstration pads or adjacent pads prior to November 15th; and
- Moving rigs to demonstration pads prior to November 15th.

Road maintenance requirements may be increased with the increased traffic volumes on the North Anticline Road and the resource roads. This may occur especially during the "mud season" on graveled-surface roads when frozen roads thaw and are subject to heavy equipment traffic. Traffic as a result of the Demonstration Project would be "incremental" traffic because drilling is allowed on State and private lands as well as Federal land outside of big game crucial winter ranges and in Questar's leases (BLM, 2004a).

4.3.2 No Action Alternative

Under this alternative, increased traffic in MA 5 as discussed under the Proposed Action would not occur. However, reductions in traffic on U.S. Highways 189 and 191 and State Highway 351

due to ASU's applicant-committed measures would also not occur. Other benefits due to applicant-committed measures such as placement of gates and signage and education programs as described in ASU's Transportation Plan would also not occur under the No Action Alternative.

4.3.3 Cumulative Impacts

Implementation of the Proposed Action would increase winter traffic in MA 5 in the PAPA on the North Anticline Road and resource roads leading to the demonstration pads, and would be a cumulative increase in traffic on those roads. However, Implementation of the Proposed Action is expected to decrease cumulative traffic volumes on Paradise Road, State Highway 351 and U.S Highways 189 and 191 because of the applicant-committed measures that ASU has proposed.

4.3.4 PAPA ROD Consistency

The Proposed Action and the No Action Alternative are consistent with the PAPA Transportation Plan which provides guidance for transportation planning, road design, construction and road maintenance. It is also consistent with BLM's overall objective of finding ways to effectively reduce peak traffic levels in the PAPA.

4.4 Land Use and Grazing

4.4.1 Proposed Action

Implementation of the Proposed Action is consistent with current land uses of oil and gas development which is allowed under the current zoning regulations.

The PAPA ROD (BLM, 2000b) allowed up to 16 well pads per square mile to be drilled in MA 5 (with the consideration of pad drilling). If the Proposed Action is implemented, ASU would increase pad drilling (multiple wells from one pad) with fewer than 16 pads per square mile developed in the Demonstration Project Area. The Proposed Action would reduce overall surface disturbance by 48 percent (see Table 4-1) over continued development under the PAPA ROD using pad drilling. This would result in less surface disturbance which would benefit grazing and other land uses.

Disturbance in winter 2005-2006 resulting from the Demonstration Project (24.1 acres) would affect approximately 2.1 AUMs (0.04 percent of total AUMs) within the Mesa Common Allotment. ASU's activities during the winter (November 15 through May 1) would not have an impact on grazing permits for the Mesa Common Allotment, because grazing within this allotment is only allowed from May 1 through November 15. However, under the demonstration development, drilling and completion operations would continue from May 1 to July 31 during the grazing allotment use period. Nevertheless, the total time to fully develop leases within the Demonstration Project Area would be less compared to the No Action Alternative.

After production is complete and the well pad is no longer needed, the surface would be revegetated and available to grazing animals, although re-establishment of vegetation would require 3 to 5 years (BLM, 1999a). However, ASU is piloting an enhanced habitat mixture outside of the Demonstration Project Area. If the pilot is successful and is implemented on the demonstration pads, the time required for revegetation would be shortened.

4.4.2 No Action Alternative

Grazing and land use impacts under the No Action Alternative would be similar to those described in the PAPA EIS, however, impacts would be even less because ASU is currently implementing pad drilling under the PAPA ROD development (the No Action Alternative).

Under this alternative, ASU would continue to develop their leases under the PAPA ROD using pad drilling. The winter restrictions in the PAPA ROD would apply (BLM, 2000b). Disturbance associated with this alternative would be 48 percent greater than for the Proposed Action (see Table 4-1) and take more time to fully develop these sections in the Demonstration Project Area. Under this alternative, approximately 9.1 AUMs (0.18 percent of total AUMs) within the Mesa Common Allotment would be disturbed.

4.4.3 Cumulative Impacts

The Proposed Action would reduce overall disturbance as compared to ASU's continued development under the PAPA ROD (the No Action Alternative). This reduced disturbance would result in less overall cumulative impacts to land use and grazing in the PAPA. Surface disturbance by well pads and roads totaling 76.7 acres within the three sections leased by the ASU operators has already occurred. Under the Proposed Action (24.1 acres) and additional required pads and roads (30.7 acres), a total of 131.5 acres would be disturbed while and additional 105.1 acres would be affected under the No Action Alternative (total of 181.8 acres). Because the No Action Alternative is based on development levels analyzed in the PAPA EIS, the amount of surface disturbance resulting from the Demonstration Project would generate less cumulative impact to land use and grazing than permitted under the ROD (BLM, 2000b).

4.4.4 PAPA ROD Consistency

The PAPA ROD does not contain COAs specific to grazing and land use although numerous COAs are provided for noxious weed control, reclamation, etc. that directly contribute to the availability of livestock forage in the PAPA. Consistency with these COAs is described in Sections 4.11.

4.5 Recreation Resources

4.5.1 Proposed Action

The Demonstration Project is not expected to alter recreational activities in and around the PAPA because two major activities, hunting and open-water fishing, occur before the beginning of the Demonstration Project (November 15, 2005). In addition, wildlife viewing is limited in the Demonstration Project Area during proposed winter drilling (November 15 through May 1) because winter restrictions, such as closures of winter crucial ranges and roads within the PAPA exclude the public during this time. There may be some decrease in hunting use of areas adjacent to the Demonstration Project Area the following year as a result of displacement of wildlife from development activities (BLM, 1987). However, the impact is not expected during the 2005 hunting season, and in subsequent years would be insignificant. In hunt areas nearest the Demonstration Project, WGFD big game harvest data from 1991 through 2004 reveals no conclusive trends in either decreased harvest or license numbers.

4.5.2 No Action Alternative

Under this alternative, ASU would continue to develop their leases under the PAPA ROD (with pad drilling) and winter restrictions would apply (BLM, 2000b). No development within big game crucial winter range or sage-grouse nesting and breeding habitat would occur during the winter, so winter recreational activities would not be adversely impacted. However, disturbance associated with overall field development would be 48 percent greater than the Proposed Action and the time necessary to fully develop these sections in the Demonstration Project Area would be longer, potentially affecting recreation in the future.

4.5.3 Cumulative Impacts

The Proposed Demonstration Project would result in a temporary loss of winter recreational opportunities on BLM lands within the vicinity of the proposed project, although it is anticipated that these impacts would be minor since they are located near previously disturbed sites, which are expected to be undesirable to recreationists. Overall cumulative impacts to recreational resources should be reduced if the Demonstration Project were implemented.

4.5.4 PAPA ROD Consistency

The PAPA ROD does not contain administrative requirements or COAs specific to recreation resources.

4.6 Visual Resources

4.6.1 Proposed Action

Implementation of the Demonstration Project would disturb an additional 24.1 acres of land within Sections 34 and 35 of T. 32 N., R. 109 W. Ultra (Mesa 7-34) would disturb 11.0 acres to expand their well pad within the VRM Class IV viewshed. Anschutz would disturb 13.1 acres to build their demonstration pad, access road and pipeline within the VRM Class IV viewshed. Shell's existing pad that will be used for the demonstration is also within VRM Class IV. VRM Class IV objective allows for major modifications to the existing character of the landscape, and therefore construction and operation of the Demonstration Project would be consistent with this objective.

In the PAPA EIS (Section 3.9, BLM 2000a), visual disturbance of objects rising 10 feet and 25 feet above ground level in the PAPA were analyzed from six key viewpoints: the Mountain Man Museum (SE/NW, Section 34, T. 34 N., R. 109 W.), the airport (NE/SE, Section 25, T. 33 N., R. 109 W.), two points along U.S. Highway 191 (SW/SE, Section 23 and SW/SE, Section 10, T. 33N., R. 109 W.), southwest Pinedale (NW/SE, Section 4, T. 33 N., R. 109 W.), and along Orcutt Road (SW, NW, Section 34, T. 34 N., R. 109 W.). However, objects greater than 25 feet (i.e., drilling rigs) were not analyzed. Therefore, visual disturbance from the two drilling rigs that would operate simultaneously on each of the demonstration well pads during the winter of 2005-2006 may occur. To minimize visual disturbance, BLM would implement mitigation procedures outlined in Section 3 of the PAPA ROD, such as restrictions on night lighting (BLM, 2000b). After drilling is complete, however, components associated with ASU's well pads should not be visible from key viewpoints, especially since low profile tanks (\leq 12 feet in height) would be used (see Appendix G, BLM, 2000a).

Implementation of the Demonstration Project reduces disturbance by 50.3 acres (48 percent) over continued development allowed under the PAPA ROD with pad drilling. The amount of time required to develop their leases within VRM Class IV on the selected sites would also be reduced with winter drilling during 2005-2006.

4.6.2 No Action Alternative

Visual impacts from direct surface disturbance would be similar to those described in the PAPA EIS. Under this alternative, ASU would continue to develop their leases under the PAPA ROD with pad drilling. Winter stipulations in the PAPA ROD would still apply (BLM, 2000b). Surface disturbance associated with this alternative would be 48 percent greater than for the Proposed Action (see Table 4-1) and additional time to develop ASU's leases would be required.

4.6.3 Cumulative Impacts

Implementation of the Proposed Action would result in a temporary increase to visual disturbance of VRM Class IV during drilling and completion of the proposed wells. These impacts are expected to be short-term, although noticeable, until drilling is complete. Visual impact from well pad components (i.e., wells, tanks, etc.) for the life of the project should be negligible since they would not be visible from key viewpoints. The Proposed Action would reduce overall surface disturbance over ASU's current development allowed under the PAPA ROD with pad drilling. This reduced disturbance should result in less overall cumulative impacts to visual resources in the PAPA.

4.6.4 PAPA ROD Consistency

The PAPA ROD specifically addresses visual impacts through COAs in Section 3 and MA restrictions and limitations on development in Section 4.

Anschutz proposes to construct one well pad within MA 5 and Ultra proposes to expand one well pad within MA 5. The ROD allowed up to 212 wells to be developed in this MA. To date, 132 well pads have been constructed and one additional pad would be constructed during winter 2005-2006 within MA 5, staying within the PAPA ROD restrictions and limitations. The ROD also limits the number of well pads/square mile to 4. If more than 4 well pads/square mile are proposed, BLM may require the operators to pad drill any additional wells or to install centralized production facilities. ASUs proposal would comply with this restriction.

Section 3 of the ROD contains COAs designed to reduce impacts from night lighting of drilling rigs. BLM will impose conditions on ASU to minimize the effects of rig lighting consistent with the COAs.

4.7 Cultural and Historic Resources

In the Demonstration Project Area moderate potential exists for unexpected discoveries as surface disturbance progresses (Vlcek, 2005). Unexpected discoveries usually occur during initial surface disturbance by heavy equipment such as dozers and excavators. Such finds would be handled on a case-by-case basis pursuant to established treatment or discovery plans. The plans would follow the BLM National Programmatic Agreement, as identified in the Agency's State Protocol Agreement between the BLM and the Wyoming State Historic Preservation Office. The agreements would provide direction in advance of when unexpected discoveries are made in the field during project development (BLM, 2000b).

4.7.1 Proposed Action

With implementation of the Demonstration Project, surface disturbance would be decreased by approximately 48 percent over current development allowed under the PAPA ROD (the No Action Alternative). A total of 24.1 acres would be disturbed, with no additional surface disturbance on Shell's Mesa 7-29 (see Table 4-1). The Proposed Action would result in a potential lower rate of damage to discovered and undiscovered cultural resources in the Demonstration Project Area.

4.7.2 No Action Alternative

Impacts from drilling and the associated surface disturbances under the No Action Alternative would be the same as those described in Section 4.9 of the PAPA EIS. Under this alternative, an additional 105.1 acres could be disturbed for well pad and road construction. Consequently, this would increase the possibility of unexpected discoveries, which, in turn could both expose the resources to winter conditions and prolong the drilling and development processes.

4.7.3 Cumulative Impacts

Implementation of the Proposed Action and No Action Alternative would result in the same cumulative impact described in the PAPA EIS. Because cultural resource sites are more numerous and estimated in the PAPA EIS, potential impact to unexpected discoveries exceed levels defined earlier by BLM (1999a and 2000a).

4.7.4 PAPA ROD Consistency

Consistent with the PAPA ROD COAs, the BLM and the State Historic Preservation Office (SHPO) have developed a Programmatic Agreement (PA) which includes discovery plans and individual project treatment plans for field development activities. Section 106 compliance of this project will be in accordance with the Wyoming Protocol implementing the National Programmatic Agreement for cultural resources. BLM will evaluate potential impacts to cultural and historic resources consistent with the PA.

4.8 Geology, Geologic Hazards, Minerals and Paleontological Resources

4.8.1 Proposed Action

Total surface disturbance within each of the lease sections comprising the Demonstration Project would be less than under the No Action Alternative. Consequently, impact to geologic outcrops and potential paleontological resources on or near the ground surface is expected to also be less than under the No Action Alternative.

Implementation of the Proposed Action should expedite natural gas production within the Project Area. The Wyoming Oil and Gas Conservation Commission (WOGCC) stated the multiple benefits of ASU's Proposed Action in relation to production including maximizing reservoir development through simultaneous original spacing and infilling, minimizing time spent developing the reservoir with fewer pads; allowing drainage of all penetrated and completed sands of various sizes and configurations equally; and by avoiding shutting in production, rigging down and moving production facilities (lines, tanks, etc.) and restarting wells (waste through formation damage and lost reserves).

4.8.2 No Action Alternative

Impacts within the PAPA from field development would continue with concomitant larger surface disturbance and risk to geological and paleontological resources than the Proposed Action. This alternative would eliminate the benefits to production summarized above, by the WOGCC.

4.8.3 Cumulative Impacts

Within the PAPA, implementation of the Proposed Action and alternatives would result in the same cumulative impacts described in the PAPA EIS.

4.8.4 PAPA ROD Consistency

Specific COAs are not provided in the PAPA ROD for mineral resources.

Consistent with the ROD, the BLM would impose standard practices to protect paleontological resources. To avoid unnecessary and undue impacts to the paleontology resource, ASU would be required to inform workers of the potential for encountering fossils and what steps to take if they do. Workers will also be informed that it is illegal to remove any vertebrate fossil from public lands without a permit

4.9 Water Resources

4.9.1 Proposed Action

Impacts to water resources are described in Section 4.13 of the PAPA EIS. Because of reduced disturbance from extensive pad drilling in the demonstration sections (a reduction of 48 percent), implementation of the Proposed Action is expected to result in less impacts to water resources than those described in the PAPA EIS. Some have suggested that winter drilling will result in exacerbated water quality degradation from runoff. It is important to recognize that winter drilling is currently allowed over much of the PAPA – it is excluded only within big game winter ranges and sage-grouse breeding and nesting habitats. The PAPA ROD contains specific mitigation guidelines and standard practices to protect surface and ground water. Those practices will be applied to development activities within ASU's selected sections regardless of the time of year that development occurs. The reduced additional disturbance in the selected sections (54.8 acres rather than 105.1 acres) would reduce the potential for water quality degradation.

4.9.2 No Action Alternative

Under this alternative, water resource impacts described in the PAPA EIS from drilling and completion would continue.

4.9.3 Cumulative Impacts

Within the PAPA, implementation of the Proposed Action would result in less cumulative impacts to water resources than described in the PAPA EIS because there would be less disturbance.

4.9.4 PAPA ROD Consistency

The PAPA ROD contains specific mitigation guidelines and standard practices to protect surface and ground water. By implementing these practices, ASU's Proposed Action and alternatives would be consistent with water resource protection COAs found in the PAPA ROD.

4.10 Soils

4.10.1 Proposed Action

Impacts to soils from development activities in the PAPA are described in Section 4.14 of the EIS. There has been some concern that drilling in the winter could exacerbate soils damage because of winter activities and traffic. It is important to recognize that winter drilling is currently allowed over much of the PAPA – it is excluded only on big game crucial winter ranges and in sage-grouse breeding and nesting habitats. The PAPA ROD contains specific mitigation guidelines and standard practices to protect soils. Those practices would be applied to activities associated with the Demonstration Project regardless of the time of year that development occurs.

Overall, it is anticipated that implementation of the Proposed Action would result in less soil disturbance (approximately 48 percent) than the No Action Alternative or continued development allowed under the PAPA ROD with pad drilling. To complete lease development using the demonstration development, a total of an additional 54.8 acres of soil disturbance would be required. Continued development under the PAPA ROD would require an additional 105.1 acres of soil disturbance for ASU to develop their leases in the selected sections. However, only 24.1 acres of new soil disturbance would be required during the winter 2005-2006 (see Table 4-1).

The potential impacts to soil resources would be same as those described in the PAPA EIS. According to the PAPA ROD, ASU would be required to follow measures in their Erosion Control Revegetation and Restoration Plan (ERRP). The ERRP would address the measures that ASU would apply to meet the zero runoff standard (including measures required due to elimination of the reserve pit on Shell's pad) as well as other measures described in Section A-5 of the PAPA ROD, BLM, 2000b). The ERRP would also address issues which are particular to winter drilling and operation in the "mud season" (including snow management) which could increase the likelihood of erosion and sedimentation.

Furthermore, when soils are wet, saturated or frozen, fluid spills (i.e., fuels, oil, hydraulic fluid, etc.) have the potential to migrate further from their source than under dry conditions. ASU would follow their Spill Prevention, Control and Countermeasure Plan (SPCC) which addresses the potential for spills and the measures or Best Management Practices that would be implemented in the event a spill occurs.

ASU would use a new habitat seed mixture of grasses, shrubs, and forbs, which is listed in Section 4.11 (Table 4-1) to speed the recovery time to stabilize soils and restore soil productivity. The habitat mixture has been used on adjacent leases and has shown positive results for shrub and forb growth.

4.10.2 No Action Alternative

Under this alternative, soil impacts described in the PAPA EIS from drilling and completion would continue. Soil disturbance and potential impacts would be greater than those described for the Proposed Action because 50.3 additional acres (see Table 4-1 and Figure 2-3) would be required to fully develop the leases in the selected sections.

4.10.3 Cumulative Impacts

Under the No Action Alternative, cumulative impacts within the PAPA would be similar to those described in the PAPA EIS. However, implementation of the Proposed Action would result in less cumulative impact to soils than described in the PAPA EIS because disturbance necessary to complete development of ASU's leases in the selected sections would be reduced.

4.10.4 PAPA ROD Consistency

The PAPA ROD contains specific mitigation guidelines and standard practices to protect soils and provide for proper reclamation regardless of the alternative selected by BLM.

4.11 Vegetation and Noxious Weeds

4.11.1 Proposed Action

Impacts from field development on vegetation are described in Section 4.15 of the PAPA EIS (BLM, 2000a).

The Demonstration Project would disturb approximately 24.1 acres of vegetation, primarily within Wyoming big sagebrush – mixed grassland steppe, of which 13.1 acres would be affected by Anschutz and 11.0 additional acres by Ultra. Shell is proposing to use an existing well pad and road; therefore no additional vegetation would be affected. Impacts to vegetation would include removal of native vegetation during construction or expansion of well pads and construction of a 0.3 mile road. To minimize impacts associated with habitat loss, ASU would reseed disturbed areas near and at the proposed project sites using a new habitat seed mixture of grasses, shrubs, and forbs (Table 4-2). This combination will provide more forbs and shrubs which are beneficial for wildlife forage and habitat. In addition, Shell planted grass on topsoil piles to provide more temporary forage and stabilize the topsoil and has overseeded certain

reclaimed areas with the habitat mixture to improve the shrub and forbs growth. Previous seeding on other leases nearby that have used this seed mixture during reclamation activities and reseeding formerly reclaimed areas has shown positive results for shrub and forbs growth. Although this seed mixture is expected to benefit wildlife through habitat improvement, it will provide less forage for livestock compared to the seed mixtures suggested in the PAPA EIS (BLM 1999a). All species in the mixture are native to Sublette County, Wyoming (Dorn, 1992).

**Table 4-2
Plant Species Included in Pilot Habitat Seed Mixture**

Plant Species	Percent of Seed Mixture	Justification
Rimrock Indian Ricegrass	4.68	Good winter forage for wildlife; drought tolerant
Four-winged Saltbush	0.86	Valuable winter browse for big game; attracts insects
Scarlet Globemallow	0.50	Excellent forage for deer and pronghorn
Sandberg Bluegrass	30.71	Good for cattle; fair for sheep, deer, and pronghorn in spring and early summer
Lupine (<i>L. polyphyllus</i> , Robinson)	0.43	Sage-grouse food source; habitat for insects; adds soil nitrogen
Winterfat	1.88	Good winter forage for wildlife
White North American Yarrow	4.60	Sage-grouse food source; attracts insects; adapted to a wide range of soils at disturbed sites
Little-Flowered Penstemon	7.30	Fair forage for mule deer
Wyoming Big Sagebrush	41.50	Excellent habitat for sage-grouse; winter browse for big game
Fringed Sagewort	7.53	Transitional food for juvenile sage-grouse

Invasive, noxious weed species could become established in disturbed areas if seeds or regenerative plant parts of noxious species are transported naturally or accidentally to the disturbed areas. All disturbed areas would, however, be reclaimed and revegetated within one growing season after construction is complete. Grasses and forbs could require two to three years for successful re-establishment (70 percent cover) in the area's arid environment (Barker et al., 1985). Sagebrush, the predominant shrub within the project area, may require more than 20 years for recovery to pre-disturbance levels after reseeding and reclamation activities begin (Knight, 1994).

The Demonstration Project would reduce overall vegetation disturbance by 48 percent (see Table 4-2) over their current development under the PAPA ROD with pad drilling, ultimately benefiting wildlife and livestock.

4.11.2 No Action Alternative

Under this alternative, development would continue under the PAPA ROD (with pad drilling) and winter stipulations would apply (BLM, 2000b). Vegetation disturbance in the lease area would be greater than under the Proposed Action because more well pads and roads would be constructed in order for ASU to recover remaining reserves in their leases. Additional vegetation disturbance expected with this alternative would be 105.1 acres or 48 percent more than the Proposed Action (see Table 4-2).

4.11.3 Cumulative Impacts

Implementation of the Proposed Action would reduce cumulative impacts to vegetation when compared to ASU's current development under the PAPA ROD with pad drilling necessary to complete development of their lease acreage within selected sections.

Weedy species often thrive on disturbed sites and out-compete more desirable plant species, rendering a site less productive as a source of forage for wildlife and livestock. Although some weed infestation may be anticipated, the application of the new habitat seed mixture would minimize impacts from weed species.

4.11.4 PAPA ROD Consistency

The PAPA ROD (BLM, 2000b) contains a number of specific mitigation guidelines and standard practices to ensure proper reclamation. Surface disturbance would be kept to a minimum. Erodible or hard to revegetate soils would not be disturbed more than necessary.

ASU, in cooperation with BLM, would monitor revegetation efforts after the second and fourth growing seasons to evaluate reclamation success. The need to seed, fertilize, or spot treat will be determined. Successful revegetation will be based on the ability of vegetation to stabilize reclaimed sites and to provide wildlife and livestock forage. Revegetation and restoration plans may need to be altered if reseeding efforts are determined necessary.

If invasive or non-native species infest disturbed sites, they would be controlled by mechanical, chemical, biological, or other methods which are approved by BLM and the local weed control agency, in accordance with Executive Order 13112.

Vehicular traffic would be limited to the running surface of roads and well pads as authorized in APDs. This is required to prevent undue impacts to vegetation and avoid soil compaction.

4.12 Wetland and Riparian Resources

4.12.1 Proposed Action

The Demonstration Project would not impact wetlands or riparian areas. However, access to the Demonstration Project would necessitate access through riparian areas associated with the New Fork River including U.S. Highway 189, U.S. Highway 191, State Highway 351, and Paradise Road. Implementation of the Proposed Action would not require any of the access routes to be widened or otherwise improved, including portions through wetlands and riparian zones. Therefore, no disturbance or impact to these areas from the Proposed Action is expected.

4.12.2 No Action Alternative

No loss of wetlands, wetland function, riparian areas or riparian functionality would occur under the No Action Alternative.

4.12.3 Cumulative Impacts

Implementation of the Proposed Action and alternatives would result in the same cumulative impacts described in the PAPA EIS.

4.12.4 PAPA ROD Consistency

Implementation of the Proposed Action would not affect the consistency of the PAPA ROD because impacts to wetlands, wetland function, riparian areas or riparian functionality would not occur under any of the alternatives.

4.13 Threatened and Endangered Species

Effects to listed threatened and endangered species and special status species by natural gas development on the PAPA were addressed in Section 4.18 of the PAPA EIS. The listed species considered in this EA include most of those that were addressed in the PAPA EIS (black-footed

ferret, bald eagle, Ute ladies'-tresses, four species of Colorado River fish) as well as Kendall Warm Springs dace, gray wolf, grizzly bear, and Canada lynx. Currently, yellow-billed cuckoo is a candidate species, greater sage-grouse and pygmy rabbits are classified as sensitive species. Other special status species that were addressed in the PAPA EIS are also considered here.

4.13.1 Proposed Action

Effects to listed species and special status species by the various components of the Proposed Action are addressed if there is some potential for effect, either adverse or beneficial. There are some components of the Proposed Action that can be addressed including winter drilling, well pad density, access roads, bussing crews to and from winter drilling sites, general traffic access, access gates, public awareness/outreach, and crew/contractor awareness. Other components, including the interim reclamation pilot project, and continuation of pronghorn and sage-grouse research either don't apply to listed and special status species or effects can not be evaluated without specific information on location and nature of the component.

The PAPA EIS anticipated up to 16 well pads per square mile in MA 5. If the Proposed Action is implemented, the well pad density on each of the proponent's total lease area would be less than that. Within each of the three Sections analyzed in this EA, the total surface disturbance required to construct a new road and pad (13.1 acres for the Anschutz Mesa 10-35 pad and access road) and expansion of existing pads (11.0 acres for the Ultra Mesa 7-34 pad, no new disturbance at the Shell Mesa 7-29 pad) would amount to 24.1 acres prior to winter 2005-2006. If Shell develops the additional pad and access road on their lease in Section 29, and if Ultra expands two existing pads, an additional 30.7 acres would be disturbed though not during winter 2005-06, the period analyzed in this EA.

Though not measurable, reduced surface disturbance translates as reduced direct impacts to habitats potentially used by some of the threatened, endangered, and special status species discussed in this section.

4.13.1.1 Federally Listed Species

Black-footed Ferret. There would be no adverse effects to black-footed ferrets by the Demonstration Project. There are no white-tailed prairie dog colonies that would be directly affected at any of the proposed well pad sites or access road rights-of-way. ASU operators and BLM would comply with requirements identified by the FWS's concurrence with BLM's determination for the PAPA EIS that project activities were not likely to adversely affect black-footed ferrets. That concurrence was based on mitigative measures provided in the PAPA EIS ROD including:

- Examining construction sites prior to surface disturbance for presence of prairie dog colonies;
- Avoid disturbance to prairie dog colonies that meet criteria as suitable habitat for black-footed ferrets;
- If colonies can not be avoided, conduct surveys for black-footed ferrets; and
- If black-footed ferrets or sign are detected during surveys, all actions that may affect black-footed ferrets will be stopped immediately and Section 7 review will be re-initiated with FWS.

ASU believes that winter drilling would allow them to complete their development in the selected section in less time than continued development under the PAPA ROD (with pad drilling). That consequence of the Proposed Action would be a long-term benefit to all wildlife because future traffic volumes on the PAPA would be substantially reduced. Vehicles have killed black-footed ferrets (records in Kinter and Martin, 1992). The North Anticline Road, used by ASU and other

operators, is within 0.5 mile of white-tailed prairie dog colonies that have not been exempted by FWS (Township 31 North, Range 109 West) from recommended surveys for black-footed ferrets (FWS, 2004) and, until surveys have been conducted, remain as potential habitat for black-footed ferrets. However, there is no evidence to suggest ferrets are or have been present in those colonies.

If black-footed ferrets are present in the vicinity of the Demonstration Project, there would be some risk of vehicle-related mortality associated with the Proposed Action because winter traffic that would otherwise be absent, would be ongoing during winter 2005-2006. The ASU proposal to transport workers to drilling sites by bus during winter would increase winter traffic. However, transporting workers to drilling sites by bus during winter would generate less traffic than would occur without busing workers. The risk of vehicle mortality or other sources harm to black-footed ferrets by the Demonstration Project is extremely minute, probably non-existent.

Kendall Warm Springs Dace. This species is limited to habitat in the Bridger-Teton National Forest approximately 30 miles north of Pinedale and would not be affected by the Demonstration Project.

Bald Eagle. Following their review of PAPA EIS, FWS concurred with BLM's determination that project activities were not likely to adversely affect bald eagles. That concurrence was based on mitigative measures provided in the PAPA EIS ROD including:

- No surface disturbing activities will occur within 1 mile of bald eagle winter use areas between November 15 and March 15;
- No surface disturbing activities (construction of roads, pipelines, well pads, drilling, completions, workovers) will occur within 1 mile of an active bald eagle nest between February 15 and August 15;
- No permanent structure will be places within 2,600 feet from and out of direct line of sight to an active bald eagle nest;
- Wells placed closer than 2,600 feet (but not within 2,000 feet) of an active nest will be out of direct line of sight and will have no human activity from February 15 to August 15;
- Central production facilities will be at least 2,600 feet from an active bald eagle nest; and
- Prior to initiating surface disturbances during nesting and wintering periods, surveys for bald eagles will be conducted. New roads that may adversely affect bald eagles will require re-initiation of Section 7 consultation with FWS.

The closest bald eagle nest to any of the Demonstration Project well pads that are proposed for winter drilling is approximately 3.2 miles away (Table 4-3). The Proposed Action (winter drilling) would not affect nesting bald eagles. Likewise, the closest well pad proposed for year-round drilling to forest-dominated riparian habitat (New Fork River) that might be utilized by wintering bald eagles is 1.6 miles (Table 4-3). With that distance, wintering and/or migrating bald eagles that might utilize riparian habitat along the New Fork River as winter communal roosts would not be affected by the Proposed Action.

**Table 4-3
Distances (miles) From Demonstration Project Components
To The Closest Bald Eagle Habitat Feature**

ASU Operator, Well Pad, Section	From ASU Pad		From ASU Lease Section	
	Nest	Winter Habitat	Nest	Winter Habitat
Anschutz - Mesa 10-35	3.2	1.6	2.9	1.2
Shell - Mesa 7-29	6.3	4.0	6.1	3.2
Ultra - Mesa 7-34	4.3	2.3	3.9	1.6

The southern terminus of the North Anticline Road (at the intersection with Paradise Road) is approximately 0.6 mile from forest-dominated riparian habitat and Paradise Road passes through forest-dominated riparian habitat before intersecting U.S. Highway 191. Traffic on Paradise Road is also within 2.5 miles of a bald eagle nest that has been active and has successfully produced young during natural gas development on the PAPA. Winter well-field traffic (November 1 through April 1) to and from the PAPA has been occurring through and adjacent to those riparian habitat areas potentially used by wintering and/or migrating bald eagles and the bald eagle nest site since 2000.

Though there are no records of bald eagles killed on either road, bald eagles have been killed by vehicles in the general area during winter and at other times as they feed on roadside carrion (FWS, 1999). Some level of risk by winter traffic that would otherwise be absent with no winter drilling may occur. ASU's proposal to transport workers to drilling sites by bus during winter would increase winter traffic but traffic would be less than expected if busing workers was not implemented.

Grizzly Bear. Suitable habitat is not present within the PAPA and grizzly bears are not likely to occur in the area. Further, WGFD's policy is to limit grizzly bear occurrence outside of the occupancy area boundary established in the Wyoming Grizzly Bear Management Plan which includes the PAPA. The Proposed Action, including winter drilling would have no effect on grizzly bears.

Canada Lynx. Absence of montane, forested habitat in the PAPA precludes Canada lynx from occurring within the vicinity of the Proposed Action. The Proposed Action, including winter drilling, would have no effect on Canada lynx.

Ute Ladies'-tresses. This species has not been detected within the PAPA and available information indicates it is not present. Further, there are no records of this species' presence in southwest Wyoming. The Proposed Action, including winter drilling, would have no effect on Ute ladies'-tresses.

Gray Wolf. Though occupied ranges of wolves introduced to YNP has expanded to include the region north and east of the PAPA, their presence in the PAPA is not expected. Wolves tend to avoid areas where human-related activities occur (Paradiso and Nowak, 1982) although they have preyed on domestic livestock as well as elk at winter feedgrounds in the region. Wolves depredating on livestock in the project area would likely be subject to control actions (FWS *et al.*, 2004).

The Wyoming Brucellosis Task Force recommended thorough evaluations of future alternatives to elk feedgrounds with the objective to eradicate transmission of brucellosis. Whether feedgrounds within the Pinedale Herd Unit or others in the region would be closed in the future is currently undetermined. Closure though, would likely disperse wintering elk, potentially including the PAPA. Wolves might similarly disperse, following pursuing if they winter on the PAPA. There is a remote possibility too that wolves might prey on mule deer or pronghorn wintering on the PAPA. Whether any wolf would pursue elk or other big game wintering on the PAPA is impossible to predict. The Proposed Action, including winter drilling, would have no effect on gray wolves.

Colorado River Fish. FWS has determined that any withdrawal of water from the Colorado River System will jeopardize the following listed species: Colorado pikeminnow, humpback chub, bonytail, and razorback sucker. BLM would enter into formal consultation with FWS if, based on monitoring and reporting, water use and depletions from the Colorado River System were determined as a result of the Proposed Action. Water use and depletion includes

evaporative loss and consumption of surface and groundwater within the Green River Basin (FWS, 2005).

4.13.2 Candidate and Other Special Status Species.

Yellow-billed Cuckoo. This species does not occur within the PAPA. The Proposed Action would have no effect on yellow-billed cuckoos.

Greater Sage-Grouse. Effects of the Proposed Action on this game species are addressed in Section 4.14.1.2 - Upland Game Birds.

Pygmy Rabbit. Pygmy rabbits inhabit the PAPA. They are active during winter, feeding almost entirely on sagebrush (Green and Flinders, 1980) and apparently have small home ranges (Green and Flinders, 1979). Consequently, pygmy rabbits that might occupy sagebrush habitats proximate to well pads that have been subject to seasonal drilling stipulations would be exposed to the same disturbance sources if drilling continued year-round. There is no information to indicate how the species responds to winter drilling but there is no reason to expect different behavioral response or diminished habitat function than already occurs with seasonal drilling stipulations applied. However, ASU believes that winter drilling would allow them to fully develop their leases in less time, with less surface disturbance, and ultimately less fragmentation and edge creation in sagebrush stands than with continued development under the PAPA ROD. Decreased fragmentation would be beneficial to pygmy rabbits.

Vehicles have killed pygmy rabbits on the PAPA. If rabbits are present in the vicinity of the Demonstration Project, there would be some risk of vehicle-related mortality associated with the Proposed Action since winter traffic that would otherwise be absent, would be ongoing during winter 2005-2006. The ASU proposal to transport workers to drilling sites by bus during winter would increase winter traffic. However, transporting workers to drilling sites by bus during winter would generate less traffic than would occur without busing workers. The risk of vehicle mortality or other sources harm to pygmy rabbits by the Demonstration Project is unknown.

Other Special Status Wildlife Species. The Proposed Action is not likely to jeopardize the status of sensitive wildlife species. Disturbance of sagebrush-grasslands may reduce potential habitat for the various sensitive sagebrush-obligate species but adverse effects to populations (increased mortality, decreased recruitment) are not expected to impact long-billed curlew, sage thrasher, loggerhead shrike, Brewers sparrow, and sage sparrow. Documented presence of mountain plovers and burrowing owls within the Project Area is unavailable. On-site survey results for both species are needed before impact and/or appropriate mitigation can be evaluated.

Season restrictions applied to activities near raptor nests in the Project Area are not included in ASU's Proposed Action. The following temporal and spatial restrictions near active raptor nest sites (including bald eagle nests), communal roosts, and foraging habitats would continue to be imposed by BLM:

- February 1 through July 31 within ½ mile of all active raptor nests;
- February 1 through July 31 within 1 mile of all active ferruginous hawk nests;
- February 1 through August 15 within 1 mile of all active bald eagle nests;
- November 1 through April 1 within 1 mile of active bald eagle communal winter roosts; and
- November 1 through April 1 within 2 ½ miles of a bald eagle nest and within 1 mile of winter forage use areas (essentially streambanks along the New Fork and Green rivers).

Special Status Plant Species. Suitable habitat for BLM sensitive plant species would be identified prior to construction and surveys to locate sensitive plant populations will be conducted so that they can be avoided during construction or otherwise conserved. However, special status plant species including Cedar Rim thistle, large-fruited bladderpod, beaver rim phlox, and tufted twinpod are not expected in the vicinity of this Proposed Action.

4.13.3 No Action Alternative

Effects to listed species and special status species by the Demonstration Project under the No Action Alternative would be the same as those analyzed in the PAPA EIS. Under this alternative, none of the potential benefits to listed and special status species that are expected from the Proposed Action would occur. The No Action Alternative would require an additional estimated 50.3 acres of surface disturbance due to well pad and road construction within Wyoming big sagebrush – mixed grassland steppe. However, some vehicular traffic during winter would be reduced by implementing the No Action Alternative because winter drilling would not occur.

4.13.4 Cumulative Impacts

Implementation of the Demonstration Project and No Action Alternative would not result in major changes to the cumulative impacts described for threatened and endangered species and special status species in the PAPA EIS. Surface disturbance by well pads and roads totaling 76.7 acres within the three sections leased by the ASU operators has already occurred. Under the Proposed Action (24.1 acres) and additional required pads and roads (30.7 acres), a total of 131.5 acres would be disturbed while 105.1 acres would be affected under the No Action Alternative (total of 181.8 acres), mostly within Wyoming big sagebrush – mixed grassland steppe. Because the No Action Alternative is based on development levels analyzed in the PAPA EIS, the amount of surface disturbance resulting from the Demonstration Project would generate less cumulative impact than permitted under the ROD (BLM, 2000b).

4.13.5 PAPA ROD Consistency

The PAPA ROD contains specific mitigation guidelines and standard practices to protect threatened and endangered species and special status species. There are specific measures carried forward from the PAPA EIS to the ROD that provide protection to bald eagles, black-footed ferrets, and endangered Colorado River fish species. At the time the ROD was published, mountain plovers were proposed for listing as threatened and mitigation measures to protect the species were specified. But, that proposed status was withdrawn in 2003 (FWS, 2003a). In the ROD, BLM states that all actions to be implemented by the ROD would be in compliance with the ESA. Further, with any changes to the scope of the Pinedale Anticline Project analyzed in the PAPA EIS that could affect listed, candidate, or migratory bird species or their habitat differently than disclosed, BLM would re-initiate Section 7 consultation under ESA and any measures resulting from consultation would be implemented by the operators. The ASU Proposed Action is consistent with the PAPA ROD.

4.14 Wildlife and Aquatic Resources

4.14.1 Proposed Action

The PAPA EIS anticipated up to 16 well pads per square mile in MA 5. If the Proposed Action is implemented, the well pad density on each of the proponent's total lease area would be less than that. Within each the three selected sections analyzed in this EA, the total surface disturbance required to construct a new road and pad (13.1 acres for the Anschutz Mesa 10-35 pad and access road) and expansion of an existing pad (11.0 acres for the Ultra Mesa 7-34 pad, no new disturbance at the Shell Mesa 7-29 pad) would amount to 24.1 acres prior to winter

2005-2006. If Shell develops the additional pad and access road on their lease in Section 29, and if Ultra expands two existing pads, an additional 30.7 acres would be disturbed though not during winter 2005-06, the period analyzed in this EA.

ASU has agreed to bus workers to drill sites. Another important aspect of the Proposed Action is ASU's plan to accelerate development of their lease area. Under the Proposed Action, the estimated development time would decrease. This would potentially benefit wildlife by concentrating disturbance-related activities within a much shorter time frame. There additional components of the Proposed Action as applicant-committed mitigation measures that are expected to reduce impact to wildlife during winter 2005-2006. Those measures include general traffic access control, installation of access gates, and development of public awareness/outreach and crew/contractor awareness programs.

ASU's commitment to fund monitoring and/or research that would lead to enhancement of wildlife habitats (i.e., the interim reclamation pilot project), research that may lead to understanding impact and approaches to effective mitigation (continuation of pronghorn and sage-grouse research) are other potential long-term benefits of the Proposed Action.

4.14.1.1 Big Game

Mule Deer. A portion of the Demonstration Project (Shell Mesa 7-29) is within the southern boundary of crucial winter range used by mule deer in the Sublette Herd Unit. Analyses of over-winter fawn mortality indicate that fawn deaths on crucial winter ranges increase with increasing winter snowfall, decreasing precipitation during two previous years, and decreasing temperatures in November, generally the start of winter in the region (Wildlife Technical Report, Appendix C). Data have not indicated that natural gas developments on the PAPA have influenced fawn over-winter mortality; a principal component of population growth. Nevertheless, research has revealed a significant decline in the wintering mule population on the Mesa where crucial winter range has been affected by natural gas developments (Sawyer *et al.*, 2005).

Winter drilling on mule deer crucial winter range has been ongoing on State Section 16 (Township 32 North, Range 109 West). Additional limited winter drilling of single wells by Questar was exempted from seasonal stipulations by BLM in the winters of 2002-03 and 2003-04. In winter 2004-2005, mule deer were exposed to more extensive winter drilling resulting from approval of Questar's Year-Round Drilling Proposal (BLM, 2004a). Since 2001, mule deer had also been exposed to activities associated with producing wells during winter (tanker truck traffic hauling condensate and produced water and traffic by operators traveling to producing wells) since 2001.

Drilling multiple wells on a single pad produces a localized disturbance (noise, night-lighting, engine exhausts, workers present all day and night winter-long) that will be added to truck traffic hauling produced water and condensate and operator attendance at other, producing well pads, during winter. Under the Proposed Action, three well pads would be drilled from multiple rigs on each pad throughout the winter.

Phase II of the Sublette Mule Deer Study (Sawyer *et al.*, 2003) has been in progress since 2000, continuing as development progressed following publication of the ROD. Available information (Sawyer *et al.*, 2004) indicates that the presence of well pads, which to date have been focal points of human activities during winter, is likely to have the greatest influence on wintering mule deer habitat use and distribution on the Mesa. Even though winter stipulations have mostly been in effect until recently on most of the Mesa (Questar's recent approved action and State Section 16 are exceptions), producing well pads that were cleared and drilled before November 15 of any year must be attended throughout the winter by trucks hauling condensate

and produced water as well as by operators' maintenance actions. Study results to date indicate that these continuing activities during winter are responsible for significant decrease in the population wintering on the Mesa. The function of that crucial winter range – providing the determining factors in a population's ability to maintain itself over the long term (WGFD, 2004b) – has been diminished. That impact is expected to continue with the Proposed Action.

There are no records of mule deer killed on access roads to ASU's leases although they have been killed in higher numbers than pronghorn on all segments of U.S. Highway 191 that parallel the PAPA, especially during winter. Implementation of ASU's Proposed Action would result in additional winter traffic in the PAPA. However, ASU's proposal to transport workers to drilling sites by bus during winter would minimize this additional winter traffic.

Pronghorn. Two components of the Demonstration Project (Anschutz Mesa 10-35 and Ultra Mesa 7-34) are within crucial winter range used by pronghorn antelope in the Sublette Herd Unit. Also, the North Anticline Road and Paradise Road pass through crucial winter range. Both roads would be used to access all components of the Demonstration Project and have been used to access other wells and leases on the Mesa during past winters.

Winter drilling on pronghorn crucial winter range has been ongoing on State Section 36 (Township 32 North, Range 109 West). Until recently, pronghorns on crucial winter ranges within the PAPA have been exposed to limited winter drilling of single wells exempted from seasonal stipulations in addition to winter drilling on State Section 36. They have also been exposed since 2001 to activities associated with producing wells during winter, namely tanker truck traffic hauling condensate and produced water as well as operator traffic traveling to producing wells. During the same period, WGFD has estimated the herd unit population increased (though not in 2004) although fawn production had been decreasing. Those observations suggest that mortality in the herd unit is low, especially fawn over-winter mortality.

The Proposed Action could adversely affect wintering pronghorn by the same mechanisms that were described in the PAPA EIS; by causing increased energy expenditures during escape through snow from development activities in winter and/or displacement to alternate habitats that could be less capable of providing adequate over-winter function for pronghorns. Displacement with concomitant decreased function of crucial winter range may be similar to effects documented and discussed above for mule deer.

If over-winter mortality of pronghorns has indeed been low as hypothesized, pronghorns migrating to and wintering on the PAPA have not been adversely affected by natural gas developments so far, at least to the extent that survival of animals in the Sublette Herd Unit has affected population growth. Continuing research on pronghorn movements, habitat use, and responses to habitat alterations and disturbances including natural gas developments on the PAPA (Berger *et al.*, 2004) is expected to reveal effects of developments on pronghorn population phenomena such as survival, migration, and fecundity.

Though there are no records of pronghorns killed on access roads to ASU's leases although they have been killed by vehicles elsewhere on the PAPA (U.S. Highway 191 in the vicinity of the Trapper's Point migration bottleneck) but mostly during summer and early fall. Implementation of ASU's Proposed Action will result in additional winter traffic in the PAPA. However, ASU's proposal to transport workers to drilling sites by bus during winter will minimize this additional winter traffic.

Moose. Moose utilize crucial winter-yearlong range within the riparian zone of the New Fork River. Although none of the Demonstration Project components are within habitats expected to be occupied by winter moose, Paradise Road passes through crucial winter-yearlong range. That road would be used to access all components of the Demonstration Project and has been

used to access other wells and leases on the Mesa during past winters. Implementation of ASU's Proposed Action would result in additional winter traffic on Paradise Road. However, ASU's proposal to transport workers to drilling sites by bus during winter would minimize additional winter traffic.

4.14.1.2 Upland Game Birds

Greater Sage-Grouse. Relative abundance of sage-grouse has been declining in the region that includes the PAPA as they have been throughout western North America (Braun, 1998). Counts of male sage-grouse attending leks on the PAPA declined from 1999 to 2004. Available data indicates that male counts on leks within 2 miles of a drilling rig declined by an average of 32 percent annually while counts on leks within 0.3 mile of a road declined at an average annual rate of 19 percent. Annual counts of males attending leks farther than 4 miles from well-field activities declined by an average of only 2 percent annually (Holloran and Anderson, 2004). Further, rates of decrease for numbers of males attending leks proximate to roads were positively correlated with traffic volume (Holloran and Anderson, 2004); more traffic presumably led to lower lek attendance. The habitat function associated with those leks – providing for reproduction – was diminished by disturbances.

Sage-grouse nesting habitat in dense sagebrush stands, in combination with presence of residual grass cover, contributes positively to nesting success (Heath *et al.*, 1997 and Holloran *et al.*, 2004). Presence of tall, dense grass cover in spring (residual cover from the previous years' growth) was found to increase the chance of nest success (Holloran *et al.*, 2004). But sage-grouse hens that mate on leks disturbed by natural gas development (within approximately 1.9 miles from well pads or roads) nested significantly farther away from the lek than hens mating on undisturbed leks. Additionally, hens from disturbed leks initiated nesting significantly less while selecting sites with greater sagebrush cover compared to hens bred on undisturbed leks (Lyon, 2000 and Lyon and Anderson, 2003). The habitat function for nesting sage-grouse proximate to disturbed those leks was diminished by disturbances.

Winter drilling would occur while sage-grouse attend leks and select nest sites on the PAPA. There are 2 leks on the PAPA that are within 1.9 miles from wells proposed under the Demonstration Project. Recent research conducted on the PAPA strongly suggests that both leks have already been significantly impacted by natural gas development and impact to nesting sage-grouse has occurred as well. Fragmentation of previously continuous habitats has been ongoing, coinciding with declining use of impacted leks. Winter drilling may exacerbate those impacts, most likely through processes associated with the presence of drill rigs and noise that would otherwise be absent with application of seasonal stipulations. However, overall surface disturbance by the Proposed Action will be less than predicted under the No Action Alternative and that is expected to reduce impact to nesting sage-grouse in the Project Area. ASU's commitment to fund research may lead to understanding impact and approaches to effective mitigation for sage-grouse.

Wintering sage-grouse have been documented in the vicinity of the Demonstration Project during 2002 and 2003 while tanker trucks had been hauling condensate and operators had been accessing production pads in winter. There is no information about sage-grouse response to roads during winter and certainly none on the effects of drilling during winter. By bussing work crews to drill sites during winter, between 8 am and 8 pm, ASU would minimize traffic effects that could be more substantial if bussing does not occur.

4.14.1.3 Migratory Birds

Raptors. BLM would impose buffers around active raptor nest sites to prevent disturbance. No surface disturbing activities would be permitted within 0.5 mile of active raptor nests and within 1

mile of an active ferruginous hawk nest (active nests are defined as those occupied within the past 3 years) during the period from February 1 through July 31. Exclusion dates and buffer distances may be adjusted based on site-specific conditions. Consequently, no impacts to nesting raptors are anticipated.

Other Neotropical Migratory Birds. Loss of sagebrush-steppe and increasing levels of fragmentation in remaining sagebrush-dominated habitats have become concerns since there have been concomitant declines of sagebrush-dependent migratory passerine bird species (Knick and Rotenberry, 1995; Knick *et al.*, 2003). A study on the effects of well field roads on densities of Brewer's sparrow and sage sparrow as well as other species dependent on sagebrush for nesting habitat found that those species' densities were markedly reduced within 300 feet of a road compared to densities beyond that distance (Ingelfinger, 2001). Disturbance by vehicular traffic accounted for some of the reduced density effects while the presence of an edge (change in vegetative type) in otherwise continuous stands of sagebrush may have had an influence; a similar reduction in sage sparrow density was also observed along a pipeline alignment (Ingelfinger, 2001).

In the region including the proposed demonstration project, horned lark abundance appears to be relatively constant but recent trends in sage thrasher abundance indicate they may be decreasing in the region. Other sagebrush-dependent species that were affected by roads on and near the PAPA have recent trends that indicate their abundance is relatively constant in the region (Brewer's sparrow, vesper sparrow) or slightly increasing (sage sparrow).

Within each of the three selected sections affected by the Proposed Action, the total surface disturbance required to construct a new road and pad (13.1 acres for the Anschutz Mesa 10-35 pad and access road) and expansion of existing pads (11.0 acres for the Ultra Mesa 7-34 pad, no new disturbance at the Shell Mesa 7-29 pad) would amount to 24.1 acres prior to winter 2005-06. If Shell develops the additional pad and access road on their lease in Section 29, and if Ultra expands two existing pads, an additional 30.7 acres would be disturbed though not during winter 2005-2006, the period analyzed in this EA. Though not currently measurable, reduced surface disturbance translates as reduced direct impacts to habitats used for nesting by some neotropical migrants.

4.14.1.4 Aquatic Resources

The Demonstration Project is not expected to adversely affect aquatic resources. The Proposed Action would not require water to be withdrawn from the New Fork River, nor would there be any affect to riparian vegetation associated with the river.

4.14.2 No Action Alternative

Effects to wildlife and aquatic resources by the Demonstration Project under the No Action Alternative would be the same as those analyzed in the PAPA EIS.

Under this alternative, none of the potential benefits to wildlife and aquatic resources that are expected from ASU's proposed mitigation would occur. The No Action alternative would require an additional estimated 105.1 acres of surface disturbance due to well pad and road construction within Wyoming big sagebrush – mixed grassland steppe. However, some vehicular traffic during winter would be reduced by implementing the No Action Alternative because winter drilling would not occur. Finally, the opportunity to gain valuable knowledge about effects on pronghorn and sage-grouse by natural gas developments, and winter drilling in particular, would be lost without continued support for the research and monitoring oriented components of the Proposed Action.

4.14.3 Cumulative Impacts

The Proposed Action would generate a localized, albeit predictable in time and space, source of impact by drilling from multiple rigs on each of 3 well pads during winter. Sources of impact to wildlife that are localized and predictable in time and space would generate fewer adverse effects than sources that are unpredictable in time and space. Consequently, zones of effect surrounding localized, focal points of disturbance are expected to be relatively constant, producing less impact than zones of effect associated with spatially dispersed and temporally unpredictable sources. Similar concepts have been recently advanced by WGFD (2004b) regarding spatial effects to wildlife habitat function beyond direct loss of habitat.

While traffic is spatially localized to some degree, the presence of a vehicle at a specific location and time cannot be predicted by wildlife. Roads with traffic in combination with multiple, widely dispersed focal points of disturbance (producing well pads) are likely to generate more expansive zones of effect to wildlife than drilling at the same location year-round. Winter drilling is expected on Sections 16 and 36 (Township 32North, Range 109 West), owned by the State of Wyoming, with or without implementation of the Proposed Action or any of the Alternatives. Consequently, effects of winter drilling under the Proposed Action would be cumulative to the effects of any winter drilling on Section 16 and Section 36, both of which are within crucial big game winter range and within 2 miles of active sage-grouse leks.

Surface disturbance by well pads and roads totaling 76.7 acres within the three selected sections leased by the ASU operators has already occurred. Under the Proposed Action (24.1 acres) and additional require pads and roads (30.7 acres), a total of 131.5 acres would be disturbed while 105.1 acres would be affected under the No Action Alternative (total of 181.8 acres), mostly within Wyoming big sagebrush – mixed grassland steppe. Because the No Action Alternative is based on development levels analyzed in the PAPA EIS, the amount of surface disturbance resulting from the Demonstration Project would generate less cumulative impact than permitted under the ROD (BLM, 2000b).

4.14.4 PAPA ROD Consistency

The PAPA ROD contains specific mitigation guidelines and standard practices to protect wildlife and aquatic resources. There were specific measures carried forward from the PAPA EIS to the ROD that provided protection to sage-grouse and wintering big game through adherence to the mitigation guidelines and standard practices stipulated in Appendix A of the ROD. Section A-6 of Appendix A does allow for exceptions to wildlife seasonal stipulations following BLM consultation with WGFD.

4.15 Air Quality and Noise

4.15.1 Air Quality

4.15.1.1 Proposed Action

Impacts to air quality from exploration and development in the PAPA are described in Section 4.10 of the PAPA EIS. Under the Demonstration Project, there would be six rigs operating simultaneously from November 15, 2005 through April 30, 2006 in MA 5. The area was designated MA 5 in the PAPA EIS because of big game crucial winter range, sage-grouse nesting and breeding habitat and sensitive viewsheds. The fact that the Demonstration Project is in MA 5 has no relevance to potential air quality impacts and therefore all of ASU's drilling activity within the PAPA (all 18 rigs) is considered.

As described in Chapter 3, ASU currently has 18 rigs operating in the PAPA (11 rigs operated by Ultra and 7 rigs operated by Shell). Shell has applied Tier 1 emissions control technology to

three of the rigs, potentially reducing NO_x emissions in the PAPA by 0.84 tons daily or by 307 tons on an annual basis if all rigs were to operate continuously for one year.

If the Demonstration Project is approved, ASU would be moving 6 of the currently operating 18 rigs in the PAPA to the demonstration pads. Two of Shell's rigs with Tier 1 control technology would be moved to their demonstration pad in Section 29. Shell is committing to further reduce NO_x emissions within the PAPA by demonstrating catalytic aftertreatment technology on those two rigs which would remove an additional 80 percent of NO_x emissions. Anschutz and Ultra are committing to reduce NO_x emissions within the PAPA by demonstrating the use of bi-fuel technology on the four rigs located on their demonstration pads. This would reduce NO_x emissions on those rigs to EPA Tier 2 equivalent levels. Table 4-4 provides estimated NO_x emissions for the Demonstration Project. Table 4-5 provides estimates of NO_x emission for all of ASU's 18 rigs operating in the PAPA (including those 6 to be used for the Demonstration Project with the control technologies). The 12 additional rigs would be operating on ASU's leases within the PAPA but would be located outside of big game crucial winter range or on State or private lands.

**Table 4-4
Proposed NO_x Emissions from ASU-Operated Rigs on Demonstration Pads
During Winter 2005-2006**

Control Technology	NO _x Emission Factor (g/hp-hr)	Estimated Daily NO _x Emissions per rig (tons) ³	No of rigs	Estimated Daily NO _x Emissions(tons)	Estimated Annual NO _x Emissions (tons)
Tier 1 with Catalytic Aftertreatment	1.36 ¹	0.05	2	0.10	36.5
Tier 2	4.1 ²	0.16	4	0.64	233.6
Total			6	0.74	270.1
¹ Tier 1 emission of 6.81 g/hp-hr with 80 percent reduction. ² (EPA, 2005). ³ Assumes average rig horsepower to be 3,500 and average load factor to be 0.42.					

**Table 4-5
Proposed NO_x Emissions from All ASU-Operated Rigs During Winter 2005-2006**

Control Technology	NO _x Emission Factor (g/hp-hr)	Estimated Daily NO _x Emissions per rig (tons) ⁴	No of rigs	Estimated Daily NO _x Emissions(tons)	Estimated Annual NO _x Emissions (tons)
Tier 1 with Catalytic Aftertreatment	1.36 ¹	0.05	2	0.10	36.5
Tier 2	4.1 ²	0.16	4	0.64	233.6
Tier 1	6.81 ²	0.26	1	0.26	94.9
Tier 0	14.07 ³	0.54	11	5.94	2,168.1
Total			18	6.94	2,533.1
¹ Tier 1 emission of 6.81 g/hp-hr with 80 percent reduction. ² (EPA, 2005). ³ (EPA, 1986). ⁴ Assumes average rig horsepower to be 3,500 and average load factor to be 0.42.					

It can be seen from a comparison of Tables 4-4 and 4-5 that estimated NO_x emissions for the Demonstration Project are only 10.7 percent of the total NO_x emissions from ASU operated rigs within the PAPA. Comparing Table 3-13 (Current NO_x Emissions from ASU Operated Rigs) to Table 4-5, shows that there would be a net reduction of 708 tons per year (22 percent) of NO_x emissions for ASU operated rigs within the PAPA as a result of implementing control technologies on those 6 pads included in the Demonstration Project.

ASU is committing to a monitoring program for the emission NO_x reduction technologies that would be demonstrated. ASU plans to monitor emissions from each of the demonstration rigs prior to implementation of the control technologies and then monitor emissions again with the control technologies in place for a determination of actual effectiveness of the control technology.

As part of the Demonstration Project, ASU would not conduct well completions for any of the wells drilled from the demonstration pads until May 1, 2006. In their current operations, ASU has reduced completion flaring by 95 percent by implementing flareless completion methods in compliance with WDEQ Flaring Rules and would continue this practice as a part of the Demonstration Project.

As discussed in Chapter 3 Section 3.16, VOC and HAPs emissions from oil and gas development is typically associated with production operations from wellhead equipment. Because the wells drilled from the demonstration pads would not be completed until after May, 2006, there would be very little production associated with the Demonstration Project. Therefore, there would be very little VOC and HAPs emission associated with the Demonstration Project and those emissions would occur after the well completions between May 1, 2006 and July 31, 2006.

ASU is proposing to bus rig crews from a centralized location to reduce traffic and resulting emissions within the PAPA. ASU currently operates 18 rigs in the PAPA and during the winter 2005-2006 would be operating 6 rigs for the Demonstration Project as well as an additional 12 rigs on either State or private lands or Federal lands outside of big game crucial winter range. Therefore, there would be a net reduction in truck traffic and a moderate reduction in associated PM₁₀ emissions during the Demonstration Project.

4.15.1.2 No Action Alternative

Under this alternative, the benefits to air quality that result from ASU's applicant-committed measures would not occur. The net reduction of 708 tons of NO_x per year resulting from the control technologies would not be realized. Air quality impacts as described in the PAPA EIS as well as additional impacts described in Chapter 3 (Table 3-13) from current development would continue.

4.15.1.3 Cumulative Impacts and PAPA ROD Consistency

The PAPA ROD states the following:

"If activity and corresponding emission assumptions and/or impacts exceed those identified in the Pinedale Anticline EIS (376.59 tons/year of NO_x emission from compressors or 693.5 tons/year NO_x emissions from the combination of construction/drilling, well production, and compression), the BLM, in cooperation and consultation with Wyoming Department of Environmental Quality-Air Quality Division, EPA Region VIII, USDA-Forest Service, and other affected agencies, will undertake additional cumulative air quality environmental review as required by CEQ regulations 40 CFR 1502.9(c)(1)(ii)."

Implementation of the Proposed Action would not increase NO_x emissions from the PAPA above the current levels. The current level of activity within the PAPA has exceeded the level of activity identified in the PAPA EIS. The PAPA EIS air quality analysis assumed that there would be 8 drilling rigs operating in the PAPA at any one time and in the early fall of 2004, there were 32 rigs operating in the PAPA. Currently, there are 34 rigs operating in the PAPA and Table 4-6 provides an estimated summary of proposed NO_x emissions from drilling rigs within the PAPA during winter 2005-2006.

**Table 4-6
Estimated NO_x Emissions from All Rigs During Winter 2005-2006**

Operator	No of rigs	Estimated Daily NO _x Emissions(tons)	Estimated Annual NO _x Emissions (tons)
ASU	18	6.94	2,533
Questar ¹	6	3.24	1,182
Others ¹	10	5.40	1,971
Total			5,686²
¹ Tier 0.			
² Estimates based on EPA emission factors, actual emissions may be less.			

According to the Jonah Infill Drilling EIS (BLM, 2005), potential cumulative visibility impacts from the Jonah project and regional sources were predicted to be above the 1.0 dv (deciview) threshold at the Bridger and Popo Agie Wilderness Area, and at the Wind River Roadless Area. Modeling for the Jonah Infill Drilling Project did account for ASU drilling rigs as well as Questar winter drilling rigs in the analysis.

4.15.2 Noise

4.15.2.1 Proposed Action

As part of the demonstration, 6 rigs would be located within or near noise-sensitive areas (big game crucial winter range). The demonstration project would cause an increase in noise levels within the noise-sensitive area, however, completions would not occur until after May 1, 2006. None of the proposed demonstration pads are located closer than 800 feet to a lek (distance from receptor where noise levels could become significant) (BLM, ;1999a. There are no other noise-sensitive areas which could be potentially impacted by the rigs in the demonstration project.

4.15.2.2 No Action Alternative

Under the No Action Alternative, the 6 rigs proposed for the demonstration project would still operate within the PAPA during winter 2005-2006 but would be located outside of big game crucial winter range. If located on State or private lands, they could be adjacent to other noise-sensitive areas (i.e., ranches along the New Fork and Green rivers).

REFERENCES

- Ayers, L.W., A.F. Reeve, F.G. Lindzey, and S.H. Anderson. 2000. A Preliminary Assessment of Mule Deer Population Dynamics in Wyoming. Wyoming Cooperative Fish and Wildlife Research Unit. Laramie, WY.
- Barker, R.E., L.K. Holzworth, and K.H. Asay. 1985. Genetic resources of wheatgrass and wildrye species native to the rangelands of western North America. *In*: Carlson, J.R., E.D. McArthur, chairmen. Range plant improvement in western North America: Proceedings of a symposium at the annual meeting of the Society for Range Management. Denver, CO. Society for Range Management: 9-13.
- Baxter, G.T., and M.D. Stone. 1980. Amphibians and Reptiles of Wyoming. Wyoming Game and Fish Department, Cheyenne, WY.
- Baxter, G.T., and M.D. Stone. 1995. Fishes of Wyoming. Wyoming Game and Fish Department. Cheyenne, WY.
- Berger, J. K. Berger, and J. Beckmann. 2004. Pronghorn and Natural Gas Fields in the Upper Green – Wyoming. Draft Proposal , The Wildlife Conservation Society, Jackson, WY.
- Braun, C.E. 1998. Sage Grouse Declines in Western North American: What Are the Problems? Proceedings of Annual Conference Western Association of Fish and Wildlife Agencies 78: 139-156.
- Bureau of Land Management. 1986. Draft Resource Management Plan/Environmental Impact Statement for the Pinedale Resource Area. Wyoming State Office. Cheyenne, WY.
- Bureau of Land Management. 1987. Final Proposed Resource Management Plan/Environmental Impact Statement for the Pinedale Resource Area. Pinedale Resource Area, Rock Springs District Office. Rock Springs, WY.
- Bureau of Land Management. 1988. Record of Decision and Resource Management Plan for the Pinedale Resource Area. Rock Springs District. Rock Springs, WY. December.
- Bureau of Land Management. 1995. Draft Environmental Impact Statement Fontenelle Natural Gas Infill Drilling Projects, Sweetwater and Lincoln Counties, Wyoming. Green River Resource Area, Rock Springs District Office. Rock Springs, WY. DES-95-15. April.
- Bureau of Land Management. 1999a. Draft Environmental Impact Statement for the Pinedale Anticline Oil and Gas Exploration and Development Project Sublette County, Wyoming. Pinedale Field Office, Pinedale, WY. DEIS-00-018. November.
- Bureau of Land Management. 1999b. Draft Environmental Impact Statement for the Pinedale Anticline Oil and Gas Exploration and Development: Technical Report. Pinedale Field Office, Pinedale, WY. DEIS-00-018. November.
- Bureau of Land Management. 2000a. Final Environmental Impact Statement for the Pinedale Anticline Oil and Gas Exploration and Development Project Sublette County, Wyoming. Pinedale Field Office, Pinedale, WY. EIS-00-018. May.
- Bureau of Land Management. 2000b. Record of Decision for the Pinedale Anticline Oil and Gas Exploration and Development Project Sublette County, Wyoming. Pinedale Field Office, Pinedale, WY. RODEIS-000-018. July.
- Bureau of Land Management. 2001. Issuance of BLM (Wyoming) Sensitive Species Policy and List. Instruction Memorandum No. USDI-BLM WY-2001-040. Wyoming State Director, Cheyenne, WY.
- Bureau of Land Management. 2004a. Finding of No Significant Impact, Decision Record and Environmental Assessment for the Questar Year-Round Drilling Proposal, Sublette County, Wyoming. Pinedale Field Office, Pinedale, WY. WY-100-EA05-034. November.

- Bureau of Land Management. 2004b. Proposed Revisions to Grazing Regulations for the Public Lands: Final Environmental Impact Statement (FES 04-39). U.S. Department of Interior. Washington, D.C.
- Bureau of Land Management. 2004c. Unpublished GIS shapefile of mapped prairie dog colonies. USDI-BLM, Pinedale Field Office, Pinedale, WY. September.
- Bureau of Land Management. 2004d. Unpublished GIS shapefile of mapped winter sage grouse feces. USDI-BLM, Pinedale Field Office, Pinedale, WY. September.
- Bureau of Land Management. 2005. Jonah Infill Drilling Project Draft Environmental Impact Statement Air Quality Impact Analysis Supplement. Pinedale Field Office, Pinedale WY. DES-05-05. August.
- Call, M.W. 1978. Nesting Habitats and Surveying Techniques for Common Western Raptors. U.S. Department of the Interior, Bureau of Land Management. Technical Note No. 316. 115 pp.
- Caplan, S. 2005. Bureau of Land Management – Physical Scientist. Personal Communication with Golder Associates. August.
- Cerovski, A.O., M. Grenier, B. Oakleaf, L. Van Fleet, and S. Patla. 2004. Atlas of Birds, Mammals, Amphibians, and Reptiles of Wyoming. Wyoming Game and Fish Department, Cheyenne, WY.
- Clause, D. 2005. 2004 Job Completion Report – Sublette Mule Deer. Wyoming Game and Fish Department, Annual Big Game Herd Unit Job Completion Reports. Cheyenne, WY
- Connelly, J.W., S.T. Knick, M.A. Schroeder, and S.J. Stiver. 2004. Conservation Assessment of Greater Sage-Grouse and Sagebrush Habitats. Unpublished report, Western Association of Fish and Wildlife Agencies. Cheyenne, WY.
- Crume, K. 2005. Bureau of Land Management, Pinedale Field Office – Resource Specialist. Written Communication to Golder Associates, Inc. September.
- Dorn, J.L., and R.D. Dorn. 1990. Wyoming Birds. Mountain West Publishing. Cheyenne, WY.
- Dorn, R.D. 1992. Vascular Plants of Wyoming. Second Edition. Mountain West Publishing, Cheyenne, WY.
- Environmental Protection Agency. 1986. AP-42, Section 3.3, Gasoline and Diesel Industrial Engines. Table 3.3-1, "Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines.
- Environmental Protection Agency. 2005. Diesel Net Emissions Standards: USA: Nonroad diesel Engines. Available on line at <http://www.dieselnet.com/standards/us/offroad.html>.
- Fertig, W. 2000. Status Review of the Ute Ladies tresses (*Spiranthes diluvialis*) in Wyoming. Wyoming Natural Diversity Database. Laramie, WY.
- Frost, G. 2005. 2004 Job Completion Report – Sublette Antelope. Wyoming Game and Fish Department, Annual Big Game Herd Unit Job Completion Reports, Cheyenne, WY.
- Green, J.S., and J.T. Flinders. 1980. Habitat and Dietary Relationships of the Pygmy Rabbit. Journal of Range Management 33:136-142.
- Green, J.S., and J.T. Flinders. 1979. Homing by a Pygmy Rabbit. Great Basin Naturalist 39: 88.
- Gurevitch, J., S.M. Scheiner, and G.A. Fox. 2002. The Ecology of Plants. Sinauer Associates, Inc., Publishers. Sunderland, MA.
- Heath, B.J., R. Straw, S.H. Anderson, and J. Lawson. 1997. Sage Grouse Productivity, Survival, and Seasonal Habitat Use Near Farson, Wyoming. Wyoming Game and Fish Department Completion Report. Cheyenne, WY.

- Holloran, M.J., and S.H. Anderson. 2004. Sage-Grouse Response to Natural Gas Field Developments in Northwestern Wyoming. Western Agencies Sage and Columbian Sharp-tailed Grouse Technical Committee Proceedings 24 (abstract only).
- Holloran, M.J., and S.H. Anderson. 2005. Greater Sage-Grouse Response to Natural Gas Field Developments in Western Wyoming: Are Regional Populations Affected by Relatively Localized Disturbances. Transactions 70th North American Wildlife and Natural Resources Conference
- Holloran, M.J., B.J. Heath, A.G. Lyon, S.J. Slater, J.L. Kuipers, and S.H. Anderson. 2004. Greater Sage-Grouse Nesting Habitat Selection and Success in Wyoming. Journal of Wildlife Management (manuscript in review).
- Ingelfinger, F. 2001. The Effects of Natural Gas Development on Sagebrush Steppe Passerines in Sublette County, Wyoming. M.S. Thesis, University of Wyoming. Laramie, WY.
- Isaacs, F.B., R.G. Anthony, and R.J. Anderson. 1983. Distribution and Productivity of Nesting Bald Eagles in Oregon, 1978-1982. The Murrelet 64:33-38.
- Jenni, D.A., and J.E. Hartzler. 1978. Attendance at a Sage Grouse Lek: Implications for Spring Census. Journal of Wildlife Management 42:46-52.
- Johnsgard, P.A. 1986. Birds of the Rocky Mountains. University of Nebraska Press. Lincoln, NE.
- Keinath, D., B. Heidel and G. P. Beauvais. 2003. Wyoming Plant and Animal Species of Concern. Prepared by the Wyoming Natural Diversity Database - University of Wyoming, Laramie, Wyoming.
- Kinter, L., and D. Martin. 1992. Black-Footed Ferret Sighting Reports in Wyoming. Wyoming Game and Fish Department, Lander, WY.
- Knick, S.T., and J.T. Rotenberry. 1995. Landscape Characteristics of Fragmented Shrubsteppe Habitats and Breeding Passerine Birds. Conservation Biology 9:1059-1071.
- Knick, S.T., D.S. Dobkin, J.T. Rotenberry, M.A. Schroeder, W. M. Vander Haegen, and C. van Riper III. 2003. Teetering on the Edge or Too Late? Conservation and Research Issues for Avifauna of Sagebrush Habitats. The Condor 105:611-634.
- Knight, D.H. 1994. Mountains and Plains: the Ecology of Wyoming Landscapes. Yale University Press. New Haven, CT.
- Laurion, T., and B. Oakleaf. 1998. Wyoming Lynx Inventories Completion Report. Threatened, Endangered and Nongame Bird and Mammal Investigations, Wyoming Game and Fish Department. Cheyenne, WY.
- Lee, R.M., J.D. Yoakum, B.W. O'Gara, T.M. Pojar, and R.A. Ockenfels, eds. 1998. Pronghorn Management Guides. 18th Pronghorn Antelope Workshop, Prescott, AZ.
- Lyon, A.G. 2000. The Potential Effects of Natural Gas Development on Sage Grouse (*Centrocercus urophasianus*) Near Pinedale, Wyoming. M.S. Thesis, University of Wyoming, Laramie, WY.
- Lyon, A.G., and S.H. Anderson. 2003. Potential Gas Development Impacts on Sage Grouse Nest Initiation and Movement. Wildlife Society Bulletin 31:486-491.
- McGee, M., D. Keinath, and G. Beauvais. 2002. Survey for Rare Vertebrates in the Pinedale Field Office of the USDI Bureau of Land Management (Wyoming). Wyoming Natural Diversity Database, Laramie, WY.
- Merrill, E.H., T.W. Kohley, M.E. Herdendorf, W.A. Reiners, K.L. Driese, R.W. Marrs, and S.H. Anderson. 1996. The Wyoming Gap Analysis Project Final Report. Wyoming cooperative Fish and Wildlife Research Unit. Laramie, WY.
- Moody, D.S., D. Hammer, M. Brusino, D. Bjornlie, R. Grogan, and B. Debolt. 2002. Wyoming Grizzly Bear Management Plan. Wyoming Game and Fish Department, Cheyenne, WY.

- Paradiso, J.L., and R.M. Nowak. 1982. Wolves. Pages 460-474 in J.A. Chapman and G.A. Feldhamer (editors). *Wild Mammals of North America: Biology, Management, and Economics*. The Johns Hopkins University Press, Baltimore, MD.
- Patla, S. 2005. Nongame Biologist. Wyoming Game and Fish Department. Personal Communication with PIC Technologies, Inc. August.
- Patla, S., B. Oakleaf, A. Cerovski, T. McEneaney, S. Loose, and T. Thomas. 2003. Bald Eagle Completion Report. A. Cerovski (editor). *Threatened, Endangered and Nongame Bird and Mammal Investigations*, Wyoming Game and Fish Department. Cheyenne, WY.
- Petroleum Association of Wyoming. 2004. Wyoming Oil and Gas Facts and Figures, 2004 Edition. Online: <http://www.pawyo.org/facts.aspx>
- Purcell, M. 2005. University of Wyoming, Laramie, personal communication with Golder Associates, Inc., August.
- Sauer, J. R., J. E. Hines, and J. Fallon. 2005. The North American Breeding Bird Survey, results and analysis 1966 - 2004. Version 2005.2. USGS Patuxent Wildlife Research Center, Laurel, MD.
- Sawyer, H., and F. Lindzey. 2000. Jackson Hole Pronghorn Study. Wyoming Cooperative Fish and Wildlife Research Unit. Laramie, WY.
- Sawyer, H., and F. Lindzey. 2001. Sublette Mule Deer Study. Wyoming Cooperative Fish and Wildlife Research Unit. Laramie, WY.
- Sawyer, H., F. Lindzey, D. McWhirter, and K. Andrews. 2002. Potential Effects of Oil and Gas Development on Mule Deer and Pronghorn Populations in Western Wyoming. *Transactions of North American Wildlife and Natural Resources Conference* 67:350-365.
- Sawyer, H., R. Nielson, and L. McDonald. 2005. 2005 Annual Report. Sublette Mule Deer Study (Phase II): Long-term monitoring plan to assess potential impacts of energy development on mule deer in the Pinedale Anticline Project Area. Western Ecosystems Technology, Inc. Cheyenne, WY.
- Sawyer, H., R. Neilson, L. McDonald, and D. Strickland. 2004. Sublette Mule Deer Study (Phase II). 2004 Annual Report. Western EcoSystem Technology, Inc. Cheyenne, WY.
- Sawyer, H., R. Neilson, and D. Strickland. 2003. Sublette Mule Deer Study (Phase II). 2003 Annual Report. Western EcoSystem Technology, Inc. Cheyenne, WY.
- Smith, S. 2003. 2002 Job Completion Report – Sublette Mule Deer. Wyoming Game and Fish Department, Annual Big Game Herd Unit Job Completion Reports. Cheyenne, WY.
- SocioEconomic Task Group. 2005. Monitoring Plan. Pinedale Anticline Working Group, Sublette County, WY. April.
- Sublette County Assessors Office. 2005. Property Value Newsletter. Sublette County, WY.
- Sublette County Visitor's Center. 2005. Destinations, Sublette County, Wyoming [online]. Retrieved from <http://www.visitsublettecounty.com>.
- Tyrrell, P. 2000. Green River Basin Plan: Recreational Uses. Technical Memorandum. Prepared by States West Water Resources Corporation. December.
- U.S. Census Bureau. 2005a. QuickFacts from the US Census Bureau Wyoming. Online: <http://quickfacts.census.gov/qfd/states/56000.html>
- U.S. Census Bureau. 2005b. QuickFacts from the US Census Bureau Sublette County, Wyoming. Online: <http://quickfacts.census.gov/qfd/states56/56035>
- U.S. Fish and Wildlife Service. 1982. The Kendall Warm Springs Dace Recovery Plan. U.S. Fish and Wildlife Service in cooperation with Wyoming Game and Fish Department and U.D.A. Forest Service, Denver, CO.

- U.S. Fish and Wildlife Service. 1999. Endangered and Threatened Wildlife and Plants; Proposed Rule to Remove the Bald Eagle in the Lower 48 States from the List of Endangered and Threatened Wildlife. Federal Register 64(128):36453-36464.
- U.S. Fish and Wildlife Service. 2000. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Contiguous U.S. Distinct Population Segment of the Canada Lynx and Related Rule. Federal Register 65(58):16052-16086.
- U.S. Fish and Wildlife Service. 2001. Endangered and Threatened Wildlife and Plants; 12-Month Finding for a Petition to List the Yellow-billed Cuckoo (*Coccyzus americanus*) in the Western Continental United States. Federal Register 66(143):38611-38626.
- U.S. Fish and Wildlife Service. 2003a. Endangered and Threatened Wildlife and Plants; Withdrawal of the Proposed Rule to List the Mountain Plover as Threatened. Federal Register 68(174):53083-53101.
- U.S. Fish and Wildlife Service. 2003b. Endangered and Threatened Wildlife and Plants; Final Rule to List the Columbia Basin Distinct Population Segment of the Pygmy Rabbit (*Brachylagus idahoensis*) as Endangered. Federal Register 68(43):10388-10409.
- U.S. Fish and Wildlife Service. 2004a. Ecological Services, Cheyenne, WY. Written Communication to Interested Parties. Reference document ES-61411/BFF/WY7746, February 2.
- U.S. Fish and Wildlife Service. 2004b. Endangered and Threatened Wildlife and Plants; 90-day Finding on a Petition to Delist the Ute Ladies'-tresses Orchid and Initiation of a 5-year Review. Federal Register 69(196):60605-60607.
- U.S. Fish and Wildlife Service. 2004c. Endangered and Threatened Wildlife and Plants; 90-day Finding for a Petition to List the Eastern Subspecies of the Greater Sage-Grouse as Endangered. Federal Register 69(4):933-936.
- U.S. Fish and Wildlife Service. 2005a. Ecological Services, Cheyenne, WY. Written Communication to Bureau of Land Management, Pinedale Field Office. Reference document ES-61411/W.I5/WY8654, August 3.
- U.S. Fish and Wildlife Service. 2005b. Endangered and Threatened Wildlife and Plants; 12-month Finding for a Petitions to List the Greater Sage-Grouse as Threatened or Endangered. Federal Register 70(8):2244-2282.
- U.S. Fish and Wildlife Service, Nez Perce Tribe, National Park Service, and USDA Wildlife Services. 2004. Rocky Mountain Wolf Recovery 2003 Annual Report. T. Meier (editor). U.S. Fish and Wildlife Service, Ecological Services. Helena, MT.
- U.S. Fish and Wildlife Service, Nez Perce Tribe, National Park Service, and USDA Wildlife Services. 2005. Rocky Mountain Wolf Recovery 2004 Annual Report. D. Boyd (editor). U.S. Fish and Wildlife Service, Ecological Services. Helena, MT.
- Vlcek, D. 2005. Bureau of Land Management, Pinedale Field Office. Personal Communication with Golder Associates, Inc. September.
- Whooping Crane Conservation Association. 2004. Current Whooping Crane Flock Status. Available online at: <http://www.whoopingcrane.com/FLOCKSTATUS.HTM>.
- Wiseman, S. 2005. Wyoming Department of Transportation, Supervisor Traffic Surveys. Personnel Communication with Golder Associates, Inc. September.
- Wyoming Department of Administration and Information, Economic Analysis Division. 2000. Population, Employment, Earnings and Personal Income Trends, Sublette Co, WY. Online: <http://eadiv.state.wy.us>
- Wyoming Department of Administration and Information, Economic Analysis Division.

2003. Ten Year Outlook. Wyoming Economic Forecast: 2003-2012. Online: <http://eadiv.state.wy.us/pop/sub-04est.htm>
- Wyoming Department of Administration and Information, Economic Analysis Division. 2004. Estimation of Population for Cities and Towns. Online: <http://eadiv.state.wy.us/pop/sub-04est.htm>
- Wyoming Department of Employment, Research and Planning. 2005. Employment Growth Continues in July. Monthly Newsletter. Online: <http://doe.state.wy.us/lmi/news.htm>
- Wyoming Department of Environmental Quality, Water Quality Division (WDEQ). 2001. Wyoming Surface Water Classification List. Retrieved from <http://deq.state.wy.us/wqd/surfacestandards/index.asp>
- Wyoming Department of Environmental Quality. 2004. Wyoming's 2004 305(b) State Water Quality Assessment Report and 2004 303(d) List of Waters Requiring TMDLs. Online at: <http://deq.state.wy.us/wqd/watershed/Downloads/305b/4-0539doc.pdf>
- Wyoming Department of Transportation. 2004a. Wyoming Traffic Summaries, Cheyenne, Wyoming.
- Wyoming Department of Transportation. 2004b. Unpublished data. Traffic Volumes on Pinedale-Area Highways. Wyoming Department of Transportation. Cheyenne, WY.
- Wyoming Game and Fish Department. 2003. Pinedale Region Aquatic Habitat Priorities – New Fork Corridor. Online: <http://gf.state.wy.us/habitat/aquatic/index.asp>. Accessed: July 10, 2005.
- Wyoming Game and Fish Department. 2004a. Minimum Programmatic Standards Recommended by the Wyoming Game and Fish Department to Sustain Important Wildlife Habitats Affected by Oil and Gas Development: A Strategy for Managing Energy Development Consistently with the FLPMA Principles of Multiple Use and Sustained Yield. Oil and Gas Mitigation Working Group, Wyoming Game and Fish Department. Cheyenne, WY.
- Wyoming Game and Fish Department. 2004b. Strategic Habitat Plan Accomplishments 2003 Annual Report. Wyoming Game and Fish Department, Aquatic Habitat, Terrestrial Habitat, Habitat and Access Maintenance, and Lands Administration Sections. Cheyenne, WY.
- Wyoming Game and Fish Department. 2005. Wyoming Game and Fish Hunting Information [online]. Retrieved from <http://gf.state.wy.us/wildlife/hunting/index.asp>